JEFFERSON COUNTY SCHOOLS
JEFFERSON ELEMENTARY SCHOOL RENOVATION

KNOXVILLE, TENNESSSEE

PROJECT MANUAL OF SPECIFICATIONS

PROJECT NO. 24-10

CONTRACT DOCUMENTS

SEPTEMBER 1, 2026

BLANKENSHIP & PARTNERS, LLC

A R C H I T E C T S & P L A N N E R S

1112 E Weisgarber Road, Suite 201

PHONE : 865.251.2585

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PROJECT MANUAL FOR

JEFFERSON COUNTY SCHOOLS
JEFFERSON ELEMENTARY SCHOOL
RENOVATION

321 WEST BROADWAY BOULEVARD
JEFFERSON CITY, TENNESSEE 37760

B&P PROJECT NUMBER: 24-10

DATE: SEPTEMBER 1, 2026

ARCHITECT:

BLANKENSHIP & PARTNERS, LLC
ARCHITECTS AND PLANNERS
1112 E Weisgarber Road, Suite 201
Knoxville, Tennessee 37909

CONSULTANTS:

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WELROC ENTERPRISES
376 Lochmere Drive
Morristown, Tennessee 37814

STRUCTURAL ENGINEERS
BENNETT & PLESS, INC
111 Sherlake Lane, Suite 200
Knoxville, Tennessee 37922

MECHANICAL, PLUMBING & FIRE ENGINEERS
ENGINEERING SERVICES GROUP, INC.
900 East Hill Avenue, Suite 350
Knoxville, Tennessee 37915

ELECTRICAL ENGINEERS
VREELAND ENGINEERS, INC.
3107 Sutherland Avenue
Knoxville, Tennessee 37919

NOTE TO BIDDERS: SEE IFB FOR DOCUMENTS REQUIRED TO BE SUBMITTED WITH BID.

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JEFFERSON COUNTY

BOARD OF EDUCATION & FINANCE DEPARTMENT

Invitation to Bid (ITB)
Jefferson Elementary School (JES) Renovation

Prepared in accordance with Tennessee Code Annotated (T.C.A.) and applicable requirements governing 1981 Act counties. Jefferson County Purchasing is receiving sealed bids for the above-mentioned project. Bids shall be identified on the exterior of the sealed envelope with all the information requested in the specifications included in this bid packet. Bids are to be addressed to the Jefferson County Finance Department and mailed or delivered to the following address:

Jefferson County Finance Department
Attn: Purchasing Agent
1244 Gay St./P.O. Box 1749
Dandridge, TN 37725

Bids will be received until 2:00 pm on 11/12/26. Date/Time Stamps of 2:00 pm or later will be rejected. Late bids will not be considered under any circumstances nor returned. Jefferson County Board of Education is not responsible for any delays due to weather, traffic conditions, nor postal services.

During the evaluation process Jefferson County Board of Education reserves the right, where it may serve the school's best interest, to request additional information or clarifications from suppliers/vendors.

Questions and requests for clarification or additional information should be directed by email to:

Brett Stone
Blankenship & Partners, LLC
bstone@bpdesigners.com
865-251-2585

With copies to:

Julie Anglea, Purchasing Agent
Janglea@jeffersoncountytn.gov

Erick Bustos, Owner's Representative
erick.bustos@skanska.com

Jefferson County Board of Education will consider all submittals that meet bid requirements as specified within the bid packet herein and to award contracts to the lowest, responsive, responsible bidder. Jefferson County Board of Education reserves the right to reject any and all bids, to waive irregularities or informalities in any proposal, and to make an award in any manner, consistent with law, deemed in the best interest of the schools.

SECTION 1: GENERAL TERMS AND CONDITIONS

General administrative, submission, and evaluation requirements applicable to all solicitations issued by Jefferson County and Jefferson County Board of Education.

1.1 General Information/Intent

Sealed bids are invited for the Jefferson Elementary School Renovation Project in Jefferson City, TN to include all renovation work required per specifications and contract documents.

1.2 Timeline (All Times are Eastern Standard Time):

1.2.1 ITB Issued: 10/13/2026

1.2.2 Mandatory Pre-Bid: 10/29/2026 at 2:00pm. Location: Jefferson Elementary School located at 321 W. Broadway Blvd., Jefferson City, TN 37760

1.2.3 Last Day for Questions: 11/5/2026 by 2:00pm

1.2.4 Addendum Issued (if applicable): TBD

1.2.5 Bid Opening: 11/12/2026 at 2:00pm

1.2.6 Anticipated Start Date: On or before 1/4/2027

1.3 Additional Information

Information about the Jefferson County Finance Department, ITB, specifications, and scope of work for this project can be obtained on the Jefferson County website at www.jeffersoncountytn.gov/finance-department.

1.4 Required Bonds/Retainage/Liquidated Damages (Construction Projects Only):

1.4.1 Bid Bond: equal to 10% of the bid is required on all construction bids as described in T.C.A 62-6-129.

1.4.2 Payment Bond: equal to 100% of a construction contract is required on all contracts above $100,000.00 as described in T.C.A. 12-4-201.

1.4.3 Performance Bond: equal to 100% of a contract is required for all construction contracts above $100,000.00. The awarded supplier(s)/vendor(s) must provide performance bonds from a Surety Company before signing a contract.

1.4.4 Actual Damages: Actual damages may accrue if work is not completed in agreed upon timeframe and to Jefferson County Board of Education 's satisfaction.

1.4.5 Retainage: A retainage account, not to exceed 5% of the contract, is required for all construction projects above $500,000 as described in T.C.A §66-34-103-104. This should be established by the contractor when the contract is signed.

1.4.6 Contractor License: certain contractor license information must be placed on the outside of the bid envelope for construction projects. When the amount of the bid exceeds $50,000.00. The name, license number, expiration date, and license classification of the contractors applying for the prime contract and for electrical, plumbing, heating, ventilation, and air condition contracts. T.C.A. §62-6-119-120.

1.5 Copies of Bids: Jefferson County Board of Education requires that submitted bids include two (2) identical copies one marked "original" and one marked "copy". Bid pages must be single sided.

1.6 Bid Submittal: Vendors shall hold their price firm and subject to acceptance by Jefferson County Board of Education for a period of forty-five (45) days from the date of bid opening, unless otherwise indicated in the bid proposal. Any bid submittal may be withdrawn prior to the scheduled time for the opening of bids, otherwise, bids will be reviewed as submitted. Jefferson County Board of Education reserves the right to reject any and or all bids and to waive any informality, technical defect, or clerical error in any bid submittal.

1.7 Bidder Obligation: Each bidder shall become fully acquainted with conditions relating to the scope and restrictions attending the execution of the work specified. Failure or omission of a vendor to become acquainted with existing conditions shall in no way relieve the bidder of any obligations with respect to the specifications or the contract.

1.8 Bid Delivery: Jefferson County Board of Education requires all bids/proposals to be submitted in sealed envelopes, addressed to the Jefferson County Finance Department, and clearly marked with the bid name by time of opening of the specified bid. Bid/proposal must be mailed or hand delivered. No bids/proposals will be accepted electronically, by fax, or by email. All bids will be opened at the specified time, and all suppliers/vendors and other people shall be invited to be present. Jefferson County Board of Education will not be responsible for any lost or misdirect mail sent by common carriers, delivery to addresses other than the one listed in solicitation, or for any late bid submissions received after the time and/or date specified. Not properly sealed and/or not properly labeled bids will not be accepted. Any bid/proposal may be withdrawn prior to the scheduled time of bid opening.

1.9 Signing Bids/Proposals & Use of Bid Forms: To be considered the bid proposal must be signed. By signing the bid proposal, the vendor acknowledges and accepts the terms and conditions stated in the document and bid packet. Vendors must complete the requested

forms contained in the bid packet. Failure to complete requested forms may result in rejection of their bid proposal.

1.10 Bid Acceptance/Award: Jefferson County Board of Education reserves the right to use all, part, or none of the submitted proposal or bid in order to provide the broadest coverage of requested parts, equipment, products, or services. Awards may be based on categories. Award will be made to the lowest, best, responsive, responsible bidder(s) meeting specifications that present the product or service that is most advantageous to Jefferson County Schools. Jefferson County Board of Education reserves the right to award this bid on an all or none basis, or by multiple awards, whichever is in the best interest of the schools. Award of specified bid (if any) should be made within thirty (30) days of bid opening. Bidders will be notified by email of the results regarding specified bid. The bidder(s) to whom the award is given may be required to enter a written contract.

1.11 Anticipated Contract Term: This contract will begin once contract is signed and all required bonds and retainage have been received. **The expected Substantial Completion of said project is 510 calendar days from start of work or by 5/28/2028. Final Completion shall be reached within 30 calendar days or by 6/27/2028.** Actual damages may accrue if work is not completed in agreed upon timeframe and to Jefferson County Board of Education's Satisfaction.

1.12 Rejection of Bids: Jefferson County Board of Education reserves the right to reject any and all bids received and to waive any informality, technical defect or clerical error in any bid. Non-acceptance of any bid will be devoid of any criticism of the bid and of any implication that the bid is deficient in any manner. Non-acceptance of a bid shall be construed as meaning simply Jefferson County Board of Education does not deem the bid acceptable or that another bid was deemed to be more advantageous for the services or goods proposed.

1.13 Evaluation Review: Jefferson County Board of Education reserves the right to use all pertinent information that might affect the school's judgement as to the appropriateness of an award to the best evaluated supplier/vendor. This information may be appended to the bids evaluation process results. Information on a service provider from reliable sources, and not within the service provider's bid proposal, may also be noted and made part of the evaluation file. Jefferson County Board of Education shall have sole responsibility for determining a reliable source. Jefferson County Board of Education reserves the right to conduct written and/or oral discussions/interviews after bid opening. The purpose of such discussions/interviews is to provide clarification and/or additional information to make an award that is in the best interest of the schools.

1.14 Restrictive or Ambiguous Specifications: It is the responsibility of the prospective bidder to review the entire bid packet and to notify the Jefferson County Finance Department Purchasing Agent if the specifications are formulated in a manner that would unnecessarily restrict competition. Any such protest or question regarding specifications or bid procedures must be received in the Jefferson County Finance Dept. no later than seven

(7) business days prior to bid opening to provide ample time, if necessary, to issue an addendum to the bid specifications. These requirements also apply to specifications that are ambiguous.

1.14.1 No oral interpretation will be made to any supplier/vendor regarding the meaning of specifications. All questions are to be submitted electronically by email and will be answered in the form of an Addendum to the solicitation by the Jefferson County Purchasing Agent.

1.14.2 Bidders taking exception to any part or section of bid specifications shall indicate such exceptions or deviations in their bid response. Failure to indicate any exceptions shall be interpreted as the bidder's intent to fully comply with the specifications as written. Conditional or qualified offers are subject to rejection in whole or in part. Exceptions will be negotiated for a mutual resolution.

1.15 Questions and Addendum: Vendor(s) shall carefully examine the ITB and any addenda. Vendor(s) are responsible for seeking clarification of any ambiguity, conflict, omission, or other errors in this specified bid writing. If the answer materially affects the specified bid the information will be incorporated into an addendum and provided to all bidders and will also be posted on the county website. An addendum will be issued, if necessary, to address questions or clarifications that result in changes to the bid scope or specifications, in accordance with Section 1.2.

1.16 Vendor Default: Jefferson County Board of Education reserves the right, in case of vendor default, to procure the articles or services from other sources and hold the defaulting vendor responsible for any excess costs occasioned thereby. Should the vendor default be due to failure to perform or because of a request for a price increase, Jefferson County Board of Education reserves the right to remove the vendor from the school's bidder list for twenty-four (24) months.

1.17 Term Bid Agreements: If this bid results in a term bid contract with the supplier/vendor, Jefferson County Board of Education must receive all general price decreases that other similar customers receive.

1.18 Alternative Bids: Jefferson County Board of Education will not accept alternate bids (those not equal to specifications) unless authorized by Jefferson County Board of Education and/or the Purchasing Agent.

1.19 Additions and/or Deletions: Jefferson County Board of Education reserves the right to consider adding goods and/or services to this bid or deleting goods and/or services that are deemed necessary and/or unnecessary. Any additions and/or deletions must be approved in writing by the Jefferson County Finance Department prior to any changes in service.

1.20 Declarative Statement: Any statement or words (e.g.: must, shall, will) are declarative statements that the vendor/supplier must comply with the condition. Failure to

comply with any such condition may result in their bid being non-responsive and disqualified.

1.21 Incurred Costs: Jefferson County Board of Education will not be responsible for any costs incurred in the preparation, submission, nor to procure or contract for any services or goods.

1.22 Taxes: Jefferson County Board of Education purchases are not subject to taxation. Tax exemption certificates will be provided upon request.

1.23 Proof of Financial and Business Capability: Bidder must, upon request, furnish satisfactory evidence of the ability to furnish products or services in accordance with the terms and conditions of these specifications. Jefferson County Board of Education will make the final determination as to the bidder's ability.

1.24 Public Records Act: Jefferson County Board of Education is subject to the Tennessee Public Records Act 10-7-503 et seq. Bidders are cautioned that all documents submitted on behalf of this solicitation shall be open to the public for viewing and inspection and Jefferson County Board of Education will comply with all legitimate requests.

1.25 Removal of Vendor's Employees: The successful contractor(s) agrees to utilize only experienced licensed, responsible, and capable people in the performance of the work specified under contract. Jefferson County Board of Education may require that the contractor remove employees who endanger persons or property, or whose continued employment under this contract is inconsistent with the interest of the schools.

1.26 State Licensing Requirements: Vendors must be properly licensed, if applicable, by the State of Tennessee for the type of work requested. Bidders should submit a copy of the required license with their bid. If a copy is not included at the time of submission, the awarded vendor must provide a valid license prior to commencing any work. All licensing must be in accordance with the Tennessee Code Annotated (T.C.A) §62-6-119.

1.27 News Releases by Vendors/Suppliers: As a matter of policy, Jefferson County Board of Education does not endorse the services of a vendor/supplier. A vendor/supplier will not make news releases concerning any resultant contract from this solicitation without prior written approval of Jefferson County Board of Education.

1.28 Closures: During periods of closure due to unforeseen circumstances or inclement weather in Jefferson County or closures at the direction of the School Superintendent, Jefferson County Mayor; the Jefferson County Finance Department/Purchasing Department will enact the following procedures in regard to solicitations, pre-bid meetings, and closures:

> **1.28.1** If the mayor and/or School Superintendent close the administrative offices prior to the time set for solicitation opening of any business day, all solicitations due that same day will be moved to the next operational business day.

1.28.2 Pre-Bid Meetings may be cancelled if closures occur. If a change is required due to unforeseen circumstances or inclement weather, an addendum will be issued for any changes and can be found on the county website. You may also contact the Purchasing Agent for any updates by email or telephone.

1.28.3 Other unforeseen circumstances shall be at the sole discretion of the Jefferson County Finance Director.

1.28.4 Jefferson County and/or Jefferson County Board of Education shall not be liable for any commercial carrier's decision regarding deliveries during any unforeseen circumstances.

1.29 Communications: The successful execution of this contract will require extensive communication between all parties involved. While information may be transmitted via telephone, it should always be followed up with an email. It is essential that the Vendor(s) have email capabilities.

1.30 Compliance with all Applicable Regulations: Vendor agrees and covenants that the company, its agents, and employees will comply with all city, county, state and federal codes, laws, rules, and regulations applicable to the business to be conducted under this contract. If the vendor performs any work knowing it to be contrary to such laws, ordinances, rules, and regulations, the vendor shall bear all costs arising from them.

1.31 Contact Personnel: It shall be essential to the success of this contract to develop a good working relationship with the vendor(s). It is imperative that the Jefferson County Board of Education account be handled efficiently and professionally. Jefferson County Board of Education should be assigned no more than two (2) vendor contacts to handle billing inquiries and service-related issues. In the event one (1) or both contacts leave the Jefferson County Board of Education account, the vendor shall formally introduce the new contacts to school personnel. These contacts must be knowledgeable of the Jefferson County Board of Education account to avoid any interruption of services.

1.32 Pricing: The vendor(s) warrants that the unit price stated for all items shall remain firm for a period of twelve (12) months from the first day of the contract period or until June 30 (the end of the government fiscal year) whichever comes first. If the vendor's price is increased after the initial year, Jefferson County Board of Education must be given written notice 30 days prior to contract end to consider continuation of services. Such a request shall include as a minimum 1) the cause for the adjustment; 2) the amount of the change requested with documentation to support the requested adjustment. Price increases will only be considered at renewal period(s). If the price increase is rejected the vendor may:

1.32.1 Continue with existing prices.

1.32.2 Request a lower price increase.

1.32.3 Not accept the renewal offer.

1.32.4 Re-submit a bid once the product/service goes back out to bid.

1.32.5 Vendor(s) must submit proof of price increase. If a price increase is approved by the Jefferson County Finance Department and the requesting department the approval notification will be made in writing and the vendor(s) will be notified of the new price schedule and the effective date of the increase. This documentation will become part of the bid file. No approvals will be authorized verbally.

1.33 Invoice Detail: Jefferson County Board of Education requests invoices show the following details to help expedite review for payment. The vendor(s) may be required to modify invoicing procedures to show detail. All potential vendor(s) are hereby cautioned that Jefferson County Board of Education will only pay from the original invoices and not facsimiles or copies. Invoices which do not adhere to these details may be returned to the vendor(s). Vendor(s) may be asked to submit a sample copy of their invoice for review during evaluation of this solicitation. Account information may be deleted.

1.33.1 The invoice must show the amount due to the vendor(s) by Jefferson County Board of Education.

1.33.2 The invoice must show an itemized detailed part and material count including dates of service, location of service, type of part, the associated unit price for the materials, parts, and/or services provided, and the total price for materials, parts, and/or services provided.

1.33.3 Invoices are to be original and uniquely pre-numbered.

1.33.4 Invoices should indicate PO number and/or department ordering.

1.34 Invoice Review: Pay applications must be submitted to the architect and Owner's project manager for review before they are fully signed and submitted to the Jefferson County Board of Education for processing payment. All invoices must adhere to the terms and conditions of the contract. Variations from the contract and contract pricing are strictly prohibited. Any variations found in the invoice will result in the rejection of those invoices. Rejected invoices will be returned to the vendor for correction.

1.35 Processing Time for Payment: Vendor(s) are advised that a minimum of thirty (30) days is required to process payment. This begins once the invoice has been submitted & approved by the architect and Owner's project manager and received in the Finance Dept. for payment.

1.36 Payment: Payment will be issued for goods received and/or services completed after final inspection and approval. Payment will be issued in full unless otherwise stated in the contract.

1.36.1 Payment Draws (Construction Projects Only): Unless otherwise stated, vendor(s) may request payment draws based on the amount of the project and work

completed. Payment draws must be approved by the Jefferson County Finance Director. Retainage will be returned after work has been completed and approved by Jefferson County Board of Education Administration and the final draw has been issued.

Section 2: Obligations, Rights, and Remedies

These terms and conditions shall be part of the contract. Jefferson County Board of Education reserves the right to negotiate other terms and conditions it deems appropriate and necessary under the circumstances to protect the public's trust.

2.1 Alterations or Amendments: No alterations, amendments, changes, modifications, or deletions to this contract shall be binding without the prior written approval by Jefferson County Board of Education.

2.2 Appropriation: In the event no funds are appropriated by Jefferson County Board of Education for the goods or services in any fiscal year or insufficient funds exist to purchase the goods or services, then the contract shall expire upon the expenditure of previously appropriated funds or the end of the current fiscal year, whichever occurs first, with no further obligations owed to or by either party.

2.3 Assignment: Vendor shall no assign or sub-contract this agreement, its obligations or rights hereunder to any party, company, partnership, incorporation, or person without the prior written specific consent of Jefferson County Board of Education.

2.4 Books and Records: Vendor shall maintain all relevant records for a minimum of three (3) years and make them available for audit or inspection.

2.5 Public Records Act: Jefferson County Board of Education is subject to the Tennessee Public Records Act T.C.A. § 10-7-503 et seq. Vendors are cautioned that all documents submitted on behalf of this solicitation shall be open to the public for viewing and inspection and Jefferson County Board of Education will comply with all legitimate requests.

2.6 Compliance with All Laws: Vendors shall comply with all applicable federal, state, and local laws, regulations, and licensing requirements affecting the provision of goods and/or services.

2.7 Default: Failure to perform or comply with any provision of this contract or the terms and conditions of any documents referenced and made a part hereof, Jefferson County Board of Education may terminate the contract, in whole or in part, and may consider such failure or noncompliance a breach of contract. Jefferson County Board of Education expressly retains all its rights and remedies provided by law in case of such breach, and no action by Jefferson County Board of Education shall constitute a waiver of any such rights or remedies. In the event of termination for default, Jefferson County Board of Education reserves the right to purchase requirements elsewhere.

2.8 Governing Law: This agreement shall be governed by the laws of the State of Tennessee with venue in Jefferson County. The Chancery Court and/or Circuit Court of Jefferson County, TN shall have exclusive and concurrent jurisdiction of any disputes which arise hereunder.

2.9 Indemnification/Hold Harmless: Vendor shall indemnify and hold harmless Jefferson County and/or Jefferson County Board of Education, its officials, and employees from all claims arising out of vendor performance, negligent act, occurrence, omission, or commission of vendor, its sub-vendors, suppliers, agents, or employees.

2.10 Non-Collusion: By submission of a signed bid/proposal the vendor certifies the proposal is made without collusion with any other person or company engaged in the same line of business or commence, or fraudulent act punishable under TN or US law

2.11 Title VI of the Civil Rights Act: Non-discrimination in Federally Assisted Programs- No person in the US shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal Financial Assistance 42 U.S.C. Section 2000d. It is the policy of Jefferson County Board of Education that all its services and activities be administered in conformance with the requirements of Title VI.

2.12 Independent Contractor: Vendor/Contractor acknowledges that it is an independent vendor/contractor and not an employee or agent of Jefferson County, TN.

2.13 Criminal History Check: Any and all contractors, subcontractors, vendors, vendor employees, agree to comply with T.C.A. § 49-5-413 requiring that all parties providing services for Jefferson County Board of Education must submit a criminal history records check at their expense. The criminal history check is to be conducted by the TN Bureau of Investigation and the Federal Bureau of Investigation.

2.14 No Boycott of Israel: Pursuant to TCA Title 12, Chapter 4, Part 1, by submission of a response to this solicitation, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint response each party thereto as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each person is not currently engaged in, and will not for the duration of the agreement engage in, a Boycott of Israel.

2.15 Iran Divestment Act: By submission of this solicitation, each vendor and each person signing on behalf of any vendor certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each vendor is not on the list created pursuant to T.C.A. § 12-12-106.

2.16 Non-Discrimination and Non-Conflict Statement: Vendor shall comply with all non-discrimination laws including Title VI. Vendors shall comply with the Fair Wage and Hour Laws, the National Labor Relations Act, and other federal and state employment laws as

applicable. Vendors covenant that it does not engage in any illegal employment practices. The vendor covenants that it has no public or private interest and shall not acquire directly or indirectly any interest, which would conflict in any manner with the provision of its goods or the performance of its services. Vendor warrants that no part of the total contract amount provided herein shall be paid directly or indirectly to any officer or employee of Jefferson County Board of Education as wages, compensation, or gifts in exchange for acting as officer, agent, employee, sub-vendor, or consultant to vendor in connection with any goods provided or work contemplated or performed relative to the agreement.

2.17 Drug-Free Affidavit: Construction bidders in Tennessee with five (5) or more employees must submit a notarized affidavit (T.C.A. § 50-9-113) with their bid, certifying they have a drug-free workplace program in effect. The affidavit must affirm compliance with Tennessee Code Annotated Title 50, Chapter 9.

2.18 Warranty/Inspection/Acceptance: Vendor warrants all goods and services are of merchantable quality, fit for purpose, and conform to specifications. Warranty periods shall not commence until Jefferson County Board of Education inspects and formally accepts goods and/or services. Acceptance of goods or services does not constitute a waiver of latent or hidden defects or defects not readily detectable by a reasonable person under the circumstances. Jefferson County Board of Education reserves the right to reject any or all items or services not in conformance to applicable specifications. Vendor assumes the costs associated with such nonconformance.

2.19 Limitations of Liability: In no event shall Jefferson County Board of Education be liable for any indirect, incidental, consequential, special, exemplary damage, or lost profits even if Jefferson County Board of Education has been advised of the possibility of such damages.

2.20 Order of Precedence: In the event of inconsistent or conflicting provisions the following order shall prevail: Change Orders and Written Amendments (executed after the contract), Contract, Addenda, RFP/ITB, Award, Supplementary Terms and Conditions, General Terms and Conditions, Specifications, Drawings/Plans, Vendor Bid/Proposal response.

2.21 Remedies: Jefferson County Board of Education retains all remedies available under Tennessee Law, including damages and termination.

2.22 Right to Inspect: Jefferson County Board of Education reserves the right to inspect work, services, and materials at any time.

2.23 Severability: If any provision is invalid, remaining provisions remain in effect.

2.24 Tax Compliance: Vendor acknowledges, by submission of bid and signature, that it is current in its respective Federal, State, County, and City taxes of whatever kind or nature and is not delinquent in any way. Delinquent status must be disclosed or risk debarment by Jefferson County and Jefferson County Board of Education.

2.25 Gratuities and Kickbacks: It shall be a breach of ethical standards for any person or company to offer, give, or agree to give any employee or former employee, or for any employee or formal employee to solicit, demand, accept, or agree to accept from another person or company gratuities or kickbacks. Breach of these provisions is a breach of contract & ethical standards and will result in disqualification, legal action, and/or debarment or suspension from being a vendor or sub-vendor under Jefferson County Board of Education contracts.

2.26 Insurance: Vendor shall maintain required insurance and provide proof of insurance. A copy of COI may be requested for proof of insurance. The successful vendor will be required to submit a COI with the specified coverage and listing Jefferson County Board of Education as additional insured; endorsement pages shall be included. It shall be the successful vendor's responsibility to keep current COI and endorsement pages on file with the Jefferson County Finance Department if the contract is in effect. The contractor shall, at its sole cost and expense, carry and maintain statutory workers' compensation insurance, employer's liability insurance, and professional liability insurance (if applicable) for any and all persons employed directly or indirectly by the contractor for the duration of the contract. The limits of liability therein shall meet, at a minimum, the limits of liability stated within the Standard Liability Insurance Requirements.

2.27 Environmental Liability: Vendor assumes responsibility for proper handling and disposal of materials in accordance with TN law.

2.28 Notice to Proceed (Construction Projects Only): Once the notice to proceed is issued, the construction completion timeframe begins with the agreed upon completion date. A written request must be received thirty (30) days prior to the expected completion date if unable to complete during given timeframe. At the discretion of Jefferson County Board of Education an extension may be granted without penalty. If a written request is not received thirty (30) days prior or Jefferson County Board of Education does not grant an extension, actual damages will begin to be assessed until the work has been completed to Jefferson County Board of Education's satisfaction.

Section 3: Specifications and Scope of Work

3.1 Refer to Project Manual & Drawings for additional details & requirements.

Section 4: Checklist

This section is provided for reference only and is not intended to represent a complete list of all documents or items that may be required as part of the bid submission.

4.1 Vendor Information Sheet

4.2 Iran Divestment Act Affidavit

4.3 Title VI Contract Assurance

4.4 Non-Collusion Affidavit

4.5 Non-Discrimination, Non-Debarment, & Lobbying Affidavit

4.6 Addendum Acknowledgement (If Applicable)

4.7 Drug-Free Workplace Affidavit

4.8 No Contact/No Advocacy Affidavit

4.9 Copy of Contractor License

4.10 Proof of Insurance and Liability

4.11 Bid Form – Price Sheet

4.12 Signature on Bid and on all required documents.

4.13 Properly Seal and Label envelope as described in ITB.

4.14 Contractor License Information From Attached to Outside of Envelope

4.15 Include two single sided copies of bid marked original and copy.

4.16 Pages one (1) through thirteen (13) do not need to be included in bid packet.

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Vendor Information Sheet

Company Name: _____

Company Address:_____

Billing Address:_____

Contact Name:_____

Phone Number:_____

Email Address:_____

List of References (List at least 3 references: Name, Phone Number, Email)

_____
_____
_____
_____
_____

Signature: Title: Date:

_____

Print Name: Title:

_____

The undersigned certifies that he/she has the authority to bind this company in an agreement/contract to supply the commodity or service in accordance with all terms, conditions, and pricing specified. By signing and submitting this proposal, the vendor acknowledges that they have read, understand, and agree to all aspects of the specifications and proposal requirements as presented without reservation or alteration. This proposal, if accepted, will constitute an agreement and contract with Jefferson County Board of Education. Prices are firm during this agreement term, unless agreed upon in writing by the BOE.

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Iran Divestment Act Affidavit

Iran Divestment Act Affidavit as per Tennessee Code Annotated, Title 12, and effective July 1, 2016: By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid, each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not on the list created pursuant to 12-12-106.

Authorized Signature:_____Date: _____

Print Name: _____

Date Bid Submitted:_____

Title:_____

Company Name:_____

Address:_____

Phone Number:_____

Email Address:_____

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Title VI Contract Assurance

It is the policy of Jefferson County Board of Education not to discriminate on the basis of race, color, national origin, age, sex, or disability in its hiring practices; or in admission to, access to, or operation of its programs services or activities. With regard to all aspects of this contract, Contractor certifies and warrants it will comply with this policy.

Please print: _____

Vendor Name

_____

Street Address

_____

City State Zip Code

_____

Phone Number Email

I_____, hereby agree to abide by the Title VI regulations.

Signature_____Date_____

Ownership Type (please check all that apply)

	African American Owned Business		Asian Owned Business
	Women Minority Owned Business		Disabled Owned Business
	Native American Owned Business		All Others
	Hispanic Owned Business		

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Non-Collusion Affidavit

_____, being first duly sworn, deposes and says that:

1) He/She is_____of_____, the bidder that has submitted the attached proposal;

2) He/She is fully informed respecting the preparation and contents of the attached proposal and of all pertinent circumstances respecting such proposal;

3) Such proposal is genuine and is not a collusive or sham proposal;

4) Neither the said bidder nor any of its officers, partners, owners, agents, representatives, employees, or partied interest, including this affiant, has in any way colluded, conspired, connived, or agree, directly or indirectly, with any other bidder, firm or person to submit a collusive or sham bid in connection with the contract for which the attached proposal has been submitted or to retain from bidding in connection with such contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other bidder, firm, or person to fix the price of prices in the attached proposal, or of any other bidder, or to fix any overhead, profit, or cost element or the bid price or the bid price of any other bidder, or to secure through any collusion, conspiracy, connivance, or unlawful agreement any advantage against Jefferson County or any person interested in the proposed contract; and

5) The price or prices quoted in the attached proposal are fair and proper and are not tainted by any collusion, conspiracy, connivance, or unlawful agreement on the part of the bidder or any of its agents, representatives, owners, employees, or parties of interest, including this affiant.

Signature_____

Print Name_____

Title_____

Date_____

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Non-Discrimination, Non-Debarment, & Lobbying Affidavit

I do hereby certify that this bid is made without prior understanding, agreement, or connection with any corporation, firm, or person submitting a bid for the same materials, supplies, or equipment, and is in all respects fair and without collusion or fraud.

I understand that collusive pricing is a violation of State and Federal law and can result in fines, prison sentences, and civil damage awards and that no collusion with another firm was used in preparation of this bid.

I also certify that this firm does not discriminate against any employee or applicant for employment on the grounds of race, color, national origin or sex; and does not and will not maintain or provide for his employees any segregated facilities at any of its establishments, and further, that the firm does not and will not permit their employees to perform their services at any location under this contract where segregated facilities are maintained.

By submission of this bid, the bidder certifies that neither it or its principals is presently debarred, suspended, proposed for debarment, declared ineligible or voluntarily excluded from participation in this transaction by any Federal or State department or agency.

I further certify that during the Invitation to Bid solicitation and/or during the performance of this contract that neither it nor its principals will participate in lobbying activities in conjunction with this project.

I agree to abide by all terms and conditions of this Invitation to Bid and certify that I am authorized to sign this affidavit for the vendor.

Please indicate which of the following apply to your company. This information is requested for information purposes only. Jefferson County currently has no policy that allows for set asides or preferences for woman owned or minority owned businesses.

_____ African American _____ Native American Owned _____ Hispanic Owned

_____ Caucasian Owned _____ Asian Owned _____ Women Owned _____Other Owned

Signature:_____Title_____Date_____

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Addendum Acknowledgement (if applicable)

If applicable, please complete and return this with bid proposal response.

I the undersigned acknowledge the receipt of the following addenda to this solicitation.

Addendum #1- Date Received_____

Addendum #2- Date Received_____

Addendum #3- Date Received_____

Addendum #4- Date Received_____

Signature_____

Print Name_____

Title_____

Company Name_____

Email_____

Phone Number_____

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Drug-Free Workplace Affidavit

State of _____

County of_____

The undersigned, principal officer of_____, an employer of five (5) or more employees contracting with Jefferson County Government and Board of Education to provide construction services, hereby states under oath as follows:

1) The undersigned is a principal officer of _____ (hereinafter referred to as the "Company") and is duly authorized to execute this Affidavit on behalf of the Company.

2) The Company submits this Affidavit pursuant to T.C.A. § 50-9-113, which requires each employer with no less than five (5) employees receiving pay who contracts with the state or any local government to provide construction services to submit an affidavit stating that such employer has a drug-free workplace program that complies with Title 50, Chapter 9,of the Tennessee Code Annotated.

3) The Company is in compliance with T.C.A. . § 50-9-113. Further affiant saith not.

_____

Principal Officer

State of_____

County of_____

Before me personally appeared_____, with whom I am personally acquainted (or proved to me on the basis of satisfactory evidence), and who acknowledged that such person executed the foregoing affidavit for the purpose of therein contained.

Witness my hand and seal at office this _____day of _____, 2026

Notary Public_____My Commission Expires_____

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No Contact/No Advocacy Affidavit

State of _____

County of _____

_____, being first duly sworn, deposes and says that:

(1) He/She is the owner, partner, officer, representative, or agent of _____ _____, the Proposer that has submitted the attached Proposal;

(2) The Proposer _____ swears or affirms that he/she will abide by the following "No Contact" and "No Advocacy" clauses:

a) NO CONTACT POLICY: After the posting of this solicitation to the Purchasing Division's website, any contact initiated by any proposer with any Jefferson County and/or Jefferson County Schools representative concerning this proposal is strictly prohibited, unless such contact is made with the Jefferson County Purchasing Agent. Any unauthorized contact may cause the disqualification of the proposer from this procurement transaction.

b) NO ADVOCATING POLICY: To ensure the integrity of the review and evaluation process, companies and/or individuals submitting proposals for any part of this project, as well as those persons and/or companies representing such proposers, may not lobby or advocate to Jefferson County and/or Jefferson County Schools staff including, but not limited to, members of Jefferson County Commission, Jefferson County Offices, Office of the Mayor, Jefferson County School Board or any other Jefferson County staff.

Any company and/or individual who does not comply with the above stated "No Contact" and "NO Advocating" policies may be subject to having their proposal rejected from consideration.

Signed: _____

Title: _____

Subscribed and sworn to before me this _____ day of _____, 2026

Notary Public_____
My Commission expires: _____

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To:	Jefferson County Purchasing Attn: Julie Anglea P.O. Box 1749/1244 Gay St. Dandridge, TN 37725	Project:	
Date:		Time:	
Site Location:		Bid Opening:	

Name of Bidder:		Bidder's License Classification:	
License No.:		Expiration Date: Monetary Limits:	

*If the Bid involves: Electrical, Plumbing, HVAC, Masonry, Roofing, or Geothermal Work, complete below section. If not enter "NONE" in the space provided under Section (A) for each work of service. *

Electrical	Plumbing	HVAC	Masonry	Roofing	Geothermal
A. Name of Sub holding electrical license	Name of Sub holding plumbing license	Name of Sub holding HVAC license	Name of Sub holding Masonry license	Name of Sub holding Roofing license	Name of Sub holding Geothermal license
B. License No. of Contractor holding Electrical License	License No. of Contractor holding Plumbing License	License No. of Contractor holding HVAC License	License No. of Contractor holding Masonry License	License No. of Contractor holding Roofing License	License No. of Contractor holding Geothermal License
C. License Classification & Limits	License Classification & Limits	License Classification & Limits	License Classification & Limits	License Classification & Limits	License Classification & Limits
D. Expiration Date of Electrical License	Expiration Date of Plumbing License	Expiration Date of HVAC License	Expiration Date of Masonry License	Expiration Date of Roofing License	Expiration Date of Geothermal License

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SECTION 00 30 00 - INFORMATION AVAILABLE TO BIDDERS

1.1 GENERAL

This Section identifies information that was gathered solely for the use of the Designer, is not a Bidding Document, but is available for review by Bidders. Bidders have the entire responsibility for their interpretation and use of this information and shall not rely on the information for preparation of a bid.

2.1 INFORMATION AVAILABLE

A. Geotechnical Exploration Report – Report Date: October 23, 2025, 37 pages.

B. Geotechnical Exploration Report – Report Date: April 22, 2026, 61 pages

END OF SECTION 00 30 00

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GEOTECHNICAL EXPLORATION REPORT

JEFFERSON ELEMENTARY SCHOOL
BUILDING ADDITION
JEFFERSON CITY, TENNESSEE

CLIENT: SKANSKA USA

REPORT DATE: OCTOBER 23, 2025

FSE PROJECT NUMBER: 725561

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

October 23, 2025

Mr. Curtis Elswick
Senior Vice President
Regional Executive
Skanska USA

RE: GEOTECHNICAL EXPLORATION REPORT
JEFFERSON ELEMENTARY SCHOOL
BUILDING ADDITION
JEFFERSON CITY, TENNESSEE
FSE FILE NO.: 725561

Dear Mr. Elswick:

Per your authorization of proposal no. 25.305, we have completed a geotechnical exploration of the above-referenced site. The purpose of the evaluation was to gather site and subsurface information from which to provide engineering recommendations concerning site preparation methods, foundation design, and other construction considerations. The following report presents our findings and recommendations.

We appreciate the opportunity to provide our geotechnical engineering and testing services. If you have any questions regarding the information within this report, please contact us at your convenience.

Sincerely,
Foundation Systems Engineering

Samuel Mathews, PE
Project Engineer/Lab Manager
TN License No: 128504

Allen Browning, MS, PE
President/CEO
TN License No: 117463

ALLEN BROWNING
REGISTERED ENGINEER
AGRICULTURE
COMMERCE
No. 117463
STATE OF TENNESSEE

10/23/2025

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Boring Location Plan
Test Boring Records
Area Topographic Map
Area Geology Map
Aerial Photograph
Test List
General Notes

EXECUTIVE SUMMARY

The following is a geotechnical exploration report requested by Skanska USA, related to the design and construction of a new building addition at Jefferson Elementary School located in Jefferson City, Tennessee.

A summary of our findings and recommendations is listed below:

- The project will consist of a new building addition.
- The subsurface conditions on the site were explored with the use of two (2) soil test borings. The approximate location of the test borings is indicated on the *Boring Location Plan* provided.
- The soil test locations encountered fill and residual soil types. The fill soil types included low to high-plasticity clays and silts. The fill soil varied in consistency from stiff and very moist. The residual soil types included low to high-plasticity clays and silts. The residual soils varied in consistency from medium to stiff and very moist.
- Boring locations B-1 and B-2 did not encounter auger refusal. These borings were terminated at predetermined depths of 20.0 feet.

FSE offers the following methods for consideration for site/foundation preparation:

It is the opinion of FSE that conventional shallow foundations are an appropriate foundation system for the proposed structure.

- **Undocumented Fill** - The owner should understand that there is an inherent risk of constructing over undocumented fill, as localized areas of compressible soils, nested boulders, or buried debris can be present between the boring locations and can go unnoticed during the geotechnical study or during construction. The only way to eliminate this risk is to completely remove the fill and replace it in a controlled, engineered manner. However, this approach would likely be cost-prohibitive at this site.

  Ultimately, the decision to build on undocumented fill is an economic decision that only the owner can make relative to the level of risk they consider acceptable should the new construction experience subgrade-related distress (e.g. building settlement, premature pavement distress, etc.). This risk can be effectively managed by performing thorough monitoring and testing during construction, as described in this report. In addition, the subgrade and the foundation-bearing soils should be observed by the Geotechnical Engineer during construction due to the prevalence of existing fill across the site.

  If the owner elects to leave the existing fill in place, careful and thorough evaluations of the subgrade during construction should be considered critical to reducing the risk of unwanted post-construction settlement. These evaluations may include proof rolling the subgrade soils, performing hand auger borings, and excavating test pits within previously filled areas. In addition, localized remedial subgrade repairs should be anticipated. The mentioned evaluations would help in identifying soft, loose, or otherwise unsuitable areas of the fill, which would require remedial activities.

- **Shallow Foundations - Select Foundation Undercutting** – Dynamic Cone Penetrometer (DCP) testing and Probe Rod Sounding testing, performed under the observation of a Geotechnical Engineer from Foundation Systems Engineering, should be used to determine the soil strength at foundation subgrade locations. Areas of soft consistency soil may be encountered during foundation excavations. Localized undercutting and replacement of soil will be required at these locations. Undercut depths are anticipated to be up to approximately 4 feet below the bottom of the concrete. Backfill material in the undercut locations should be compacted, select gravel aggregate; approved soil fill; or flowable fill concrete. FSE recommends an allowable soil bearing pressure of 2,000 psf be used for the design of the foundations.
- **Utility Line Trenches** - Utility trenches should *not* be backfilled with open-graded gravel to limit subsurface and lateral water movement on the site. We recommend the use of select, crushed gravel, with fines (TDOT 303A) and/or fined grained soil for backfill material.
- **Existing Utilities** – Existing utilities could be present within the footprint of the proposed addition. Relocation of existing utilities or caution should be used during construction if the utilities are left in place.
- The completed project plans should be reviewed by FSE to allow final recommendations on the general method of construction and site/foundation preparation methods.
- Concrete slab-on-grade and mat foundations can be designed using a modulus of subgrade reaction (k) of 100 pounds per cubic inch (pci). An IBC 2024 Seismic Site Class "C" is recommended for this site.
- The site grading and foundation construction should be performed under the observation of a geotechnical engineer to assist with the continued evaluation of soil conditions during the construction process.
- This summary should be used in conjunction with the entire report for design purposes. Details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled "General Qualifications" should be read for an understanding of the report limitations.

SCOPE OF SERVICES

Item	Description
Information Reviewed	- USGS Topographic Mapping - Geologic Mapping of Northeast Tennessee - 2024 International Building Code
Site Reconnaissance	Walk-down of the site to observe: - Topographic features - Drainage patterns - Ground surface cover - Surface improvements - Existing development - Karst features
Soil Test Borings (2)	- Two (2) soil test borings advanced with a geoprobe drilling rig with sampling at preselected intervals - Observation of drilling and samples for soil type and moisture conditions was performed during the drilling operations. - On-site and laboratory classification of soil samples. - Backfilled borings with auger soil cuttings
Test Location Layout	- Soil test borings were located in the field by FSE - Boring locations may have been shifted to clear away from subsurface utility lines. - Locations should be considered approximate; existing ground surface elevation was not available.
Laboratory/Field Soil Testing	- Thirty (30) Natural Moisture Tests - Two (2) Soil Classification Tests
Groundwater Measurement	- Groundwater was not encountered during drilling.

PROJECT/SITE INFORMATION

PROJECT DESCRIPTION

Item	Description
Project Location	Jefferson Elementary School Jefferson City, Tennessee
Project Information	General – The project will consist of a new building addition Foundation Loads - Not provided Below Grade Walls – No (Assumed) Bearing Capacity - 2,000 psf (Assumed) Excavation - Up to approximately 4 feet Fill Placement – Up to approximately 4 feet

SITE DESCRIPTION

Item	Description
Current Conditions	**Ground Cover** - Primarily Grass and Top Soil **Drainage Patterns** - The site has been previously graded during past construction and water was observed to drain to designed storm water systems/detention ponds **Karst Activity** - No sinkholes in the area observed **Exposed Rock** - None observed
Topography	**USGS Mapping** - The site has been previously graded during past construction and water was observed to drain to designed storm water systems/detention ponds

Regional Geology	Based on review of available geologic mapping, the project site is located in the Valley and Ridge physiographic province of northeast Tennessee. The mapping indicates that the site is located within the geology of Longview Dolomite which is part of the Knox Group. The bedrock of this formation consists primarily of dolomite and limestone. These carbonate rocks are prone to karst development (i.e. sinkholes, springs, underground channels and caves). These rock types typically weather to near surface residual soils consisting of primarily silts and clays. The depth of the soil profile is continually altered over geologic time by gradual weathering at the soil/rock interface, and more rapidly by erosion of surficial soils. Weathering of the parent bedrock is generally more rapid near fracture zones. Therefore, the bedrock surface will be irregular.
Karst Activity	Our review of the topographic mapping of the area indicates that the site's geology is located in the Knox Group, in which karst topography is present. Karst terrain is characterized by the existence of sinkholes and closed depressions at the ground surface. Past experience has found that sites where grading/construction activities remove all or a portion of the stiff upper crust of soil overburden are at a higher risk of sinkhole activity (dropouts) than sites where no such excavation is made. Similarly, sinkholes may be induced by ponding water, porous utility line trench backfill materials, or from leaking pipes, etc. Soil supported foundations overlying rock units that are susceptible to solutioning and sinkhole development are at risk of damage from sinkhole activity. Structures supported on soil overlying soluble carbonate rock units are at risk of damage resulting from sinkhole development. This risk can be minimized but cannot be eliminated.

SUBSURFACE DESCRIPTION

The following is a summary of the soils encountered at the soil test locations. Additional subsurface details may be seen on the attached *Test Boring Records*. The subsurface stratification indicated on the records is approximate and represents FSE's interpretation of the soils encountered at the excavation/sampling locations.

Item	Description
Ground Cover	Grass and Top Soil - Approximately 2 inches Comments - Variation in thickness will occur over the site
Fill Soil	Origin - man-made, derived from placement during past use Test Locations – B-1 and B-2 Description – Tan and Red Silts and Clays with Iron Staining Consistency – Stiff Moisture – Very Moist Depth - Encountered to approximate depths from 0.0 to 2.0 feet.
Residual Soil	Origin – Native, derived from the weathering of underlying bedrock materials Test Locations – B-1 and B-2 Description – Tan and Red Silts and Clays with Chert, Silt Seams, and Iron Staining Consistency – Medium to Stiff Moisture – Very Moist Depth - Encountered to approximate depths from 2.0 to 20.0 feet.
Bedrock/ Auger Refusal	Bedrock Locations – None Auger Refusal – None, borings were terminated at a predetermined depth of 20.0 feet
Groundwater	Groundwater was not encountered during drilling operations. Comments - Changes in groundwater elevations will occur during wet weather periods.

LABORATORY TESTING

NATURAL MOISTURE CONTENT

The Natural Moisture Content tests provide data that assist in evaluating the on-site soil moisture for engineering properties and the amount of moisture conditioning required for their re-use as on-site fill soil.

Natural Moisture Content Data Summary					
Boring Location	Depth (Feet)	Natural Moisture Content (%)	Boring Location	Depth (Feet)	Natural Moisture Content (%)
B-1	1.0	19.8	B-2	1.0	30.9
B-1	2.5	34.6	B-2	2.5	32.6
B-1	4.0	34.6	B-2	4.0	44.1
B-1	5.0	35.2	B-2	5.0	29.1
B-1	6.5	39.6	B-2	6.5	31.9
B-1	8.0	38.3	B-2	8.0	34.1
B-1	9.0	39.4	B-2	9.0	30.8
B-1	10.5	38.6	B-2	10.5	34.5
B-1	12.0	40.4	B-2	12.0	34.0
B-1	13.0	36.0	B-2	13.0	32.0
B-1	14.5	38.2	B-2	14.5	31.6
B-1	16.0	41.5	B-2	16.0	33.4
B-1	17.0	31.0	B-2	17.0	35.3
B-1	18.5	36.0	B-2	18.5	44.8
B-1	20.0	37.6	B-2	20.0	34.8

ATTERBERG LIMITS

The Atterberg Limits Determination provides the Liquid and Plastic limits for soil classification purposes and to assist in evaluating the soil for engineering properties.

The following table summarizes the Atterberg Limits Determination Testing:

Atterberg Limits Data Summary						
Boring Location	Sample Depth (Feet)	Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	USCS Soil Classification
B-1	0.0 – 4.0	N/A	58	36	18	MH
B-2	0.0 – 4.0	N/A	62	31	31	CH

SOIL GRADATION (SIEVE ANALYSIS)

The Soil Gradation provides a classification of soil that ranks the soil based on particle sizes contained in the soil. The gradation of soil affects compressibility and ground permeability. The gradation of soil is determined by a distribution curve produced from the results of sieve analysis.

The following table summarizes the Soil Gradation Testing:

Soil Gradation Data Summary					
Boring Number	**Sample Depth (Feet)**	**Gravel (%)**	**Sand (%)**	**Fines (%)**	**USCS Soil Classification**
B-1	0.0 – 4.0	0.0	4.5	95.5	MH
B-2	0.0 – 4.0	0.0	3.0	97.0	CH

TESTING SUMMARY

The soils present on the site are classified as low to high-plasticity silts, clays, and sands based on the USCS soil classification system. These soil types are given the soil symbols ML, CL, MH, CH, and CL-ML. The soil types have a generally low to high potential for volume change from changing moisture contents and loading conditions.

Such soils have poor to fair compaction characteristics, with compaction typically achieved using a vibratory sheepsfoot roller. Moisture conditioning (drying) will be required to achieve specified compaction density. We anticipate that the on-site soil will generally exist at a moisture content that is 0% to 20% above the optimum moisture, as determined by laboratory testing.

With proper moisture conditioning (drying), the onsite soil may be used for onsite fill.

RECOMMENDATIONS

We offer the following geotechnical engineering recommendations based on the project information provided and the site and geotechnical data gathered during our subsurface exploration.

GEOTECHNICAL CONSIDERATIONS

FSE offers the following methods for consideration for site/foundation preparation:

It is the opinion of FSE that conventional shallow foundations are an appropriate foundation system for the proposed structure.

- **Undocumented Fill** - The owner should understand that there is an inherent risk of constructing over undocumented fill, as localized areas of compressible soils, nested boulders, or buried debris can be present between the boring locations and can go unnoticed during the geotechnical study or during construction. The only way to eliminate this risk is to completely remove the fill and replace it in a controlled, engineered manner. However, this approach would likely be cost-prohibitive at this site.

  Ultimately, the decision to build on undocumented fill is an economic decision that only the owner can make relative to the level of risk they consider acceptable should the new construction experience subgrade-related distress (e.g. building settlement, premature pavement distress, etc.). This risk can be effectively managed by performing thorough monitoring and testing during construction, as described in this report. In addition, the subgrade and the foundation-bearing soils should be observed by the Geotechnical Engineer during construction due to the prevalence of existing fill across the site.

  If the owner elects to leave the existing fill in place, careful and thorough evaluations of the subgrade during construction should be considered critical to reducing the risk of unwanted post-construction settlement. These evaluations may include proof rolling the subgrade soils, performing hand auger borings, and excavating test pits within previously filled areas. In addition, localized remedial subgrade repairs should be anticipated. The mentioned evaluations would help in identifying soft, loose, or otherwise unsuitable areas of the fill, which would require remedial activities.

- **Shallow Foundations - Select Foundation Undercutting** – Dynamic Cone Penetrometer (DCP) testing and Probe Rod Sounding testing, performed under the observation of a Geotechnical Engineer from Foundation Systems Engineering, should be used to determine the soil strength at foundation subgrade locations. Areas of soft consistency soil may be encountered during foundation excavations. Localized undercutting and replacement of soil will be required at these locations. Undercut depths are anticipated to be up to approximately 4 feet below the bottom of the concrete. Backfill material in the undercut locations should be compacted, select gravel aggregate; approved soil fill; or flowable fill concrete. FSE recommends an allowable soil bearing pressure of 2,000 psf be used for the design of the foundations.

- **Utility Line Trenches** - Utility trenches should *not* be backfilled with open-graded gravel to limit subsurface and lateral water movement on the site. We recommend the use of select, crushed gravel, with fines (TDOT 303A) and/or fined grained soil for backfill material.

- **Existing Utilities** – Existing utilities could be present within the footprint of the proposed addition. Relocation of existing utilities or caution should be used during construction if the utilities are left in place.
- The completed project plans should be reviewed by FSE to allow final recommendations on the general method of construction and site/foundation preparation methods.
- Concrete slab-on-grade and mat foundations can be designed using a modulus of subgrade reaction (k) of 100 pounds per cubic inch (pci). An IBC 2024 Seismic Site Class "C" is recommended for this site.
- The site grading and foundation construction should be performed under the observation of a geotechnical engineer to assist with the continued evaluation of soil conditions during the construction process.
- This summary should be used in conjunction with the entire report for design purposes. Details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled "General Qualifications" should be read for an understanding of the report limitations.

SITE SUBGRADE PREPARATION

The area to be developed should be stripped of organic soil, construction materials, and soft/wet soils. After clearing and grubbing are complete, the site should be Proof Roll Tested to evaluate the subgrade soil strength characteristics.

The soil subgrades should be Proof Roll Tested with a fully loaded dump truck (minimum load of 20 tons) in a slow crossing pattern across the site. A minimum of four passes should be used to evaluate the soil subgrade. Proof Roll Testing should be performed under the observation of a geotechnical engineer to evaluate the subgrade and provide recommendations for any unsuitable areas encountered. The type and method of soil improvement may be determined at that time.

STRUCTURAL FILL

ENGINEERED FILL DESCRIPTION AND RECOMMENDED USES		
Fill Type	**USCS Classification**	**Acceptable Location for Placement**
Soil[1]	Various (PI<30)	All Locations and elevations
Stone[2]	GW[2]	All Locations and elevations

1. Controlled, compacted fill should consist of approved materials that are free of organic matter, debris, particles greater than 4 inches. Frozen material should not be used, and fill should not be placed on a frozen subgrade. Minimum Standard Proctor (ASTM D-698) dry unit weight 90 pcf. Each soil type should be submitted to the geotechnical engineer for evaluation.

2. Similar to TDOT Section 903.05 Type A, Grading D crushed limestone aggregate, limestone screenings, or such as well-graded gravel or crushed stone.

Item	Description
Fill Lift Thickness	8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used.
	4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used.
Compaction Requirements (Building Footprint Areas, plus 10 feet past perimeter)	At least 98% of the materials Standard Proctor maximum dry density (ASTM D 698).
Compaction Requirements (Drive/Parking Areas - in upper 2 feet from finish subgrade)	At least 98% of the materials Standard Proctor maximum dry density (ASTM D 698).
Compaction Requirements (Drive/Parking Areas - below 2 feet from the finish subgrade)	At least 95% of the materials Standard Proctor maximum dry density (ASTM D 698).
Compaction Requirements (Embankment Slopes/Berms)	At least 95% of the materials Standard Proctor maximum dry density (ASTM D 698).
Compaction Requirements (Trench Lines)	Per the above depending upon location/elevation.
Moisture Content, Cohesive Soil	Within the range of -2% to +2% within the optimum moisture content value as determined by the Standard Proctor test at the time of placement and compaction.
Testing Frequency	1 soil density and moisture test per 2500 square feet or less of fill area for each soil fill lift.
Testing Personnel	A qualified soil technician, under the direction of a geotechnical engineer, should perform the soil density testing.
Soil Subgrade Approval	Prior to fill placement, the soil subgrade should be Proof Roll Tested under the observation of a geotechnical engineer for approval to begin fill placement.

FILL SOIL PLACEMENT CONSIDERATIONS

Fill materials should not be placed on frozen soils, frost-heaved soils, and/or on excessively wet soils. Borrow fill materials should not contain frozen materials at the time of placement, and all frozen or frost-heaved soils should be removed prior to placement of Structural Fill or other fill soils and aggregates. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned.

At the end of each workday, all fill areas should be graded to facilitate drainage of any precipitation, and the surface should be sealed by the use of a smooth-drum roller to limit infiltration of surface water. During placement and compaction of new fill at the beginning of each workday, the Contractor may need to scarify existing subgrades to a depth on the order of 4 inches so that a weak plane will not be formed between the new fill and the existing subgrade soils.

Where fill materials will be placed to widen existing embankment fills or placed against the sloping ground, the soil subgrade should be scarified, and the new fill benched or keyed into the existing material. Fill material should be placed in horizontal lifts. In confined areas such as utility trenches, portable compaction equipment and thin lifts of 3 inches to 4 inches may be required to achieve specified degrees of compaction.

We recommend that the grading contractor have equipment on-site during earthwork for both drying and wetting fill soils. We do not anticipate significant problems in controlling moisture within the fill during dry weather, but moisture control may be difficult during winter months or extended periods of rain. The control of moisture content of higher plasticity soils is difficult when these soils become wet. Further, construction traffic quickly degrades such soils when the moisture content is elevated.

MOISTURE SENSITIVE AND PLASTIC CLAYS AND SILTS

The natural, fine-grained, residual soils include low and high-plasticity clay and silt (denoted with a USCS symbols of ML, CL, MH, and CH). Plastic clay and elastic silt have the potential to expand and shrink with changes in moisture content, which can lead to premature deterioration of pavements and cosmetic cracking of building finishes when they are located directly beneath pavements, floor slabs, and building footings. The soils encountered on the site can be easily degraded from repeated construction traffic and is not recommended for re-use as engineered fill at elevations near the finished subgrade elevations in the pavement, floor slab, and foundation areas.

These soils will be sensitive to changes in moisture content. If these soils are exposed to moisture and poor surface drainage for prolonged periods, their strength and workability will rapidly deteriorate. During construction, the Contractor can reduce subgrade deterioration by sealing the ground surface using a smooth-drum roller prior to precipitation events.

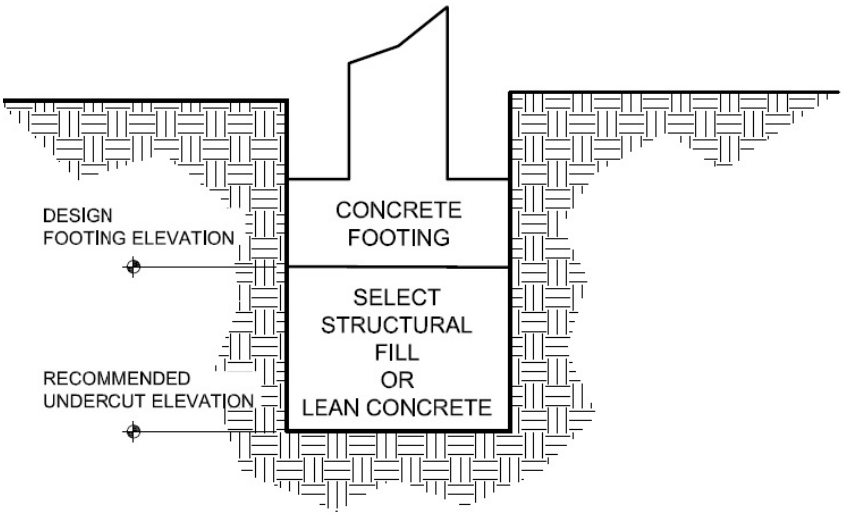
It is important to note that the laboratory testing of these soils indicated natural moisture contents above the Plastic Limit. Therefore, in-situ conditions are present that could make re-use as new fill a challenge if drying is not planned. Drying can likely be achieved during periods of dry weather by spreading the soil across the site in one thin lift.

FOUNDATION EXCAVATION – OBSERVATION AND TESTING

Foundation construction should begin as soon as possible after foundation excavations are performed. A geotechnical engineer should observe all foundation excavations at the time of construction to confirm that the soil conditions are suitable for the recommended design parameters. In addition, Dynamic Cone Penetrometer (DCP) testing should be performed in foundation excavations to verify that the specified bearing capacity exists in the foundation excavations.

Soil that is encountered with less than a stiff consistency should be evaluated by the geotechnical engineer. Undercutting to a depth determined in the field based on the local soil data obtained may be recommended. Undercut depths are related to soil strength and foundation size.

In undercut locations, flowable fill concrete or select crushed stone backfill should be used as backfill. Select crushed stone should be placed in loose horizontal lifts not to exceed 6 inches in thickness.



TYPICAL UNDERCUT DETAIL

NOTE: Excavations in sketch shown vertical for convenience. Excavations should be sloped as necessary for safety.

SHALLOW FOUNDATION - DESIGN RECOMMENDATIONS

Foundation design recommendations for the proposed structure are presented in the following table and paragraphs.

Description	Structure
Net allowable bearing pressure[1]	2000 psf
Minimum dimensions	24 inches
Minimum embedment below finished grade for frost protection[2]	24 inches
Approximate (estimated) total/differential settlement[3,4]	½ inch to 1 inch

1. The net allowable bearing pressure is the pressure in excess of the minimum overburden pressure at the footing base elevation. Assumes the foundations will be prepared and tested per the recommendations provided and under the direction of the geotechnical engineer. Undercut depths up to 4 feet are anticipated to achieve the required bearing capacity.

2. For perimeter footing and footings beneath unheated areas; also, to reduce the effects of seasonal moisture variations in the subgrade soils.

3. The foundation settlement will depend upon the variations in the subsurface soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of the compacted fill, and the quality of the earthwork operations. The foundations should be placed on prepared subgrade soil, as recommended in this report.

4. Settlement Estimates do not account for ground subsidence related to karst activity.

SEISMIC CLASSIFICATION

Code Used	Site Classification
2018 International Code (IBC)[1]	C[2]

1. In general accordance with the 2018 International Building Code, Section 1613.3.2.

2. The 2018 International Building Code (IBC) requires a site soil profile determination extending a depth of 100 feet for seismic site classification. The current scope requested does not include the required 100 feet soil profile determination. This seismic class definition considers that bedrock depths are greater than refusal depths encountered.

SPECTRAL RESPONSE ACCELERATIONS

Type	Value
S_S (g)	0.490
S_1 (g)	0.110
S_{DS} (g)	0.320
S_{D1} (g)	0.098

1. In general accordance with the 2024 International Building Code, Section 1613.3.2.

2. The 2024 International Building Code (IBC) requires a site soil profile determination extending a depth of 100 feet for seismic site classification. The current scope requested does not include the required 100 feet soil profile determination. This seismic class definition considers that bedrock depths are greater than refusal depths encountered.

SLAB ON GRADE/MAT FOUNDATION – DESIGN RECOMMENDATIONS

Item	Description
Floor slab support[1]	Compacted soil passing density/proofroll testing
Modulus of subgrade reaction	100 pounds per square inch per in (psi/in) for point loading conditions
Aggregate base course/capillary break[2]	6 inches of free-draining material (ASTM C 33 size No. 57 crushed limestone gravel)
Vapor Barrier	Project Specific

1. All floor slab subgrade areas should be moisture conditioned and properly compacted to the recommendations in this report immediately prior to placement of the stone base and concrete.
2. The floor slab design should include a capillary break comprised of free-draining, compacted, granular material at least 4 inches thick. Free-draining granular material should have less than 5 percent fines (material passing the #200 sieve).

CONSTRUCTION CONSIDERATIONS

Moisture Sensitive Soil - Unstable subgrade conditions will develop during general construction operations, particularly if the soils are wetted and/or subjected to repetitive construction traffic. Should unstable subgrade conditions develop, stabilization measures will need to be employed.

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to the construction of floor slabs and pavements. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become frozen, desiccated, saturated, or disturbed, the affected material should be removed, or these materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction.

Site Drainage - Drainage should be controlled during construction and once the site is completed to prevent ponding of surface water. If necessary, pumps, ditches, or other grading methods should be used to prevent ponding surface water. Roof water should be collected into piping and conducted away from the building areas to prevent moisture related soil movements.

Areas Excavated to Finish Subgrade - All areas of the site that are excavated to the finish subgrade elevation should be evaluated for soil/rock strength and type. Areas should be Proof Roll Tested under the observation of the geotechnical engineer to determine if additional stabilization is recommended.

Excavations - Temporary excavations will probably be required during grading operations. The grading contractor, by his contract, is usually responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required, to maintain the stability of both the excavation sides and bottom. All excavations should be sloped or braced to comply with applicable local, state, and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards.

All permanently excavated embankments less than 15 feet in height should be constructed with a slope geometry of no steeper than 3H:1V. All excavated embankments greater than 15 feet in height should be evaluated by the geotechnical engineer for stability. Embankments that will be permanently maintained as grassed or lawn areas should not exceed a slope geometry of 3H:1V.

Drainage ditches or other methods of drainage control should exist above the embankment areas to limit surface erosion and softening of embankment soil.

Construction Observation - The site grading and foundation construction should be performed under the observation of a geotechnical engineer and/or their representative to assist with continued evaluation of soil and bedrock conditions during the construction process.

Plan Review - The design civil/site preparation and foundation plans for the project should be provided to the geotechnical engineer to assist with the review process.

GENERAL QUALIFICATIONS

This report has been prepared for the exclusive use of Skanska USA for the design and construction of the planned new building addition at Jefferson Elementary School located in Jefferson City, Tennessee. This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions contained in this report are based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other warranty, expressed or implied, is made.

Foundation Systems Engineering is not responsible for any claims, damages, or liability associated with any other party's interpretation of this report's subsurface data or re-use of this report's subsurface data or engineering analysis without our express written authorization.

The analyses and professional opinions submitted herein are based, in part, upon the data obtained from the subsurface evaluation. The nature and extent of subsurface variations between the test borings will not become evident until construction.

We recommend that the services of Foundation Systems Engineering be obtained for the final design and construction phases of the project to provide engineering evaluation and testing services.

APPENDICES

Boring Location Plan
Test Boring Records
Area Topographic Map
Area Geology Map
Aerial Photograph
Test List
General Notes

Foundation Systems Engineering, P.C.

Geotechnical Engineering and Consulting

APPENDICES

LEGEND

BORING LOCATION

FOUNDATION SYSTEMS ENGINEERING, P.C.
Geotechnical Engineers

3002 INDUSTRIAL DRIVE
JOHNSON CITY, TN 37604
423-926-0762
FAX 926-0588
www.fsepc.com

BORING LOCATION PLAN
NEW ADDITION
JEFFERSON ELEMENTARY SCHOOL
JEFFERSON CITY, TENNESSEE

FOR: SKANSKA USA

DRAWN BY: AJ	NOTES:	
PROJ #: 725561	BORING LOCATIONS ARE APPROXIMATE	
SCALE: NONE	DATE: 10/22/2025	DWG: BLP

Project: **Jefferson Elementary School** Project Location: **Jefferson City, Tennessee** Client **Jefferson County Schools**	Log of Boring B-1 **Sheet 1 of 1**

Date(s) Drilled **10/11/2025**	Drilling Contractor **FSE/CML**	FSE File Number **725561**
Drilling Method **Direct Push**	Logged By **AJ**	Total Depth of Borehole **20.0'**
Drill Rig Type **Geoprobe**	Checked By **AB**	Approximate Surface Elevation **N/A**
Borehole Backfill **Augered Soil Cuttings**	Sampling Method **SPT**	Groundwater Depth (ft) **N/A**
	Comments **Boring Terminated at 20.0'**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0								Grass and Topsoil (2-inches)	
									FILL, Stiff, Very Moist, Red and Tan Silty CLAY	
			1	14					RESIDUAL, Medium to Stiff, Very Moist, Tan and Red Silty CLAY w/ Chert, Iron Staining, and Silt Seams	
			2	10						
	5									
			3	12						
			4	8						
	10									
			5	8						
	15									
			6	8						
	20								Boring Terminated at 20.0'	

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Project: **Jefferson Elementary School** Project Location: **Jefferson City, Tennessee** Client **Jefferson County Schools**	Log of Boring B-2 **Sheet 1 of 1**

Date(s) Drilled **10/11/2025**	Drilling Contractor **FSE/CML**	FSE File Number **725561**
Drilling Method **Direct Push**	Logged By **AJ**	Total Depth of Borehole **20.0'**
Drill Rig Type **Geoprobe**	Checked By **AB**	Approximate Surface Elevation **N/A**
Borehole Backfill **Augered Soil Cuttings**	Sampling Method **SPT**	Groundwater Depth (ft) **N/A**
	Comments **Boring Terminated at 20.0'**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0								Grass and Topsoil (2-inches)	
									FILL, Stiff, Very Moist, Tan and Red Silty CLAY w/ Iron Staining	
			1	12					RESIDUAL, Medium, Very Moist, Tan and Red Silty CLAY w/ Chert, Iron Staining, and Silt Seams	
			2	8						
	5									
			3	7						
			4	7						
	10									
			5	5						
	15									
			6	5						
	20								Boring Terminated at 20.0'	

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Project: **Jefferson Elementary School**

Project Location: **Jefferson City, Tennessee**

Client **Jefferson County Schools**

Key to Log of Boring

Sheet 1 of 1

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8	9	10	11

COLUMN DESCRIPTIONS

1. Elevation (feet): Elevation (MSL, feet).
2. Depth (feet): Depth in feet below the ground surface.
3. Sample Type: Type of soil sample collected at the depth interval shown.
4. Sample Number: Sample identification number.
5. Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
6. Water Content, %: Water content of the soil sample, expressed as percentage of dry weight of sample.
7. LL, %: Liquid Limit, expressed as a water content.
8. PI, %: Plasticity Index, expressed as a water content.
9. Graphic Log: Graphic depiction of the subsurface material encountered.
10. MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
11. REMARKS AND OTHER TESTS: Comments and observations regarding drilling or sampling made by driller or field personnel.

FIELD AND LABORATORY TEST ABBREVIATIONS

NMC: Natural Moisture Content, percent
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf

MATERIAL GRAPHIC SYMBOLS

- Asphaltic Concrete (AC)
- Bentonite
- Bentonite chips
- Bentonite powder
- Bentonite plug
- Boulders
- Fat CLAY, CLAY w/SAND, SANDY CLAY (CH)
- Fat CLAY/SILT (CH-MH)
- Fat CLAY/PEAT (CH-OH)
- Lean CLAY, CLAY w/SAND, SANDY CLAY (CL)
- Lean-Fat CLAY, CLAY w/SAND, SANDY CLAY (CL-CH)
- SILTY CLAY (CL-ML)
- Lean CLAY/PEAT (CL-OL)
- Claystone
- Portland Cement Concrete
- Cuttings
- AF
- Clayey GRAVEL (GC)
- Clayey GRAVEL to Gravelly CLAY (GC-CH)
- Clayey GRAVEL to Gravelly CLAY (GC-CL)
- Silty GRAVEL (GM)
- Silty GRAVEL to Clayey GRAVEL (GM-GC)
- Silty GRAVEL to Gravelly SILT (GM-MH)
- Silty GRAVEL to Gravelly SILT (GM-ML)
- Poorly graded GRAVEL (GP)
- Poorly graded GRAVEL with Silt (GP-GM)
- Granite
- Grass and/or topsoil
- Gravel
- Grout
- Well graded GRAVEL (GW)
- Well graded GRAVEL with Silt (GW-GM)
- Poorly to Well graded GRAVEL (GW-GP)
- Limestone
- Artificial Fill
- SILT, SILT w/SAND, SANDY SILT (MH)
- SILT, SILT w/SAND, SANDY SILT (ML)
- SILT, SILT with SAND, SANDY SILT (ML-MH)
- High plasticity PEAT (OH)
- Low plasticity PEAT (OL)
- Low to High plasticity PEAT (OL-OH)
- Sandstone
- Clayey SAND (SC)
- Clayey SAND to Sandy CLAY (SC-CH)
- Clayey SAND to Sandy CLAY (SC-CL)
- Shale
- Silt
- Siltstone
- Silty SAND (SM)
- Silty SAND to Sandy SILT (SM-MH)
- Silty SAND to Sandy SILT (SM-ML)
- Silty to Clayey SAND (SM-SC)
- Poorly graded SAND (SP)
- Poorly graded SAND with Clay (SP-SC)
- Poorly graded SAND with Silt (SP-SM)
- Well graded SAND (SW)
- Well graded SAND with Clay (SW-SC)
- Well graded SAND with Silt (SW-SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS

- Auger sampler
- Bulk Sample
- 3-inch-OD California w/ brass rings
- CME Sampler
- Grab Sample
- 2.5-inch-OD Modified California w/ brass liners
- Pitcher Sample
- 2-inch-OD unlined split spoon (SPT)
- Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

- Water level (at time of drilling, ATD)
- Water level (after waiting)
- Minor change in material properties within a stratum
- Inferred/gradational contact between strata
- ? Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

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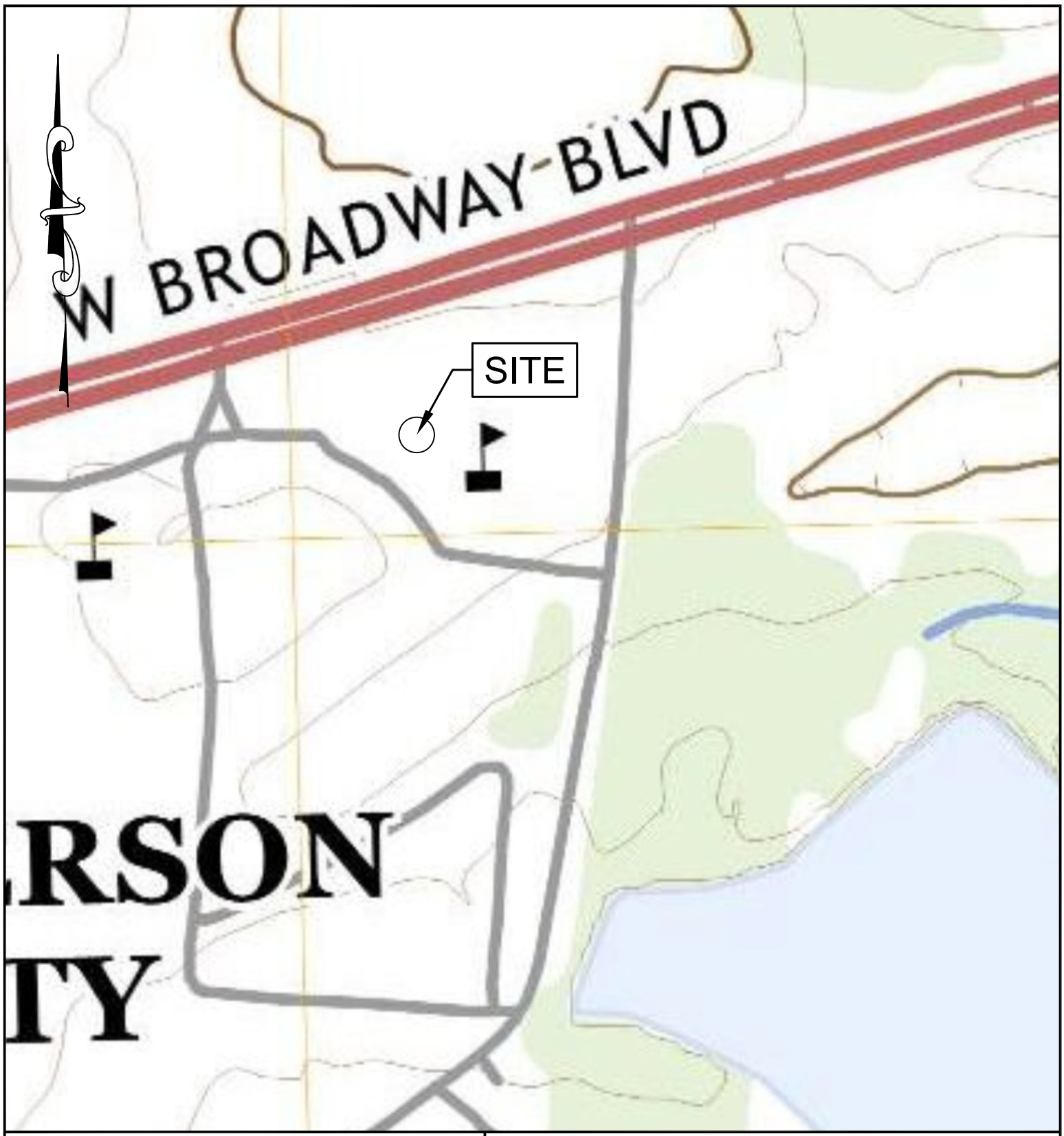

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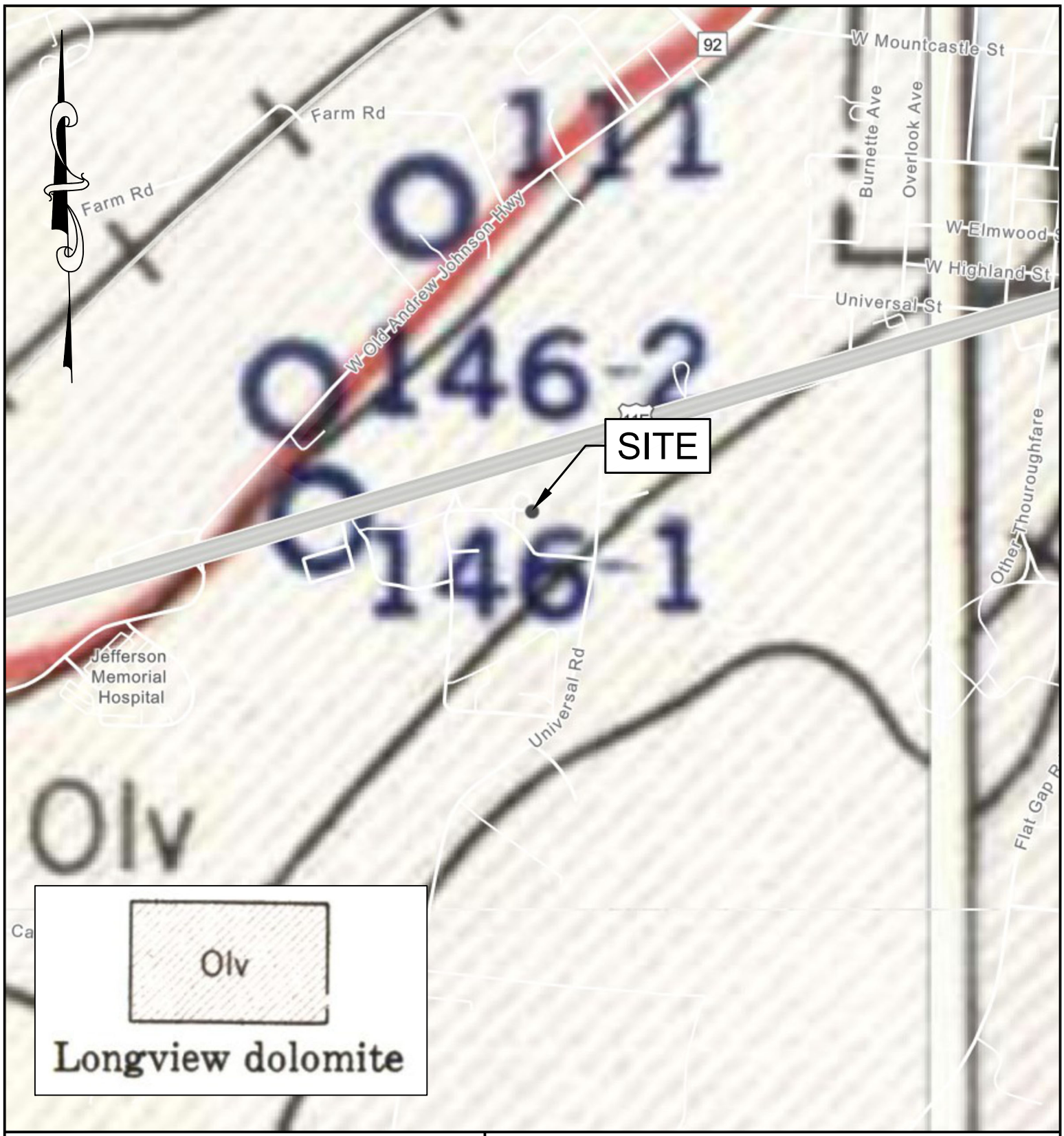
www.fsepc.com

AREA TOPOGRAPHIC MAP
NEW ADDITION
JEFFERSON ELEMENTARY SCHOOL
JEFFERSON CITY, TENNESSEE

FOR: SKANSKA USA

DRAWN BY: AJ	NOTES: ADAPTED FROM USGS MAPPING	
PROJ #: 725561		
SCALE: NONE	DATE: 10/22/2025	DWG: TOPO



FOUNDATION SYSTEMS ENGINEERING, P.C. Geotechnical Engineers	AREA GEOLOGY MAP NEW ADDITION JEFFERSON ELEMENTARY SCHOOL JEFFERSON CITY, TENNESSEE	
	FOR: SKANSKA USA	
3002 INDUSTRIAL DRIVE JOHNSON CITY, TN 37604 www.fsepc.com 423-926-0762 FAX 926-0588	DRAWN BY: AJ PROJ #: 725561	NOTES: ADAPTED FROM USGS MAPPING SOURCE:
	SCALE: NONE	DATE: 10/22/2025 DWG: GEO

FOUNDATION SYSTEMS ENGINEERING, P.C.
Geotechnical Engineers

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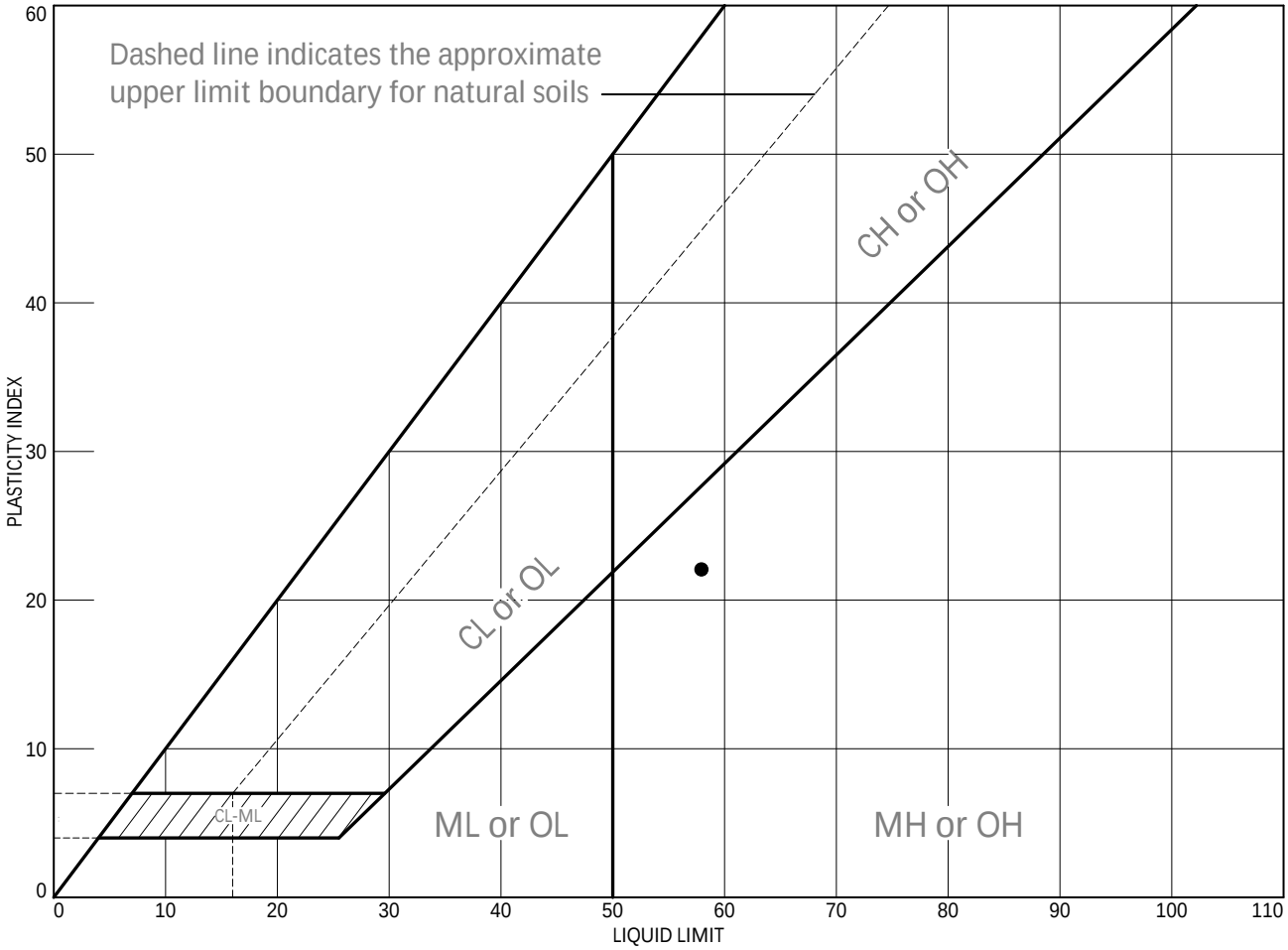
AERIAL PHOTOGRAPH
NEW ADDITION
JEFFERSON ELEMENTARY SCHOOL

JEFFERSON CITY, TENNESSEE

FOR: SKANSKA USA

DRAWN BY: AJ	NOTES:	
PROJ #: 725561	SOURCE: GOOGLE EARTH	
SCALE: NONE	DATE: 10/22/2025	DWG: AERIAL

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Tan Red Silty Clay with Iron Staining	58	36	22	96.9	95.5	MH

Project No. 725561 Client: Skanska USA

Project: Jefferson Elementary School

●Location: B-1 Depth: 0.0' - 4.0' Sample Number: N/A

Remarks:

Construction Materials Laboratory

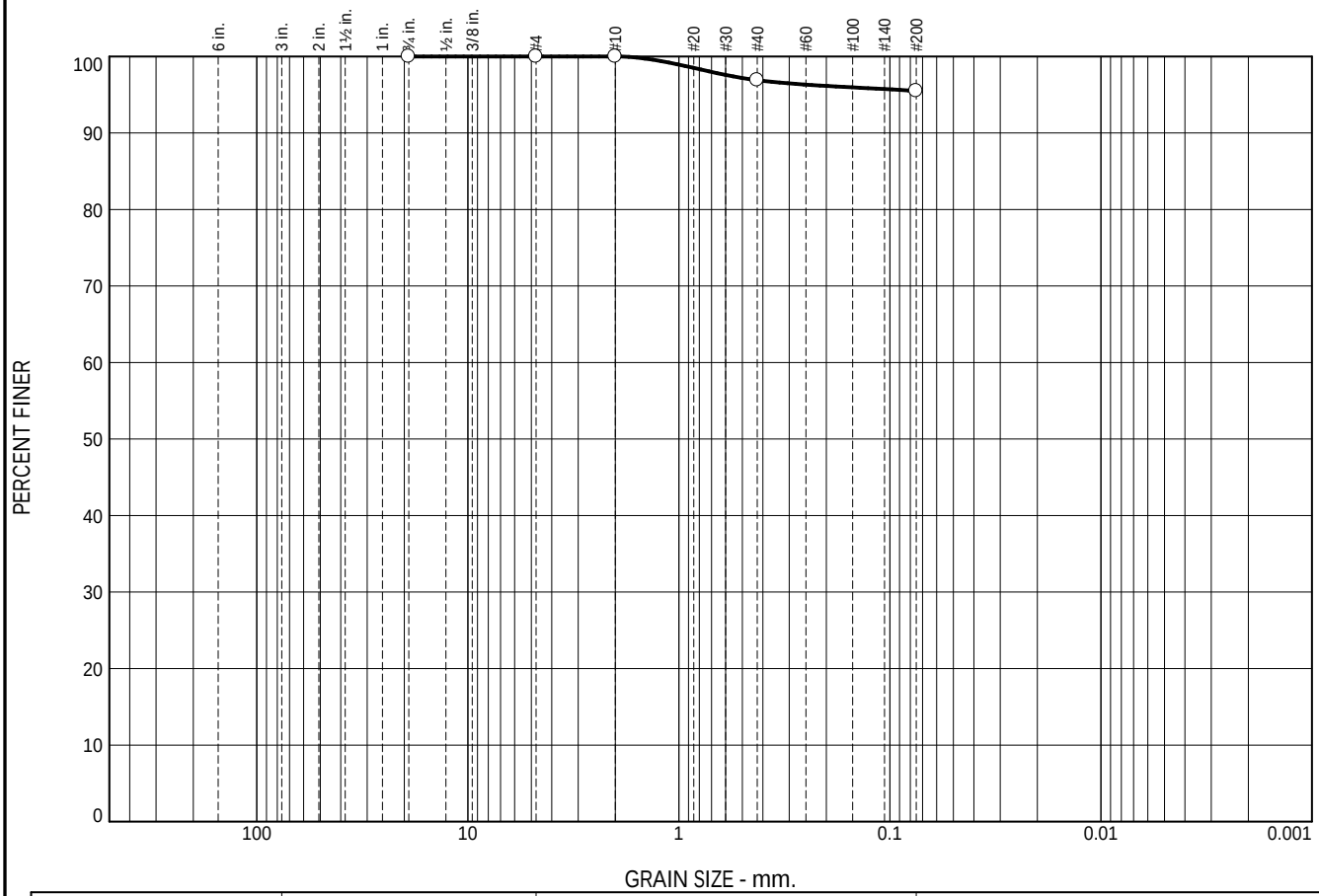
Johnson City, Tennessee

Figure

Tested By: Jason Necessary Checked By: Samuel Mathews, PE

Particle Size Distribution Report

ASTM D422



	% +3"	% Gravel	% Sand	% Fines	
				Silt	Clay
○	0.0	0.0	4.5	95.5	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	58	36								

Material Description	Test Date	USCS	NM
○ Tan Red Silty Clay with Iron Staining	10-21-25	MH	

Project No. 725561 Client: Skanska USA

Project: Jefferson Elementary School

○Location: B-1 Depth: 0.0' - 4.0' Sample Number: N/A

Remarks:

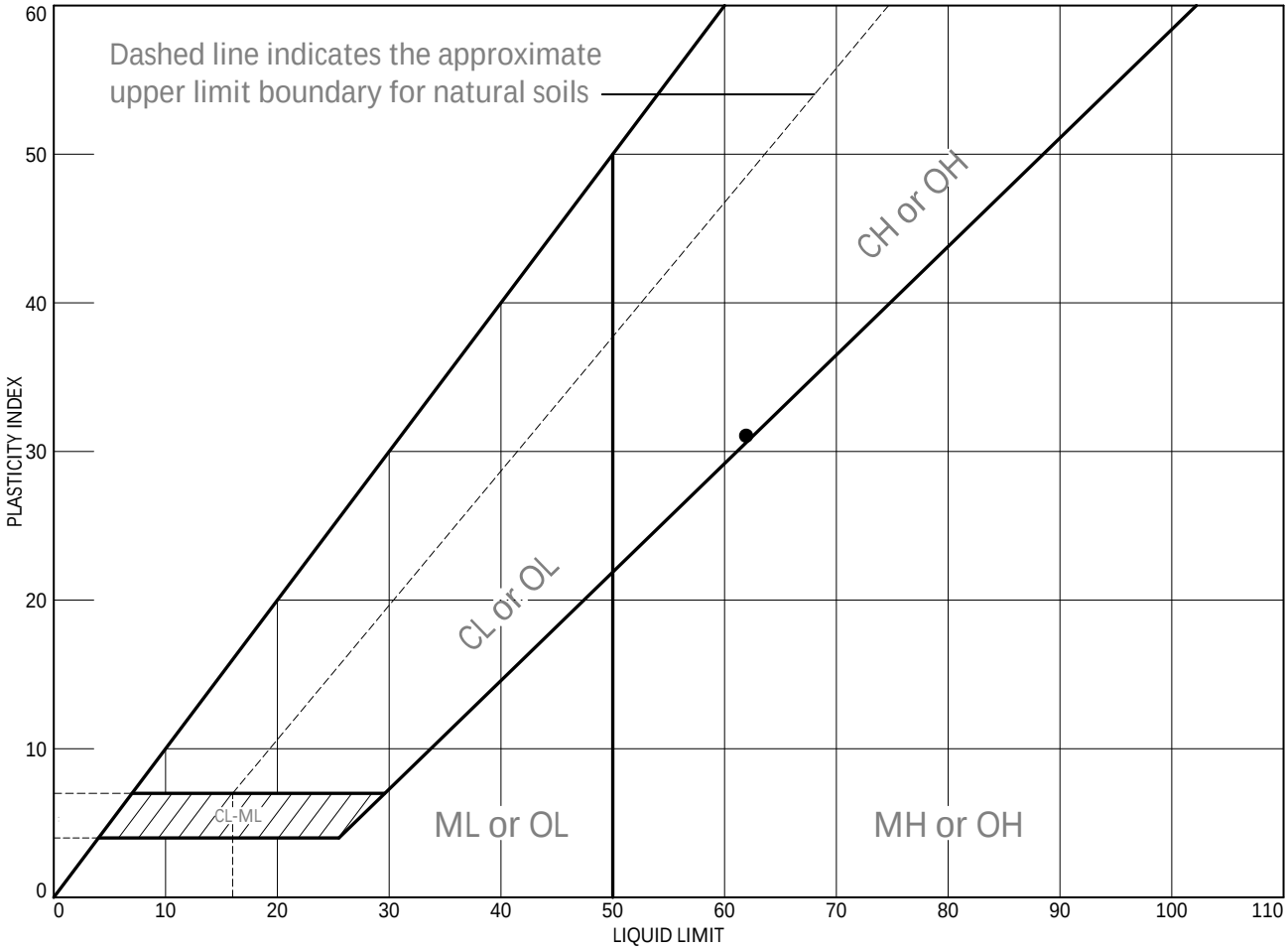
Construction Materials Laboratory

Johnson City, Tennessee

Figure

Checked By: Samuel Mathews, PE

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Tan Red Silty Clay with Iron Staining	62	31	31	97.8	97.0	CH

Project No. 725561 Client: Skanska USA

Project: Jefferson Elementary School

●Location: B-2 Depth: 0.0' - 4.0' Sample Number: N/A

Remarks:

Construction Materials Laboratory

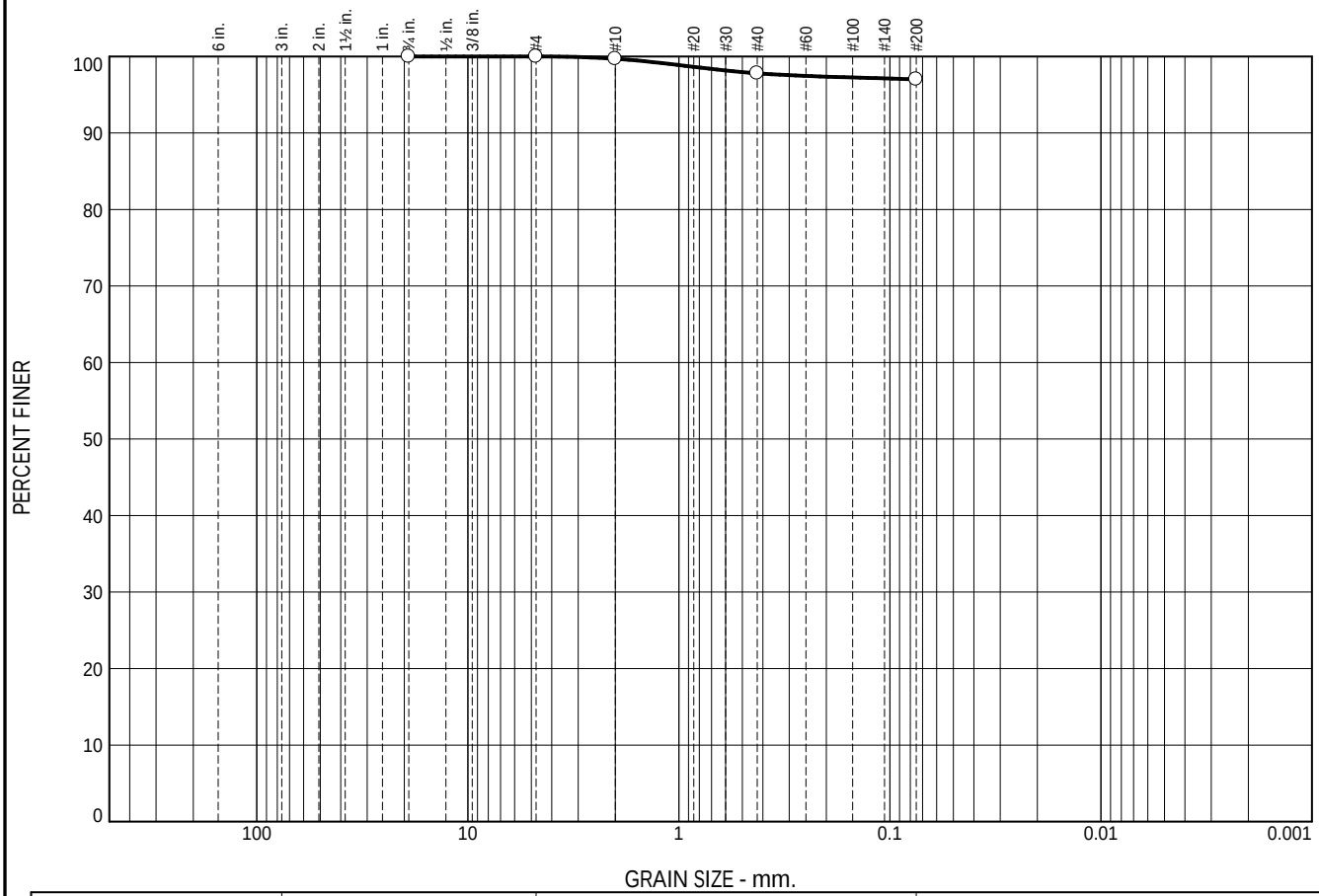
Johnson City, Tennessee

Figure

Tested By: Jason Necessary Checked By: Samuel Mathews, PE

Particle Size Distribution Report

ASTM D422



	% +3"	% Gravel	% Sand	% Fines	
				Silt	Clay
○	0.0	0.0	3.0	97.0	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	62	31								

Material Description	Test Date	USCS	NM
○ Tan Red Silty Clay with Iron Staining	10-21-25	CH	

Project No. 725561 Client: Skanska USA

Project: Jefferson Elementary School

○Location: B-2 Depth: 0.0' - 4.0' Sample Number: N/A

Remarks:

Construction Materials Laboratory

Johnson City, Tennessee

Figure

Checked By: Samuel Mathews, PE

GENERAL NOTES

WATER LEVEL MEASUREMENT:

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levelsat other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soil, the accurate determination of groundwater levels may not be suitable with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION:

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength. Qu, psf	Standard Penetration or N-value (55) Blows/Ft.	Consistency
< 500	0 - 1	Very Soft
500-1,000	2 - 4	Soft
1,000 - 2,000	4 - 8	Medium Stiff
2,000 - 4,000	8 - 15	Stiff
4,000 - 8,000	15 - 30	Very Stiff
8,000+	> 30	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	Relative Density
0 - 3	Very Loose
4 - 9	Loose
10 - 29	Medium Dense
30 - 50	Dense
>50	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75mm)
Sand	#4 to #200 sieve (4.75 to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	<5
With	5 -12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

ATTERBERG LIMITS

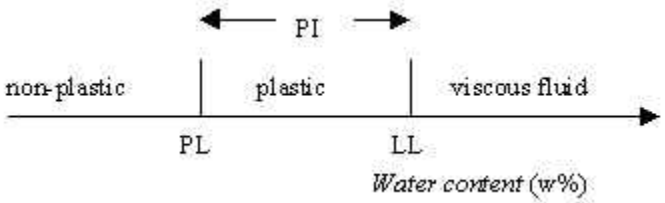
ASTM D4318-17

The objective of the Atterberg limits test is to obtain basic index information about the soil used to estimate strength and settlement characteristics. It is the primary form of classification for cohesive soils.

Fine-grained soil is tested to determine the liquid and plastic limits, which are moisture contents that define boundaries between material consistency states. These standardized tests produce comparable numbers used for soil identification, classification and correlations to strength.

The liquid (LL) and plastic (PL) limits define the water content boundaries between non-plastic, plastic and viscous fluid states. The plasticity index (PI) defines the complete range of plastic state. Figure 1 illustrates it nicely.

Figure 1: Atterberg limits illustration.



Liquid Limit (LL)

The liquid limit defines the boundary between plastic and viscous fluid states. It is determined using a standard "Liquid Limit Device," which drops a shallow cupfull of soil 1 cm consistently. When a groove cut through the sample closes 1/2", the number of drops is recorded and a moisture content sample processed.

Repeating the procedure for a total of four drop-count ranges provides enough data to plot on a semi-log scale. From the plot, the moisture content at 25 drops defines the Liquid Limit.

Plastic Limit (PL)

The plastic limit defines the boundary between non-plastic and plastic states. It is determined simply by rolling a thread of soil and adjusting the moisture content until it breaks at 1/8 inch diameter.

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) — ASTM D2487-17

The Unified Soil Classification System (USCS) is a nationally recognized standard for classifying soils in accordance with their engineering properties. The parameters considered in this system are:

- Particle Size
- Water Holding and Plasticity
- Organic Content

The system identifies three major soil divisions; coarse-grained soils, fine-grained soils, and highly organic soils. These three divisions are further subdivided into a total of 15 basic soil groups. Based on the results of visual observations and prescribed laboratory tests, the soil is cataloged into basic soil groups, which include variations of gravel, sands, silty, clays and highly organic soils.

STANDARD PENETRATION TEST (SPT) — ASTM D1586-18

This test uses a thick-walled sample tube, with an outside diameter of 2 inches, an inside diameter of 1 3/8 inches, and a length of around 32 inches. This tube is driven into the ground at the bottom of a borehole by blows from a slide hammer with a weight of 140 lb falling through a distance of 30 in. The sample tube is driven into the ground and then the number of blows needed for the tube to penetrate each 6 inch increment up to a depth of 18 inches is recorded. The sum of the number of blows required for the second and third 6 inches of penetration is termed the "standard penetration resistance" or the "N-value".

In cases where 50 blows are insufficient to advance it through a 6 inch interval the penetration after 50 blows is recorded. The blow count provides an indication of the soil consistency and can be correlated to the bearing capacity of the soil.

SOIL GRADATION TEST — ASTM D7928-21

The soil gradation test is performed to determine the grain size distribution of a soil type. The soil is passed through a set of sieves and separated into three groups by size. Particles larger than a #4 sieve are classified as gravel, those smaller than a #4 but larger than a #200 sieve are sands and particles less than a #200 sieve are classified as fines. In some cases, a hydrometer test may be performed on the fine particles to further classify them into silts and clays. This information is used to assist in soil classification.

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GEOTECHNICAL EXPLORATION REPORT

JEFFERSON CITY ELEMENTARY SCHOOL SETTLEMENT INVESTIGATION

321 WEST BROADWAY BLVD
JEFFERSON CITY, TENNESSEE

CLIENT: SKANSKA USA

REPORT DATE: APRIL 22, 2026

FSE PROJECT NUMBER: 726167

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

Foundation Systems Engineering, P.C.

Geotechnical Engineering and Consulting

April 22, 2026

Mr. Curtis Elswick
Senior Vice President
Regional Executive
Skanska USA Buildings, Inc.

RE: GEOTECHNICAL EXPLORATION
JEFFERSON CITY ELEMENTARY SCHOOL SETTLEMENT EVALUATION
321 WEST BROADWAY BOULEVARD
JEFFERSON CITY, TENNESSEE
FSE FILE NO: 726167

Dear Mr. Elswick:

Per your authorization, we have completed a geotechnical exploration at Jefferson City Elementary at 321 West Broadway Boulevard in Jefferson City, Tennessee. The purpose of the evaluation was to gather site and subsurface information from which to provide engineering recommendations concerning site issues surrounding settlement. The following report presents our findings and recommendations

We have appreciated the opportunity to provide our professional engineering services during this phase of the project. If you have any questions regarding the information within this report, please contact us at your convenience.

Sincerely,
Foundation Systems Engineering

Samuel Mathe
Senior Enginee
TN License No

SAMUEL AUSTIN MATHEWS
REGISTERED ENGINEER
AGRICULTURE
COMMERCE
No. 128504
STATE OF TENNESSEE
4/22/2026

Allen Browning, MS, PE
President/CEO
TN License No: 117463

GREGORY ALLEN BROWNING
REGISTERED ENGINEER
AGRICULTURE
COMMERCE
No. 117463
STATE OF TENNESSEE
4/22/2026

Leonardo Garcia De La Cruz, MS, EI
Geotechnical EIT
TN State No: 35453

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Test Descriptions

EXECUTIVE SUMMARY

The following is a geotechnical exploration report requested by Skanska USA for Jefferson Elementary School in Jefferson City, Tennessee.

A summary of our findings and recommendations is listed below:

- As part of the subsurface exploration, a visual walkdown was performed of the structure. Vertical, horizontal, and stair step cracking was observed in the brick and tile veneer indicative of ongoing settlement damage. It was stated that previous repairs were performed to the subsurface soils and potentially the foundations, but no documentation of the repairs was available. Based on subsurface exploration (soft and wet soils) and visual walkdowns, previous repairs were not effective or not performed.
- The subsurface conditions on the site were explored with the use of four (4) soil test borings. Borings B-1 and B-2 were placed at the gymnasium and boring sB-3 and B-4 were placed at Classroom 303. The approximate locations of the test borings are indicated on the *Boring Location Plan* provided.
- The soil test locations encountered fill and residual soil types. The fill soil types included tan and red silts and clays with carrying amounts of iron staining and chert. The fill soils generally exhibited a soft to stiff consistency in a very moist to wet condition. The residual soils included tan and red silts and clays with varying amounts of iron staining, chert, and silts seams. The residual soils generally exhibited a medium to stiff consistency in a very moist to wet condition.
- It was noted that the upper approximately 4 feet of soil was generally soft consistency in a very moist to wet condition. High plasticity soils and soils susceptible to shrink and swelling with moisture changes were also encountered during subsurface exploration.
- All boring locations encountered auger refusal at depths ranging from approximately 8.0 to 17.0 feet. Boring location B-4 was interpreted to refuse on limestone/dolomite bedrock. All other boring locations were interpreted to refuse on very stiff soils/chert.
- Groundwater was not encountered at the time of drilling.
- GPR Scanning was performed at the gymnasium window to determine spacing and depth of reinforcement. Reinforcement size was not able to be determined.

Based on our findings, it is the opinion of FSE that the structure is experiencing differential settlement due to soft consistency soils and soils that are susceptible to shrink and swell with moisture changes. FSE provides the following recommendations for stabilization of the structure.

- **Foundation Stabilization – Helical Piers** – For support of the structure where the crack in the cast in place wall was observed, we recommend the use of helical piers as deep foundation support elements that bear into the underlying stiff residual soil and/or bedrock beneath the wet soil layer. These helical piers (or other screwed-in pier types) transmit foundation loading to the stiff residual soils or bedrock beneath the variable consistency wet soils and should experience relatively small amounts of movement should the wet soil continue to experience movement as it dries. Helical piers do not require bearing on bedrock should the residual soils beneath the wet soil layer provide adequate bearing to achieve the required service load. Recommendations for this method are further detailed later in this section of this report.

- **Slab Settlement Considerations - Cap and Compaction Grouting** – If settlement of slab-on-grades are observed, FSE recommends that the areas be cap and compaction grouted. Cap and compaction grouting of the area is a suitable option for stabilizing the area without extensive excavation.

  Cap and compaction grouting consists of drilling down to bedrock and grouting until suitable back pressure is reached. Once suitable back pressure is reached, the machine is raised in small increments and grouting continues until surrounding voids and densification of the subsurface is completed by achieving suitable back pressure and continuing to raise in small increments.

  Since soil type consistency will vary from injection point to injection point, performance specifications are recommended. Grout take and pressures should be monitored at each injection point. Injection points are recommended to be placed at the affected area and a minimum of 10 feet to each side of the affected areas. The completed project plans should be reviewed by FSE to allow final recommendations on the general method of construction and site/foundation preparation methods. **Care should be taken to prevent damage to the underground utilities. Pressures should be reduced when in close proximity to existing utilities.**

- **Moisture Sensitive/High Plasticity Soils** - The natural, fine-grained, residual soils include low and high-plasticity clay and silt (denoted with a USCS symbols of ML, CL, MH, and CH). Plastic clay and elastic silt have the potential to expand and shrink with changes in moisture content, which can lead to premature deterioration of pavements and cosmetic cracking of building finishes when they are located directly beneath pavements, floor slabs, and building footings.

- **CMU Wall Scanning** – The gymnasium wall was scanned to determine spacing and depth of reinforcement above, below, and to each side of the window. The following observations were made:

  1. Below Window – The average spacing of vertical reinforcement was approximately 7.9”. The maximum spacing of vertical reinforcement was approximately 9.5” and the minimum spacing was approximately 6.0”. Horizontal reinforcement was observed to be spaced at approximately 16” on center below the window. The approximate cover depth of reinforcement was 2.4 - 2.7”.

  2. Above Window – It is the opinion of FSE that the lintel above the window is a precast concrete lintel. The average spacing of vertical reinforcement in the lintel was 11.125”. The maximum spacing of vertical reinforcement was approximately 13.0” and the minimum spacing was approximately 10.0”. Horizontal reinforcement was observed to be spaced at approximately 20.0” on center above the window. The approximate cover depth of reinforcement was 1 - 1.25”.

  3. Sides of Window – The average spacing of vertical reinforcement was approximately 1.8”. The maximum spacing of vertical reinforcement was approximately 8.5” and the minimum spacing was approximately 7.0”. The approximate cover depth of reinforcement was 8.5 – 10.0”. The sides of the window were only scanned at the bottom of the wall due to the height and access to the top of window.

- The remediations should be performed under the observation of an FSE geotechnical engineer to assist with the continued evaluation of subgrade conditions during the construction process.

The above summary should be used in conjunction with the entire report. Details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled "General Qualifications" should be read for an understanding of the report's limitations.

SCOPE OF SERVICES

Item	Description
Information Reviewed	- USGS Topographic Mapping - Google Satellite Imagery - Geologic Mapping of Northeast Tennessee
Site Reconnaissance	Walk-down of site to observe: - Topographic features - Drainage patterns - Ground surface cover - Surface improvements - Existing development - Karst features - Settlement damage
Soil Borings (4)	- Four (4) soil borings were advanced to refusal with a geoprobe drilling rig. - Observation of drilling and sampling for soil type and moisture conditions was performed during the drilling operations. - On-site and laboratory classification of soil samples. - Backfilled borings with soil trimmings and concrete.
Boring Location Layout	- Soil test borings were located in the field by FSE. - Boring Locations can be found on the attached *Boring Location Plan*.
Laboratory Soil Testing	- Eighteen (18) Natural Moisture Tests - Four (4) Soil Classification Tests - Sixteen (16) Unconfined Compressive Tests
Groundwater Measurement	- Groundwater was not encountered during subsurface exploration.

PROJECT/SITE INFORMATION

PROJECT DESCRIPTION

Item	Description
Project Location	Jefferson City Elementary 321 West Broadway Boulevard Jefferson City, Tennessee
Project Information	Subsurface exploration to investigate a sinkhole that opened up in roadway.

SITE DESCRIPTION

Item	Description
Current Conditions	**Ground Cover** - Primarily grass and top soil **Drainage Patterns** - The area has previously been graded and developed. Surface water was observed to drain away from the gymnasium to the North and West and away from Classroom 303 towards the parking lot. **Improvements** - Past grading and construction - Asphalt pavement - Underground utilities
Topography	**USGS Mapping** - The area has previously been graded and developed. Surface water was observed to drain away from the gymnasium to the North and West and away from Classroom 303 towards the parking lot.
Regional Geology	Based on review of available geologic mapping, the project site is located in the Valley and Ridge physiographic province of northeast Tennessee. The mapping indicates that the site is located within the geology of the Longview Dolomite. The bedrock of this formation consists primarily of limestone and dolomite. These carbonate rocks are prone to karst development (i.e., sinkholes, springs, underground channels and caves). These rock types typically weather to near surface residual soils consisting of primarily silts and clays. The depth of the soil profile is continually altered over geologic time by gradual weathering at the soil/rock interface, and more rapidly by erosion of surficial soils. Weathering of the parent bedrock is generally more rapid near fracture zones. Therefore, the bedrock surface will be irregular.

Karst Activity	Our review of the topographic mapping of the area indicates that the site's geology is located in the Longview Dolomite, in which karst topography is present. Karst terrain is characterized by the existence of sinkholes and closed depressions at the ground surface. Past experience has found that sites where grading/construction activities remove all or a portion of the stiff upper crust of soil overburden are at a higher risk of sinkhole activity (dropouts) than sites where no such excavation is made. Similarly, sinkholes may be induced by ponding water, porous utility line trench backfill materials, or from leaking pipes, etc. Soil supported foundations overlying rock units that are susceptible to solutioning and sinkhole development are at risk of damage from sinkhole activity. Structures supported on soil overlying soluble carbonate rock units are at risk of damage resulting from sinkhole development. This risk can be minimized but cannot be eliminated.

SUBSURFACE DESCRIPTION

The following is a brief summary of the soils encountered at the soil test locations. Additional subsurface details may be seen on the attached *Test Boring Records*. The subsurface stratification indicated on the boring records is approximate and represents FSE's interpretation of the soils encountered at the excavation/sampling locations.

Item	Description
Ground Cover	Primarily grass and top soil
Fill Soil	Boring Locations – All boring locations. Description – Generally tan and red silts and clays with iron staining and chert Consistency – Generally soft to stiff Moisture – Generally very moist to wet Depth – Encountered beneath the ground cover to approximately 3.0 feet.
Residual Soil	Origin - Native, derived from weathering of the underlying limestone bedrock material. Test Locations – All Description – Generally tan and red silts and clays with iron staining, chert, and silt seams Consistency – Generally medium to stiff Moisture – Generally very moist to wet Depth – Encountered beneath fill layers until auger refusal. Comments – Soil consistency varies with depth.
Auger Refusal	Refusal Locations – All boring locations encountered refusal at depths ranging from approximately 8.0 feet to 17.0 feet Refusal Material – The refusal material was interpreted to be limestone bedrock at B-4. All other borings were interpreted to refuse on very stiff soil/chert.
Groundwater	Groundwater was not encountered during subsurface exploration. Comments - Changes in groundwater elevations will occur during wet weather periods

LABORATORY TESTING

LABORATORY AND PERSONNEL ACCREDITATION

All laboratory testing was performed by Foundation Systems Engineering/Construction Materials Laboratory. FSE/CML holds American Association of State Highway and Transportation Officials (AASHTO) and US Army Corps of Engineers (USACE) accreditation for soil laboratory testing, and the technicians performing the testing are accredited by the American Concrete Institute (ACI) for soil laboratory testing.

ATTERBERG LIMITS (ASTM D4318)

The Atterberg Limits test is used to determine the critical water content thresholds that define the boundaries between the different states of consistency of fine-grained soils, primarily clays and silts. The test measures three key parameters: the Liquid Limit (LL), the Plastic Limit (PL), and the Plasticity Index (PI). These parameters indicate the soil's behavior as it transitions from a liquid to a plastic state and from a plastic to a semi-solid state. These limits help in classifying the soil according to its plasticity and predicting its potential for shrink-swell behavior.

The following table summarizes the Atterberg Limits Determination Testing:

Atterberg Limits Data Summary						
Boring Location	Sample Depth (Feet)	Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	USCS Soil Classification
B-1	0.0 – 4.0	N/A	36	24	12	CL
B-2	4.0 – 8.0	N/A	70	30	40	CH
B-3	4.0 – 8.0	N/A	44	23	21	CL
B-4	0.0 – 4.0	N/A	35	25	10	ML

SOIL GRADATION (SIEVE ANALYSIS) (ASTM D 6913)

A soil gradation test, also known as a particle size distribution test, is performed to determine the range and size distribution of particles within a soil sample. The test involves passing the soil through a series of sieves with different mesh sizes to separate the particles into various size ranges. This analysis helps identify the soil texture and classify the soil type (e.g., sand, silt, clay).

The following table summarizes the Soil Gradation Testing:

Soil Gradation Data Summary

Boring Number	Sample Depth (ft)	Gravel (%)	Sand (%)	Fines (%)	USCS Soil Classification
B-1	0.0 – 4.0	0.2	13.4	86.4	CL
B-2	4.0 – 8.0	0.0	5.3	94.7	CH
B-3	4.0 – 8.0	1.1	11.2	87.7	CL
B-4	0.0 – 4.0	0.0	16.8	83.2	ML

UNCONFINED COMPRESSION TESTING

The unconfined compression testing provides the rate and magnitude of volume decrease that a soil sample undergoes when subjected to vertical loads. This information is useful in determining the settlement behavior of a soil.

The results of the unconfined compression testing are summarized on the following table.

Unconfined Compression Testing Summary

Sample Location	Sample Depth (Feet)	Unconfined Strength, psf	Undrained Shear Strength, psf	Moisture Content
B-1	0.0 – 2.0	3663	1831	17.2
B-1	2.0 – 4.0	2475	1238	20.4
B-1	4.0 – 6.0	9930	4965	23.4
B-1	6.0 – 8.0	10608	5304	30.7
B-2	0.0 – 2.0	2257	1128	22.4
B-2	2.0 – 4.0	907	454	22.1
B-2	4.0 – 6.0	10385	5193	23.1
B-2	6.0 – 8.0	13525	6763	30.9
B-3	0.0 – 2.0	3811	1905	18.8
B-3	2.0 – 4.0	4467	2233	24.1
B-3	4.0 – 6.0	3323	1661	20.1
B-3	6.0 – 8.0	3539	1769	25.3
B-4	0.0 – 2.0	3586	1793	14.2
B-4	2.0 – 4.0	1996	998	23.6
B-4	4.0 – 6.0	5360	2680	24.1
B-4	6.0 – 8.0	5628	2814	26.7

NATURAL MOISTURE CONTENT (ASTM D2216)

The natural moisture content test measures the amount of water in a soil sample in its natural, undisturbed state. This test involves weighing a soil sample, drying it in an oven to remove all water, and then weighing it again. The moisture content is calculated as a percentage of the weight of the dry soil. The natural moisture content affects the soil's physical properties, such as strength, compressibility, and compaction characteristics.

Natural Moisture Content Data Summary		
Boring Location	**Depth (Feet)**	**Natural Moisture Content (%)**
B-1	**2.0**	**20.1**
B-2	**4.0**	**31.3**
B-2	**8.0**	**30.0**
B-2	**9.0**	**29.2**
B-2	**10.0**	**30.0**
B-3	**4.0**	**24.3**
B-3	**8.0**	**26.0**
B-3	**10.5**	**25.6**
B-3	**12.0**	**26.2**
B-4	**4.0**	**20.4**
B-4	**8.0**	**30.2**
B-4	**10.5**	**30.5**
B-4	**12.0**	**31.5**
B-4	**13.0**	**30.7**
B-4	**14.5**	**33.2**
B-4	**16.0**	**35.5**
B-4	**16.5**	**32.6**
B-4	**17.0**	**32.5**

Note: Remaining moisture contents calculated with Unconfined Compressive Strength Testing

TESTING SUMMARY

The soils present on the site are classified as low to high plasticity sands, silts, and clays based on the USCS soil classification system. These soil types are given the soil symbol ML, CL, MH, and CH. The soil types have a generally low to high potential for volume change from changing moisture contents and loading conditions.

Such soils have poor to fair compaction characteristics with compaction typically achieved using a vibratory sheepsfoot roller. Moisture conditioning (drying) will be required to achieve specified compaction density. We anticipate that the on-site soil will generally exist at a moisture content that is 0% to 25% above the optimum moisture as determined by laboratory testing.

RECOMMENDATIONS

We offer the following geotechnical engineering recommendations based on the project information provided and the site and geotechnical data gathered during our subsurface exploration.

GEOTECHNICAL CONSIDERATIONS

Based on our findings, it is the opinion of FSE that the structure is experiencing differential settlement due to soft consistency soils and soils that are susceptible to shrink and swell with moisture changes. FSE provides the following recommendations for stabilization of the structure.

- **Foundation Stabilization – Helical Piers** – For support of the structure where the crack in the cast in place wall was observed, we recommend the use of helical piers as deep foundation support elements that bear into the underlying stiff residual soil and/or bedrock beneath the wet soil layer. These helical piers (or other screwed-in pier types) transmit foundation loading to the stiff residual soils or bedrock beneath the variable consistency wet soils and should experience relatively small amounts of movement should the wet soil continue to experience movement as it dries. Helical piers do not require bearing on bedrock should the residual soils beneath the wet soil layer provide adequate bearing to achieve the required service load. Recommendations for this method are further detailed later in this section of this report.

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STRUCTURAL FILL

ENGINEERED FILL DESCRIPTION AND RECOMMENDED USES		
Fill Type	**USCS Classification**	**Acceptable Location for Placement**
Stone[1]	GW[1]	Pool and Slab Undercut Locations

1. Similar to TDOT Section 903.05 Type A, Grading D crushed limestone aggregate, limestone screenings, or such as well-graded gravel or crushed stone.

Item	Description
Fill Lift Thickness	8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used.
	4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used.
Compaction Requirements (Pool and Deck)	At least 98% of the materials Standard Proctor maximum dry density (ASTM D 698).
Compaction Requirements (Trench Lines)	Per the above depending upon location/elevation.
Testing Frequency	1 soil density and moisture test per 2500 square feet or less of fill area for each soil fill lift.
Testing Personnel	A qualified soil technician, under the direction of an FSE geotechnical engineer, should perform the soil density testing.
Soil Subgrade Approval	Prior to fill placement, the soil subgrade should be DCP or Proof Roll Tested under the observation of an FSE geotechnical engineer for approval to begin fill placement.

HELICAL PIERS – DESIGN RECOMMENDATIONS

Helical piers or other types of the screwed-in pier may be utilized to provide support to the damaged southern foundations of the home. Screwed in piers are small-diameter steel pile foundation elements with helical type auger flights. The piers are constructed by screwing a steel pier element into the ground. Additional steel sections are added until a suitable bearing stratum is achieved. The foundations of the wall can then be hydraulically lifted/stabilized by attaching a steel foundation assembly to the foundation of the existing building addition walls and the shaft of the pier element.

A geotechnical engineer should observe the pier installation to assist in interpreting subsurface conditions and determining when the appropriate depth has been reached. We recommend the use of a maximum pier service load of 20 kips per pier. Pier spacing for this system is typically between 4 to 8 feet on center. We recommend that pier spacing not exceed 5 feet on center. Pier spacing/locations should consider building loads and openings such as windows and doors concerning the existing foundation/building layout.

Piers should be extended to bedrock or at least 20 feet in depth below ground surface level to extend beneath the wet, variable consistency soils that are unsuitable for support of foundations, down into the underlying dry, stiff residual soil or to bedrock. The pier construction should be performed using standard industry guidelines. The design of the pier system can be performed using technical guide information provided by the manufacturer. We recommend a design/build contract with the specialty contractor, where the contractor is given the design requirements and then designs a system to meet the requirements.

If refusal occurs prior to achieving the minimum depth, helical piles often can be reversed in direction and worked up and down in an attempt to break through the obstruction. Obstructed piles also may be removed and modified or replaced to have fewer helical bearing elements. If the obstruction is shallow, it should be removed by surface excavation; backfill and compact prior to pile reinsertion. If the obstruction is deep, a pilot hole should be made with a rock drill; the diameter of the pilot hole should be no larger than necessary to bypass or break through the obstruction.

If refusal occurs after reaching the minimum depth, helical piles can be deemed acceptable provided the depth of helical bearing elements corresponds to the depth of suitable bearing stratum in the boring logs and/or helical piles installed nearby achieved required torque at similar depth as the obstructed pile.

The specialty contractor and design team (architect/engineers) should evaluate the ability of the screwed-in (Helical) piers to achieve the recommended 20 kip service load, given the soil conditions existing at the damaged areas of the home foundations, prior to using this option. The ability of the piers to generate the required capacity from the stiff residual soil and/or bedrock is critical. Piers failing to achieve these requirements would be rejected.

It is important to note that settlement in different locations of the structure may still occur by partially stabilizing the structure at the southern foundation wall. There is inherent risk of differential settlement in other locations that only the owner can assume should the foundations be partially stabilized.

CAP AND COMPACTION GROUTING – RECOMMENDATIONS

The work consists of injecting 0- to 4-inch slump grout under pressure into the grout holes. The slump will be measured with a standard slump cone. Grouting mixes, pressures, and pumping rate shall be determined in the field by the Contractor based on existing soil conditions and reaction.

Should an on-site grout plant be used, it shall be designed to handle the specified materials for this type of work. The mixer shall be of the plaster and mortar type to ensure complete and uniform mixing of the materials used and shall be of sufficient capacity to continuously provide the pumping unit with mixed grout at its required pumping rate.

The pumping unit shall be capable of continuously delivering the specified grout materials at a pressure of at least 200 psi. Pressure gauges shall be supplied at the pump and at the grout lead pipe. An adequate communications system shall be maintained between the grout plant, pump, and injection location so as to allow strict control of the pumping operations.

Grout injection holes shall be drilled and continuously cased to the top of the rock as indicated by refusal of the drilling tools or other method acceptable. Adjustments to the grout injection locations may be required, upon approval, to avoid existing and future underground elements. Primary and secondary grout holes shall be located in a pattern and approved by the Geotechnical Engineer prior to start of work. Depending on field observation of the drilling and grouting operations, additional intermediate secondary grout holes may be required.

Grout pipes shall be steel casing of adequate strength to withstand the required pumping, drilling and/or jacking pressures. The pipes shall have an inside diameter of at least 2 inches in order to handle the specified low slump material without plugging. The pipes shall be installed by augering, drilling, and/or jacking to the grouting depth in a manner that ensures that the grout pipes are free of soil and debris, and that a tight seal is made around the pipe sufficient to withstand the grouting pressures. The installation of the grout pipes shall be performed in such a manner as to extend the grout pipes to the interpreted top of the bedrock.

Grout pipe pulling jacks shall be provided capable of withdrawing the steel. The Contractor shall adequately protect grout pipes from foreseeable hazards. After grouting at each grout injection location, the Contractor shall plug each hole and return the area to its original conditions.

At each grout injection location, the grout pipe shall be installed to refusal of the drilling equipment as interpreted top of bedrock, then the grout pipe shall be lifted approximately 2 feet to begin the cap grouting portion of the Work. Grout shall then be pumped at this depth using the following limiting criteria:

1. When the injection pressure at the grout pipe header exceeds 50 PSI at the level the grout is being injected.

2. When the upward movement of the soils occurs as determined by the visual observation.

3. When the maximum quantity of grout has been injected. The maximum quantity of grout to be injected at any location shall be 2 cubic yards (not including the grout used for the compaction portion of the Work) unless otherwise directed by the engineer.

4. When undesirable upward movement of nearby adjacent structures occurs as determined by the monitoring system.

The arrangement of the grouting equipment shall be so as to provide a continuous flow of grout to the injection point and to permit accurate pressure and flow rate control regardless of the magnitude of the grout take. During grouting operations, the Contractor shall take such precautions as may be necessary to prevent drill cuttings, equipment exhaust, oil, wash water, and grout from defacing or damaging adjacent structures, or entering any waterway, ditch line, or other conduit to a waterway. The Contractor shall furnish such pumps as may be necessary to handle wastewater and grout from his operations, and will clean up all waste resulting from his operations.

KARST TERRAIN AND SINKHOLE ACTIVITY

This site is located within the geologic setting of the Knox Group Formation. The bedrock of this formation consists of limestone and dolomite bedrock, both carbonate rocks.

There is an inherent risk associated with building on any site underlain by carbonate rock. By employing construction methods that take the potential for sinkhole activity into consideration, this risk can be reduced but not eliminated.

On a site located within carbonate rock geology, sinkhole activity is most likely to occur in areas of excavation, as the removal of the surface soils exposes subsurface soil fissures to rainfall and runoff.

The cause of sinkhole activity is water passing through natural fissures in the soil structure. As water passes through these fissures, it erodes the sides of the fissures, causing soil loss and voids in the soil structure. As such, the Contractor should continually review the site for positive drainage.

Areas, where the surface soils are disturbed, are of concern as the upper soil layers provide a natural seal over the subsurface cracking. When this protective layer is removed, the fissures in the soil structure are exposed to rainfall and surface water, thus increasing the potential for sinkhole activity. Conversely, areas that receive fill soil are sealed with properly placed and compacted soil material.

We recommend that the following construction practices be adopted for sites underlain by carbonate rock:

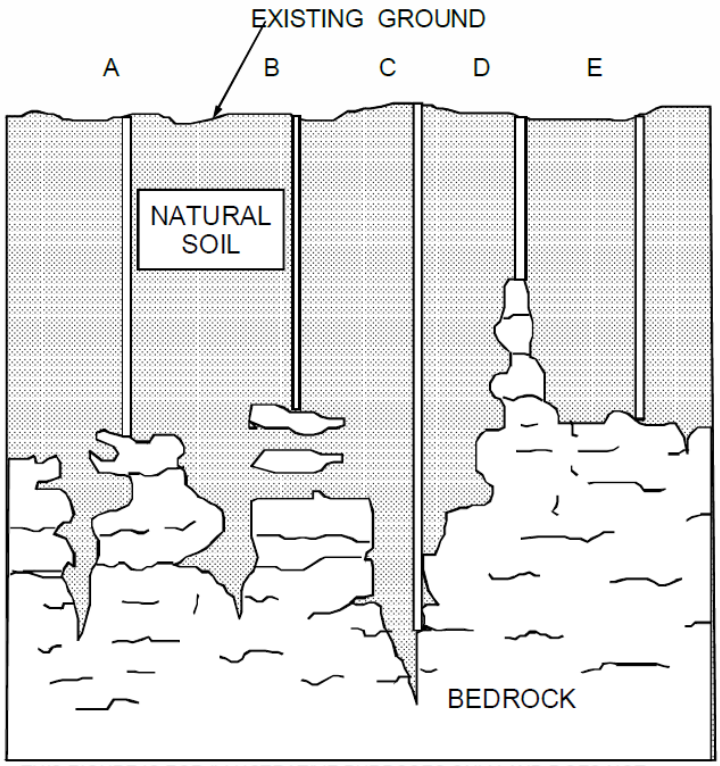
- Always maintain positive drainage throughout the site.
- *Backfill utility trenches and slab excavations with compacted crushed stone or soil. We* ***do not*** *recommend the use of open-graded aggregate such as #57 stone as backfill material on sites with an elevated risk of sinkhole activity.*
- Upon reaching the subgrade elevation in excavated areas, we recommend that the upper twelve inches of soil be scarified and recompacted to remold the Subgrade and provide a seal over the subsurface soils.
- If sinkhole activity is observed during construction, the Contractor should notify the engineer immediately so that the sinkhole can be evaluated, and an appropriate method of repair can be determined.

BEDROCK CONSIDERATIONS

Weathered rock that is penetrated with drilling augers can typically be excavated with large excavation equipment fitted with rock teeth using concentrated effort or ripped with large bulldozers. Layers of intact rock may be present within the weathered zones, which could require breaking with pneumatic rock breakers or blasting.

Auger refusal is defined as the depth below the ground surface at which a boring can no longer be advanced with the soil drilling technique being used. Auger refusal is subjective and is based upon the type of drilling equipment used, the types of augers being used, and the effort exerted by the driller. Auger refusal can result on the upper surface of discontinuous bedrock (A), slabs of unweathered rock suspended in the residual soil matrix or "floaters" (B), in widened joints that may extend well below the surrounding bedrock surface (C), on rock "pinnacles" rising above the surrounding bedrock surface (D), or on the upper surface of continuous bedrock (E). These possible auger refusal conditions are illustrated in the below figure.

AUGER REFUSAL ILLUSTRATION



THIS FIGURE IS FOR ILLUSTRATIVE PURPOSES ONLY AND DOES NOT NECESSARILY DEPICT THE SPECIFIC BEDROCK CONDITIONS AT THIS SITE

MOISTURE SENSITIVE AND PLASTIC CLAYS AND SILTS

The natural, fine-grained, residual soils include low and high-plasticity clay and silt (denoted with a USCS symbols of ML, CL, MH, and CH). Plastic clay and elastic silt have the potential to expand and shrink with changes in moisture content, which can lead to premature deterioration of pavements and cosmetic cracking of building finishes when they are located directly beneath pavements, floor slabs, and building footings. The soils encountered on the site can be easily degraded from repeated construction traffic and is not recommended for re-use as engineered fill at elevations near the finished subgrade elevations in the pavement, floor slab, and foundation areas.

These soils will be sensitive to changes in moisture content. If these soils are exposed to moisture and poor surface drainage for prolonged periods, their strength and workability will rapidly deteriorate. During construction, the Contractor can reduce subgrade deterioration by sealing the ground surface using a smooth-drum roller prior to precipitation events.

It is important to note that the laboratory testing of these soils indicated natural moisture contents above the Plastic Limit. Therefore, in-situ conditions are present that could make re-use as new fill a challenge if drying is not planned. Drying can likely be achieved during periods of dry weather by spreading the soil across the site in one thin lift.

GENERAL QUALIFICATIONS & LIMITATIONS OF THIS REPORT

This report has been prepared for the exclusive use of Skanska USA for Jefferson Elementary School in Jefferson City, Tennessee.

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The services performed and conclusions rendered are consistent with the level of care and skill ordinarily exercised by members of the geotechnical engineering profession practicing under similar circumstances in this geographic region at the time the services were performed. No other warranty, expressed or implied, is made. This report does not relieve the owner, contractor, or design professionals of record from their respective responsibilities for design adequacy, construction quality, code compliance, or site safety.

If any subsurface or topographic variations become evident, a reevaluation of the opinions contained in this report will be necessary after we have had an opportunity to observe the characteristics of the conditions encountered. All deviations from the conditions described herein shall be considered material changes. The recommendations and opinions contained in this report shall be void unless such deviations are reviewed and the conclusions are modified or reaffirmed in writing by Foundation Systems Engineering.

Our review and/or site visits, if any, do not constitute continuous observation of the work and shall not relieve the contractor of responsibility for performing the work in accordance with the plans, specifications, and applicable standards.

Foundation Systems Engineering is not responsible for construction means, methods, techniques, sequences, procedures, safety precautions, or for the contractor’s failure to comply with the recommendations contained in this report.

In no event shall Foundation Systems Engineering be liable for any consequential, incidental, special, or indirect damages, including but not limited to loss of use, delay damages, loss of profits, or diminution in property value. The opinions and recommendations provided herein are professional judgments based on available information and not guarantees of long-term stability.

Foundation Systems Engineering is not responsible for any claims, damages, or liability associated with any other party's interpretation of this report's data or reuse of this report's engineering analysis without our express written authorization. To the fullest extent permitted by law, the total liability of Foundation Systems Engineering for any and all claims arising out of this report shall not exceed the total compensation received by Foundation Systems Engineering for the services specifically related to this report.

APPENDICIES

Boring Location Plan
Test Boring Records
Area Topographic Map
Area Geology Map
Aerial Photograph
Lab Data
GPR Sketch
General Notes
Test Descriptions

Foundation Systems Engineering, P.C.

Geotechnical Engineering and Consulting

APPENDICES

LEGEND

BORING LOCATION

FOUNDATION SYSTEMS ENGINEERING, P.C.
Geotechnical Engineers

3002 INDUSTRIAL DRIVE
JOHNSON CITY, TN 37604
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www.fsepc.com

BORING LOCATION PLAN
SUBSURFACE EXPLORATION
JEFFERSON ELEMENTARY SCHOOL
JEFFERSON CITY, TN

FOR: SKANSKA USA

DRAWN BY: AJ	NOTES:	
PROJ #: 726167	BORING LOCATIONS ARE APPROXIMATE	
SCALE: NONE	DATE: 4/15/2026	DWG: BLP

Project: **Jefferson City Elementary** Project Location: **Jefferson City, Tennessee** Client **726167**	Log of Boring B-1 **Sheet 1 of 1**

Date(s) Drilled **4/3/26**	Drilling Contractor **CML**	FSE File Number **726167**
Drilling Method **Direct Push**	Logged By **JT**	Total Depth of Borehole **8.0'**
Drill Rig Type **Geoprobe**	Checked By **AB**	Approximate Surface Elevation **N/A**
Borehole Backfill **Soil Cuttings with Concrete**	Sampling Method **SPT**	Groundwater Depth (ft) **N/A**
	Comments **Auger Refusal Interpreted to be a layer of Very Stiff Soils/Chert**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0								Grass and Top Soil (4-inches)	
									FILL, Medium, Very Moist, Tan Red Silty Clay with Iron Staining and Silt Seams	
			1	6						
									RESIDUAL, Medium to Stiff, Very Moist, Tan Red Silty Clay with Iron Staining, Silt Seams, and Chert	
			2	8						
	5									
			3	12						
									Auger Refusal at 8.0'	
	10									
	15									
	20									

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Project: **Jefferson City Elementary** Project Location: **Jefferson City, Tennessee** Client **726167**	Log of Boring B-2 **Sheet 1 of 1**

Date(s) Drilled **4/3/26**	Drilling Contractor **CML**	FSE File Number **726167**
Drilling Method **Direct Push**	Logged By **JT**	Total Depth of Borehole **10.5'**
Drill Rig Type **Geoprobe**	Checked By **AB**	Approximate Surface Elevation **N/A**
Borehole Backfill **Soil Cuttings with Concrete**	Sampling Method **SPT**	Groundwater Depth (ft) **N/A**
	Comments **Auger Refusal Interpreted to be a layer of Very Stiff Soils/Chert**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0								Grass and Top Soil (1-inch)	
									FILL, Soft, Very Moist to Wet, Tan Red Silty Clay with Iron Staining and Silt Seams	
			1	4						
									RESIDUAL, Medium to Stiff, Very Moist, Tan Red Silty Clay with Iron Staining, Silt Seams, and Chert	
			2	7						
	5									
			3	12						
			4	14						
	10								Auger Refusal at 10.5'	
	15									
	20									

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Project: **Jefferson City Elementary** Project Location: **Jefferson City, Tennessee** Client **726167**	Log of Boring B-3 **Sheet 1 of 1**

Date(s) Drilled **4/3/26**	Drilling Contractor **CML**	FSE File Number **726167**
Drilling Method **Direct Push**	Logged By **JT**	Total Depth of Borehole **12.0'**
Drill Rig Type **Geoprobe**	Checked By **AB**	Approximate Surface Elevation **N/A**
Borehole Backfill **Soil Cuttings with Concrete**	Sampling Method **SPT**	Groundwater Depth (ft) **N/A**
	Comments **Auger Refusal Interpreted to be a layer of Very Stiff Soils/Chert**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0								Grass and Top Soil (2-inches)	
									FILL, Stiff, Very Moist, Red Tan Silty Clay with Iron Staining	
			1	10						
									RESIDUAL, Stiff, Very Moist, Tan Red Silty Clay with Iron Staining and Silt Seams	
			2	11						
	5									
			3	12						
			4	14						
	10									
									Auger Refusal at 12.0'	
	15									
	20									

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Project: **Jefferson City Elementary** Project Location: **Jefferson City, Tennessee** Client **726167**	Log of Boring B-4 **Sheet 1 of 1**

Date(s) Drilled **4/3/26**	Drilling Contractor **CML**	FSE File Number **726167**
Drilling Method **Direct Push**	Logged By **JT**	Total Depth of Borehole **17.0'**
Drill Rig Type **Geoprobe**	Checked By **AB**	Approximate Surface Elevation **N/A**
Borehole Backfill **Soil Cuttings with Concrete**	Sampling Method **SPT**	Groundwater Depth (ft) **N/A**
	Comments **Auger Refusal Interpreted to be Weathered Limestone Bedrock**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0								Grass and Top Soil (2-inches)	
									FILL, Soft, Very Moist, Red Tan Silty Clay with Iron Staining	
			1	4						
									RESIDUAL, Medium to Stiff, Very Moist to Wet, Tan Red Silty Clay with Iron Staining, Silt Seams, and Chert	
			2	6						
	5									
			3	9						
			4	12						
	10									
			5	14						
	15									
									Auger Refusal at 17.0'	
	20									

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Project: **Jefferson City Elementary**

Project Location: **Jefferson City, Tennessee**

Client **726167**

Key to Log of Boring

Sheet 1 of 1

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8	9	10	11

COLUMN DESCRIPTIONS

1 Elevation (feet): Elevation (MSL, feet).
2 Depth (feet): Depth in feet below the ground surface.
3 Sample Type: Type of soil sample collected at the depth interval shown.
4 Sample Number: Sample identification number.
5 Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
6 Water Content, %: Water content of the soil sample, expressed as percentage of dry weight of sample.
7 LL, %: Liquid Limit, expressed as a water content.
8 PI, %: Plasticity Index, expressed as a water content.
9 Graphic Log: Graphic depiction of the subsurface material encountered.
10 MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
11 REMARKS AND OTHER TESTS: Comments and observations regarding drilling or sampling made by driller or field personnel.

FIELD AND LABORATORY TEST ABBREVIATIONS

NMC: Natural Moisture Content, percent
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf

MATERIAL GRAPHIC SYMBOLS

Asphaltic Concrete (AC)
Bentonite
Bentonite chips
Bentonite powder
Bentonite plug
Boulders
Fat CLAY, CLAY w/SAND, SANDY CLAY (CH)
Fat CLAY/SILT (CH-MH)
Fat CLAY/PEAT (CH-OH)
Lean CLAY, CLAY w/SAND, SANDY CLAY (CL)
Lean-Fat CLAY, CLAY w/SAND, SANDY CLAY (CL-CH)
SILTY CLAY (CL-ML)
Lean CLAY/PEAT (CL-OL)
Claystone
Portland Cement Concrete
Cuttings
AF
Clayey GRAVEL (GC)
Clayey GRAVEL to Gravelly CLAY (GC-CH)
Clayey GRAVEL to Gravelly CLAY (GC-CL)
Silty GRAVEL (GM)
Silty GRAVEL to Clayey GRAVEL (GM-GC)
Silty GRAVEL to Gravelly SILT (GM-MH)
Silty GRAVEL to Gravelly SILT (GM-ML)
Poorly graded GRAVEL (GP)
Poorly graded GRAVEL with Silt (GP-GM)
Granite
Grass and/or topsoil
Gravel
Grout
Well graded GRAVEL (GW)
Well graded GRAVEL with Silt (GW-GM)
Poorly to Well graded GRAVEL (GW-GP)
Limestone
Artificial Fill
SILT, SILT w/SAND, SANDY SILT (MH)
SILT, SILT w/SAND, SANDY SILT (ML)
SILT, SILT with SAND, SANDY SILT (ML-MH)
High plasticity PEAT (OH)
Low plasticity PEAT (OL)
Low to High plasticity PEAT (OL-OH)
Sandstone
Clayey SAND (SC)
Clayey SAND to Sandy CLAY (SC-CH)
Clayey SAND to Sandy CLAY (SC-CL)
Shale
Silt
Siltstone
Silty SAND (SM)
Silty SAND to Sandy SILT (SM-MH)
Silty SAND to Sandy SILT (SM-ML)
Silty to Clayey SAND (SM-SC)
Poorly graded SAND (SP)
Poorly graded SAND with Clay (SP-SC)
Poorly graded SAND with Silt (SP-SM)
Well graded SAND (SW)
Well graded SAND with Clay (SW-SC)
Well graded SAND with Silt (SW-SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS

Auger sampler
CME Sampler
Pitcher Sample
Bulk Sample
Grab Sample
2-inch-OD unlined split spoon (SPT)
3-inch-OD California w/ brass rings
2.5-inch-OD Modified California w/ brass liners
Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

Water level (at time of drilling, ATD)
Water level (after waiting)
Minor change in material properties within a stratum
Inferred/gradational contact between strata
Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

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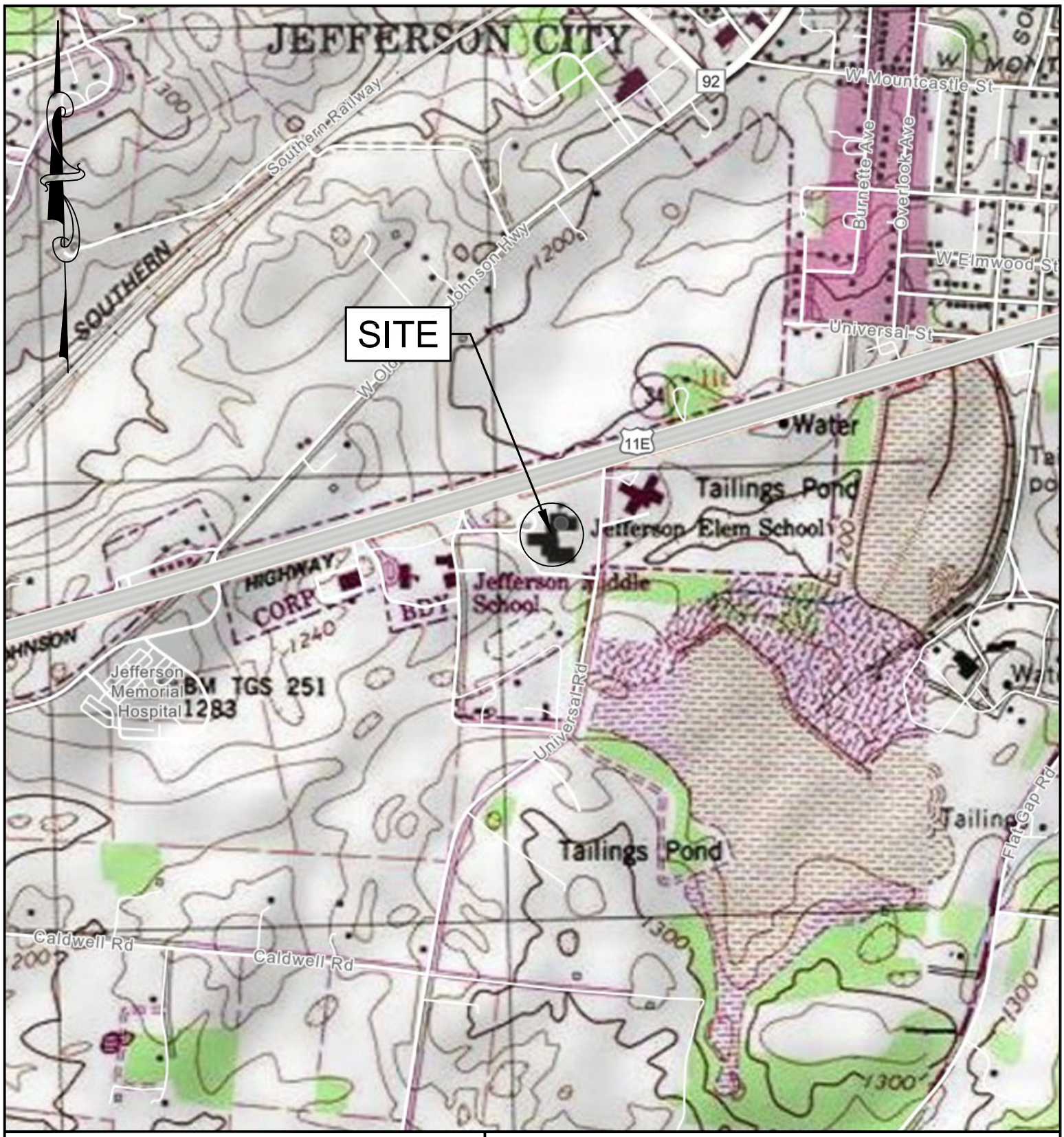

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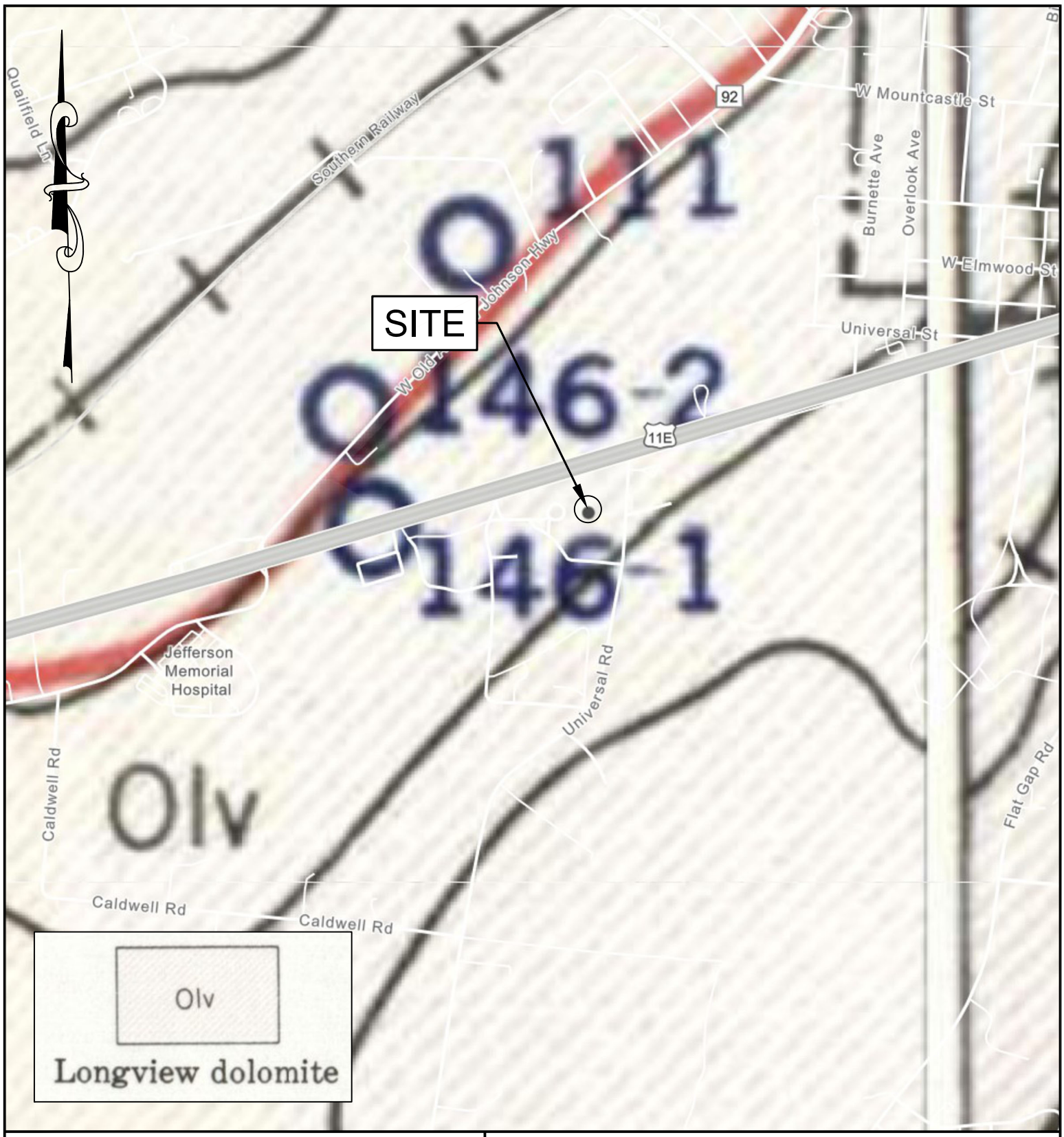
www.fsepc.com

AREA TOPOGRAPHIC MAP
SUBSURFACE EXPLORATION
JEFFERSON ELEMENTARY SCHOOL
JEFFERSON CITY, TN

FOR: SKANSKA USA

DRAWN BY: AJ	NOTES: ADAPTED FROM USGS MAPPING	
PROJ #: 726167		
SCALE: NONE	DATE: 4/15/2026	DWG: TOPO



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AREA GEOLOGY MAP
SUBSURFACE EXPLORATION
JEFFERSON ELEMENTARY SCHOOL

JEFFERSON CITY, TN

FOR: SKANSKA USA

DRAWN BY: AJ	NOTES: ADAPTED FROM USGS MAPPING SOURCE:	
PROJ #: 726167		
SCALE: NONE	DATE: 4/15/2026	DWG: GEO

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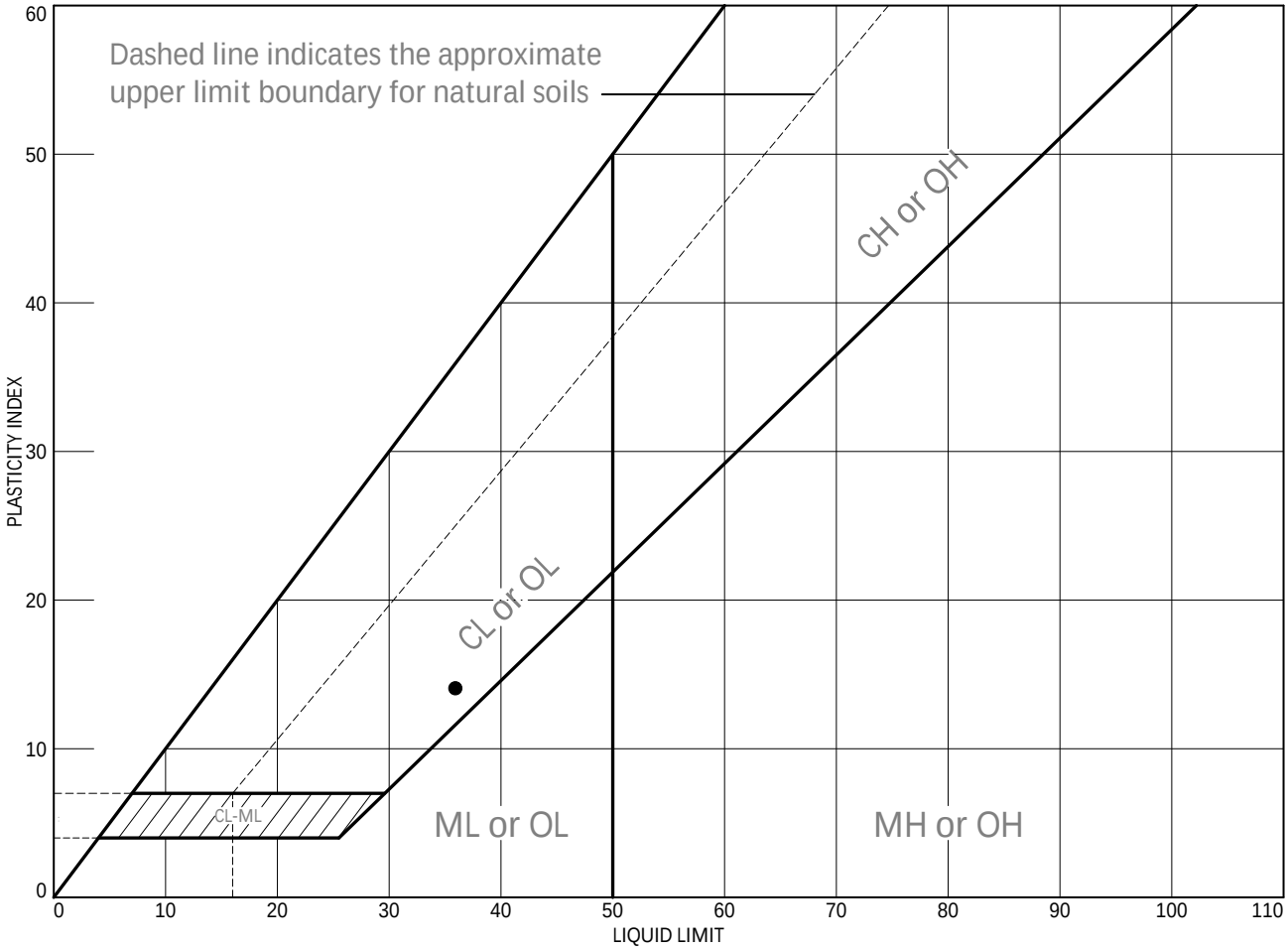
AERIAL PHOTOGRAPH
SUBSURFACE EXPLORATION
JEFFERSON ELEMENTARY SCHOOL

JEFFERSON CITY, TN

FOR: SKANSKA USA

DRAWN BY: AJ	NOTES:	
PROJ #: 726167	SOURCE: GOOGLE EARTH	
SCALE: NONE	DATE: 4/15/2026	DWG: AERIAL

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Tan Red Silty Clay with Iron Staining and Chert	36	22	14	92.5	86.4	CL

Project No. 726167 Client: Skanska USA

Project: Jefferson City Elementary

●Location: B-1 Depth: 0.0 - 4.0' Sample Number: N/A

Remarks:

Construction Materials Laboratory

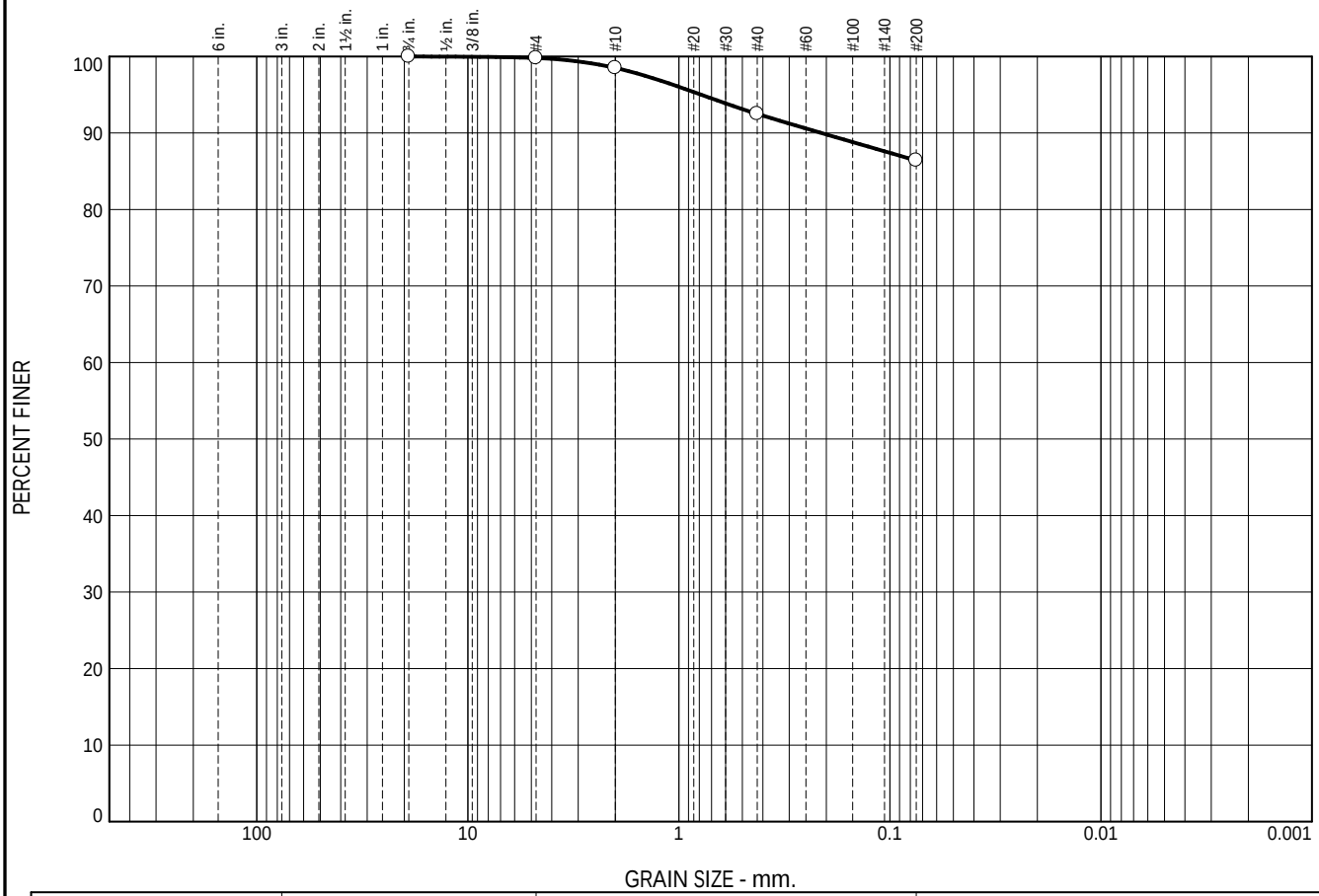
Johnson City, Tennessee

Figure

Tested By: JN Checked By: SM

Particle Size Distribution Report

ASTM D422



	% +3"	% Gravel	% Sand	% Fines	
				Silt	Clay
○	0.0	0.2	13.4	86.4	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	36	22								

Material Description	Test Date	USCS	NM
○ Tan Red Silty Clay with Iron Staining and Chert		CL	

Project No. 726167 Client: Skanska USA

Project: Jefferson City Elementary

○Location: B-1 Depth: 0.0 - 4.0' Sample Number: N/A

Remarks:

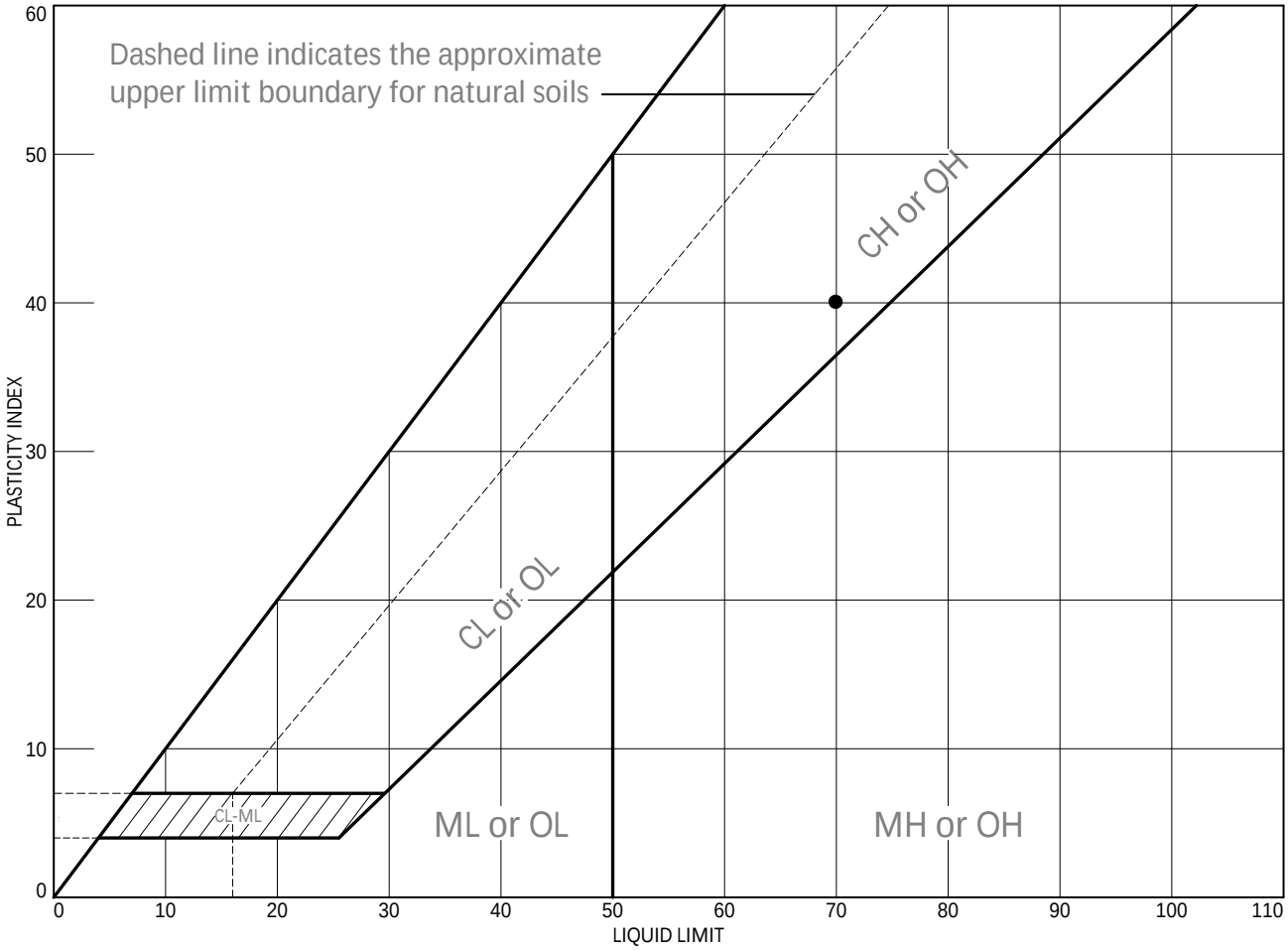
Construction Materials Laboratory

Johnson City, Tennessee

Figure

Checked By: SM

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Tan Red Silty Clay with Iron Staining and Chert	70	30	40	96.6	94.7	CH

Project No. 726167 Client: Skanska USA

Project: Jefferson City Elementary

●Location: B-2 Depth: 4.0' - 8.0' Sample Number: N/A

Remarks:

Construction Materials Laboratory

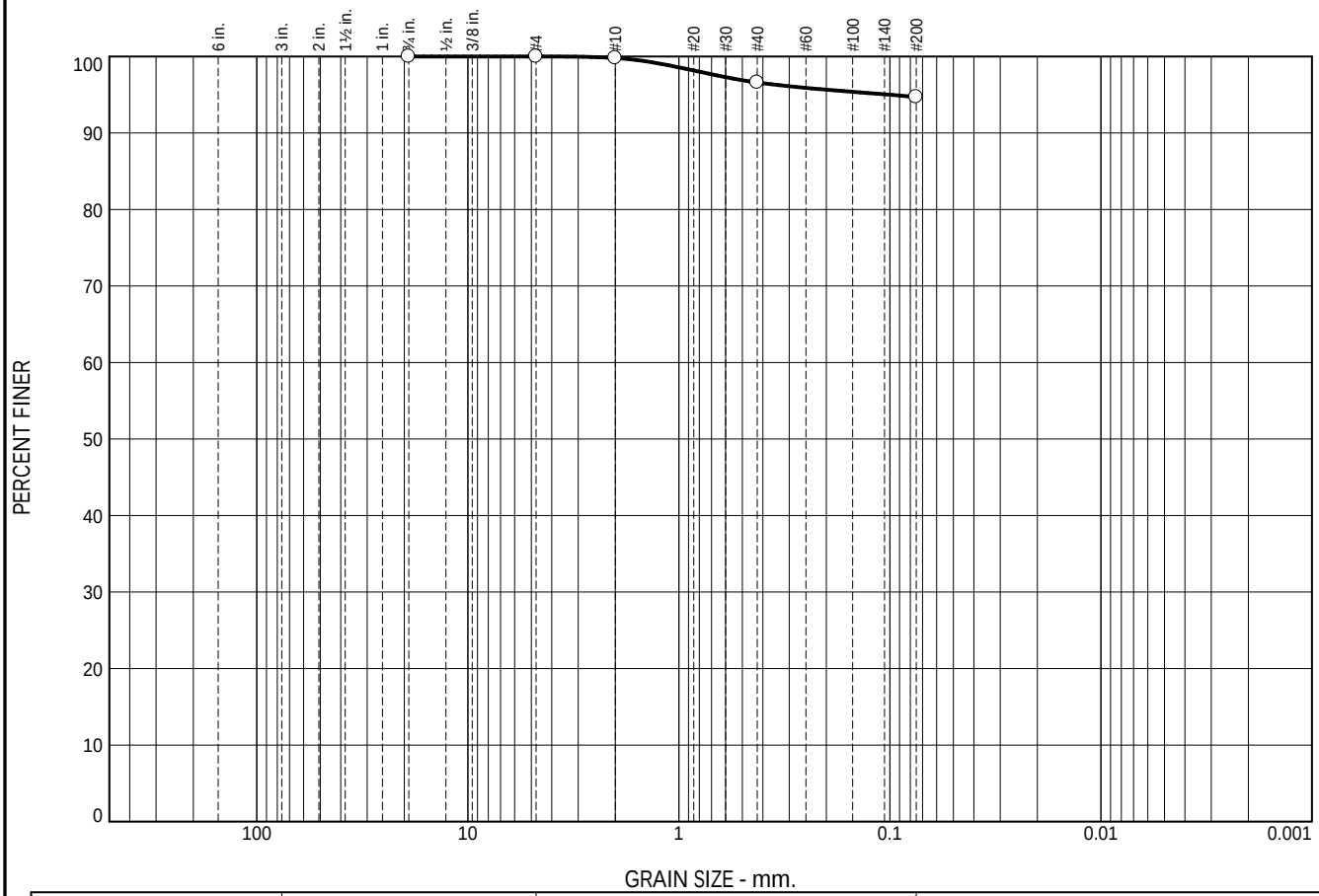
Johnson City, Tennessee

Figure

Tested By: JNS Checked By: SM

Particle Size Distribution Report

ASTM D422



	% +3"	% Gravel	% Sand	% Fines	
				Silt	Clay
○	0.0	0.0	5.3	94.7	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	70	30								

Material Description	Test Date	USCS	NM
○ Tan Red Silty Clay with Iron Staining and Chert		CH	

Project No. 726167 Client: Skanska USA

Project: Jefferson City Elementary

○Location: B-2 Depth: 4.0' - 8.0' Sample Number: N/A

Remarks:

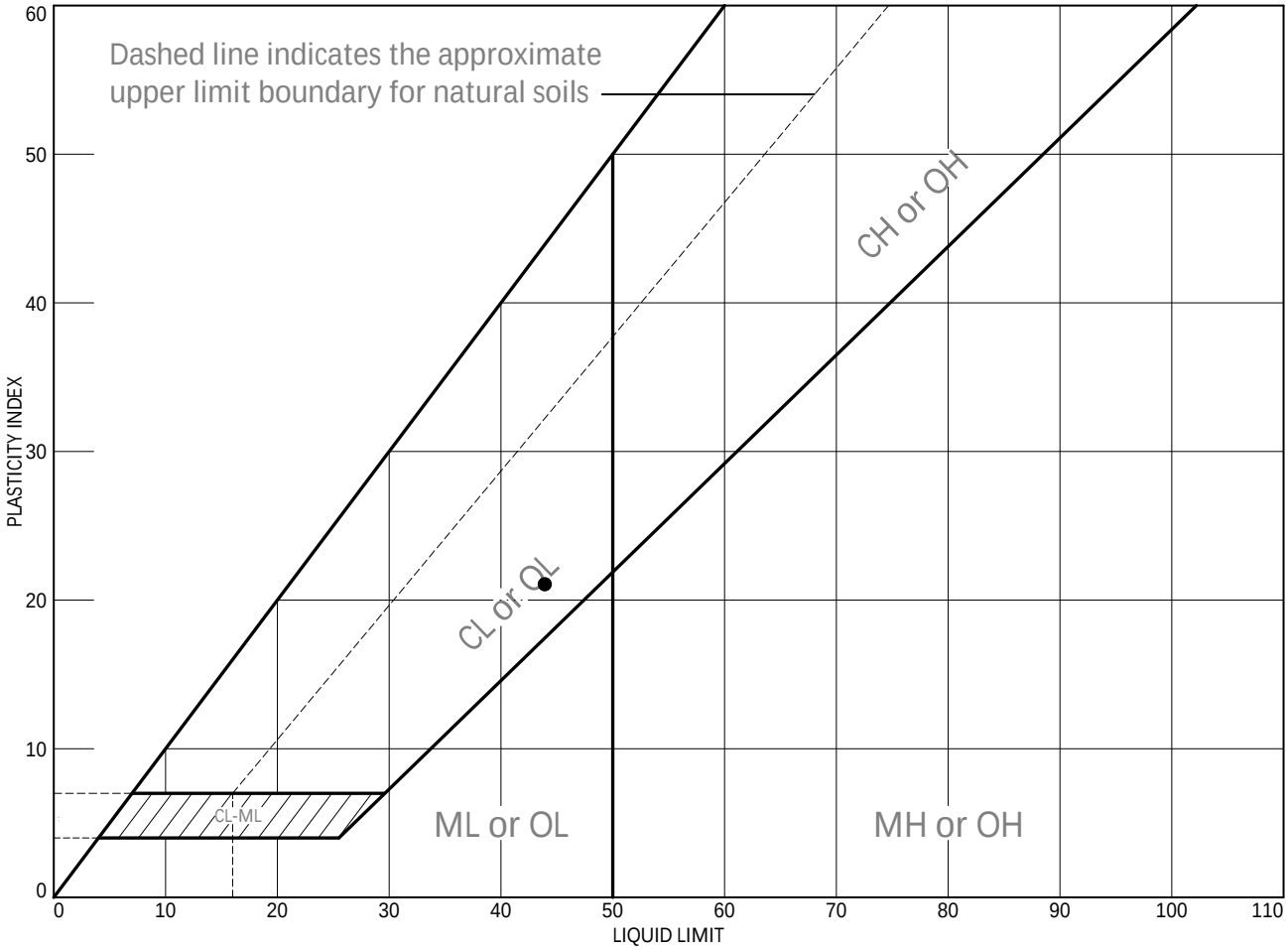
Construction Materials Laboratory

Johnson City, Tennessee

Figure

Checked By: SM

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Tan Red Silty Clay with Iron Staining and Chert	44	23	21	93.3	87.7	CL

Project No. 726167 Client: Skanska USA

Project: Jefferson City Elementary

●Location: B-3 Depth: 4.0' - 8.0' Sample Number: N/A

Remarks:

Construction Materials Laboratory

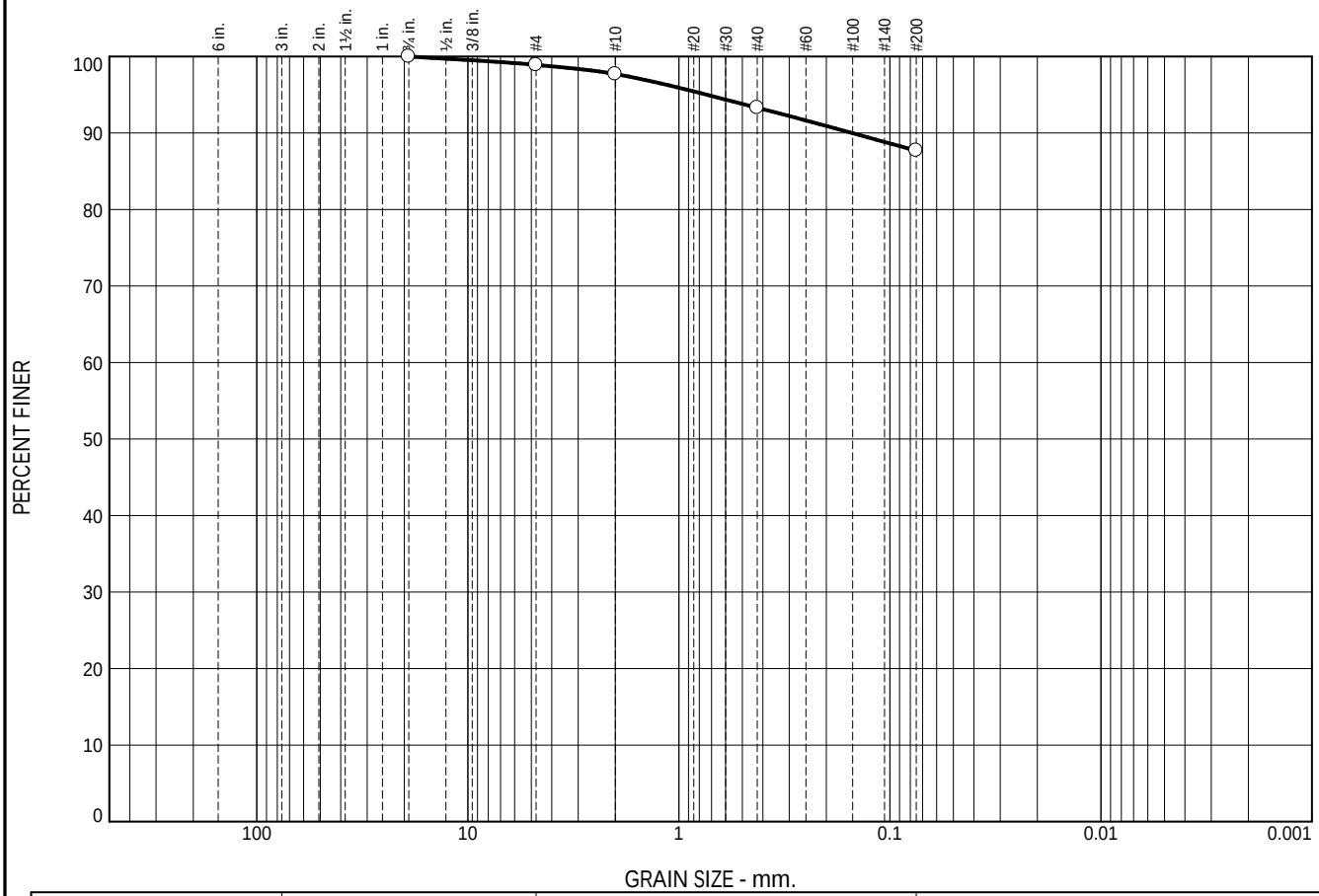
Johnson City, Tennessee

Figure

Tested By: JN Checked By: SM

Particle Size Distribution Report

ASTM D422



	% +3"	% Gravel	% Sand	% Fines	
				Silt	Clay
○	0.0	1.1	11.2	87.7	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	44	23								

Material Description	Test Date	USCS	NM
○ Tan Red Silty Clay with Iron Staining and Chert		CL	

Project No. 726167 Client: Skanska USA

Project: Jefferson City Elementary

○Location: B-3 Depth: 4.0' - 8.0' Sample Number: N/A

Remarks:

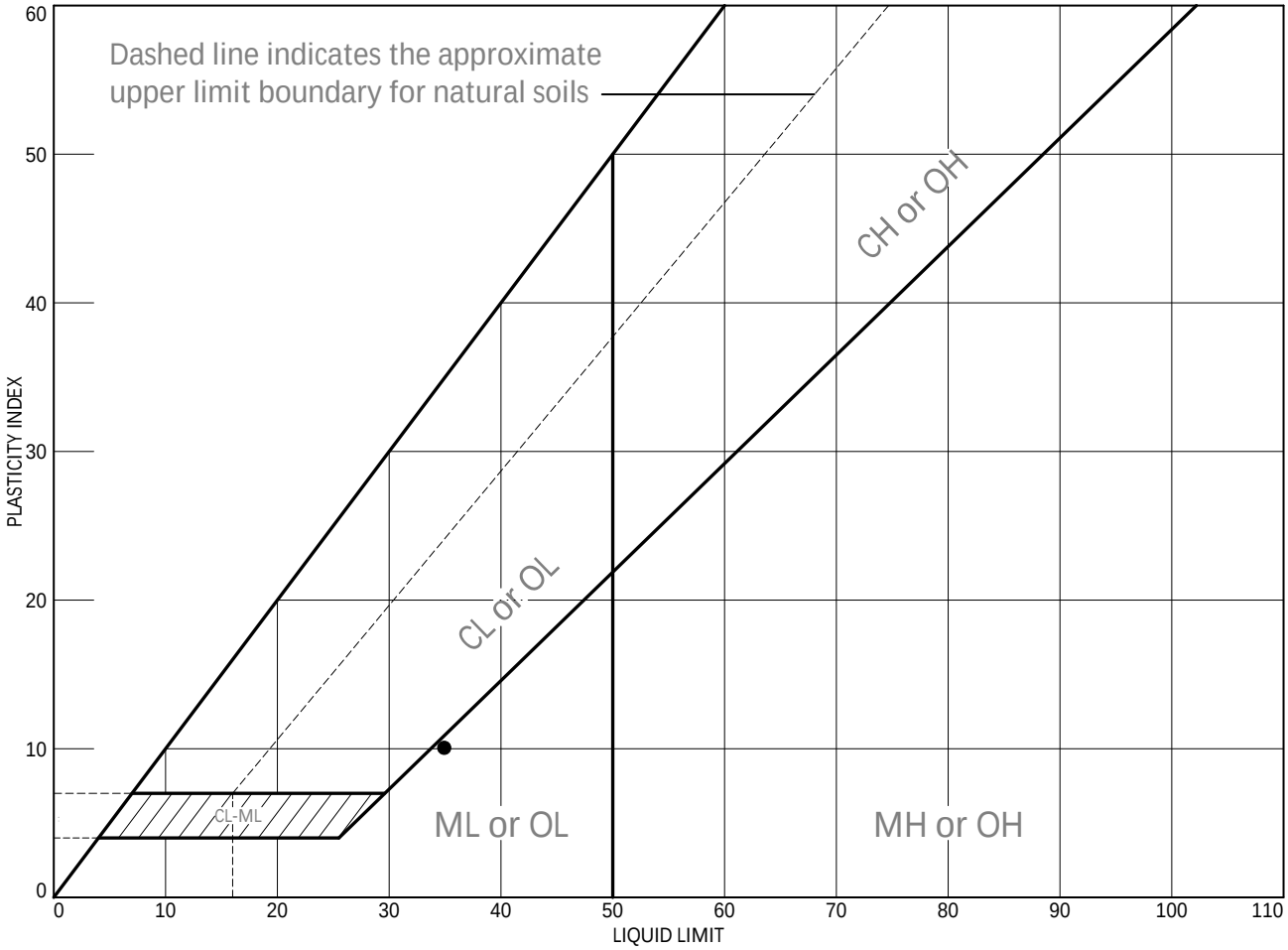
Construction Materials Laboratory

Johnson City, Tennessee

Figure

Checked By: SM

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Red Tan Clayey Silt with Iron Staining	35	25	10	92.2	83.2	ML

Project No. 726167 Client: Skanska USA

Project: Jefferson City Elementary

●Location: B-4 Depth: 0.0' - 4.0' Sample Number: N/A

Remarks:

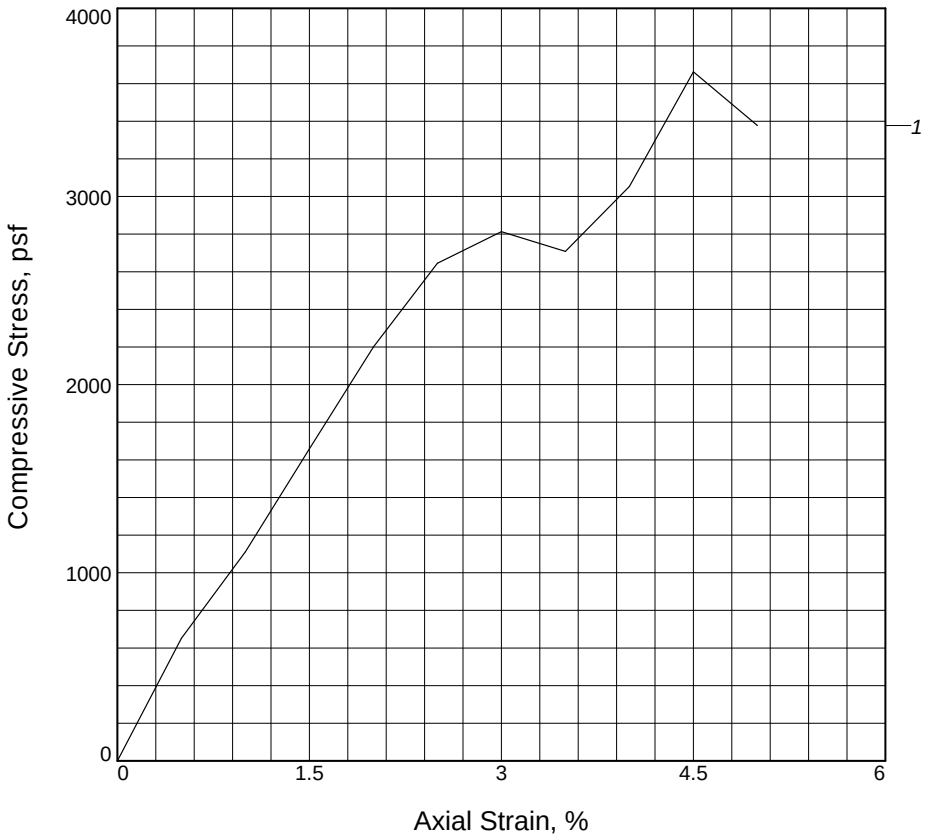
Construction Materials Laboratory

Johnson City, Tennessee

Figure

Tested By: JN Checked By: SM

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	3663			
Undrained shear strength, psf	1831			
Failure strain, %	4.5			
Strain rate, in./min.	N/A			
Water content, %	17.2			
Wet density, pcf	118.2			
Dry density, pcf	100.8			
Saturation, %	71.1			
Void ratio	0.6405			
Specimen diameter, in.	1.40			
Specimen height, in.	2.80			
Height/diameter ratio	2.00			

Description: Tan Red Silty Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.65	**Type:** Undisturbed

Project No.: 726167
Date Sampled:
Remarks:

Figure _____

Client: Skanska USA

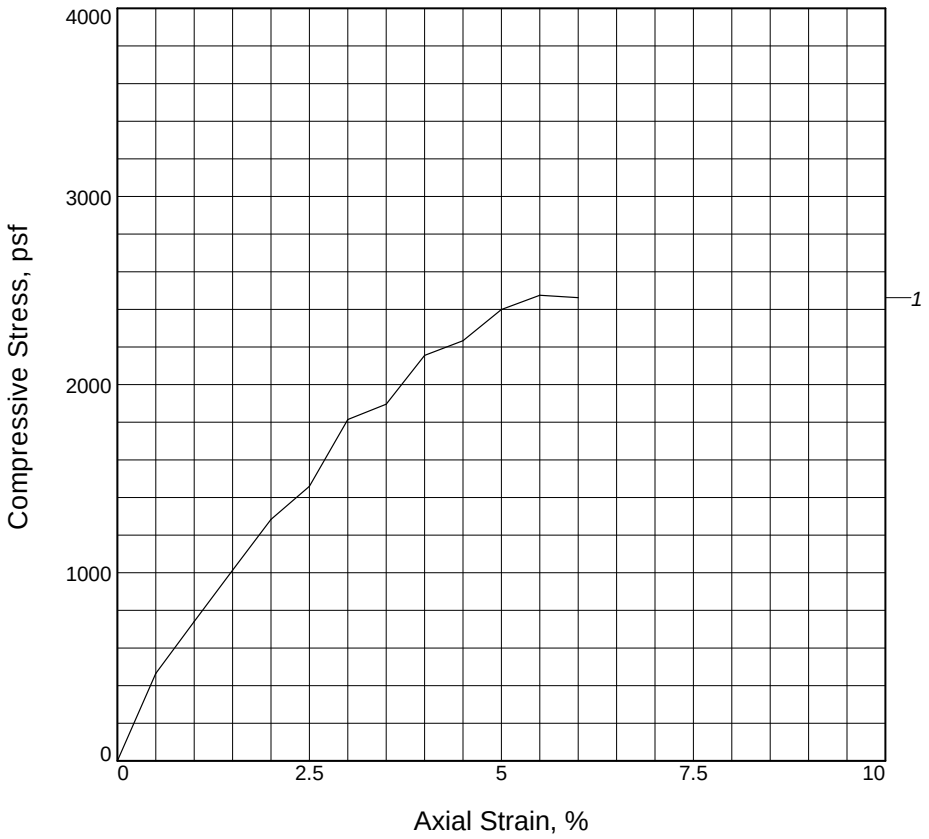
Project: Jefferson City Elementary

Location: B-1
Sample Number: N/A **Depth:** 0.0' - 2.0'

UNCONFINED COMPRESSION TEST
Construction Materials Laboratory
Johnson City, Tennessee

Tested By: SM **Checked By:** SM

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	2475			
Undrained shear strength, psf	1238			
Failure strain, %	5.5			
Strain rate, in./min.	N/A			
Water content, %	20.4			
Wet density, pcf	130.1			
Dry density, pcf	108.1			
Saturation, %	98.3			
Void ratio	0.5593			
Specimen diameter, in.	1.40			
Specimen height, in.	2.80			
Height/diameter ratio	2.00			

Description: Tan Red Silty Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** Undisturbed

Project No.: 726167
Date Sampled:
Remarks:

Figure _____

Client: Skanska USA

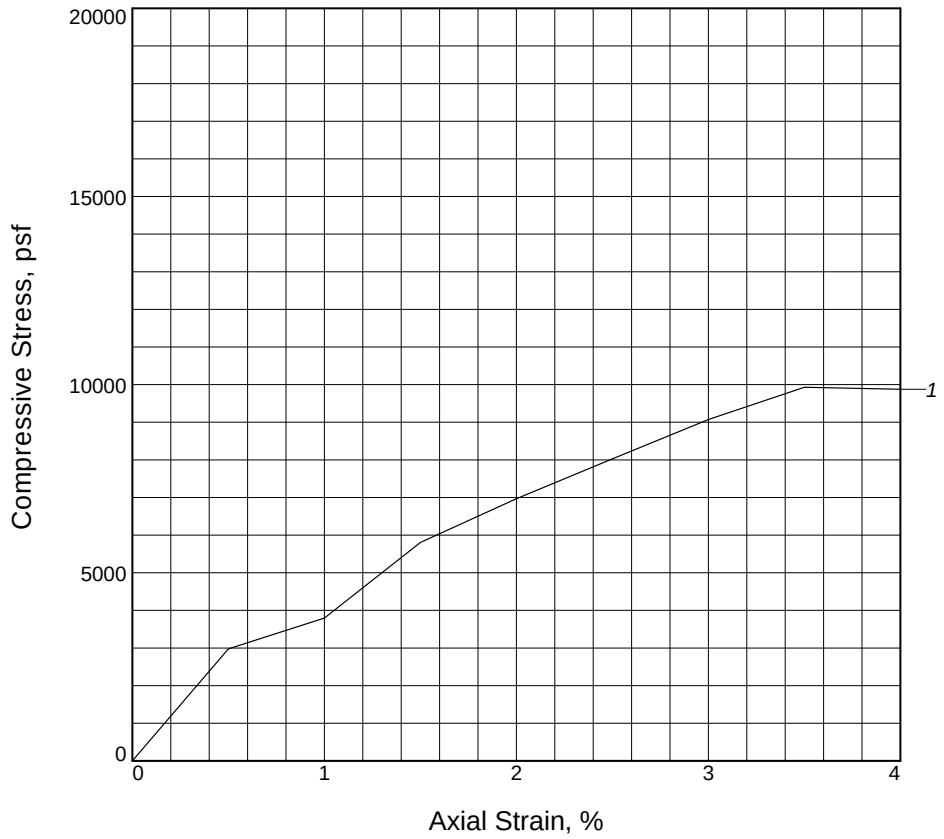
Project: Jefferson City Elementary

Location: B-1
Sample Number: N/A **Depth:** 2.0' - 4.0'

UNCONFINED COMPRESSION TEST
Construction Materials Laboratory
Johnson City, Tennessee

Tested By: SM **Checked By:** SM

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	9930			
Undrained shear strength, psf	4965			
Failure strain, %	3.5			
Strain rate, in./min.	N/A			
Water content, %	23.4			
Wet density, pcf	124.4			
Dry density, pcf	100.7			
Saturation, %	96.7			
Void ratio	0.6422			
Specimen diameter, in.	1.40			
Specimen height, in.	2.80			
Height/diameter ratio	2.00			

Description: Tan Red Silty Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.65	**Type:** Undisturbed

Project No.: 726167
Date Sampled:
Remarks:

Figure _____

Client: Skanska USA

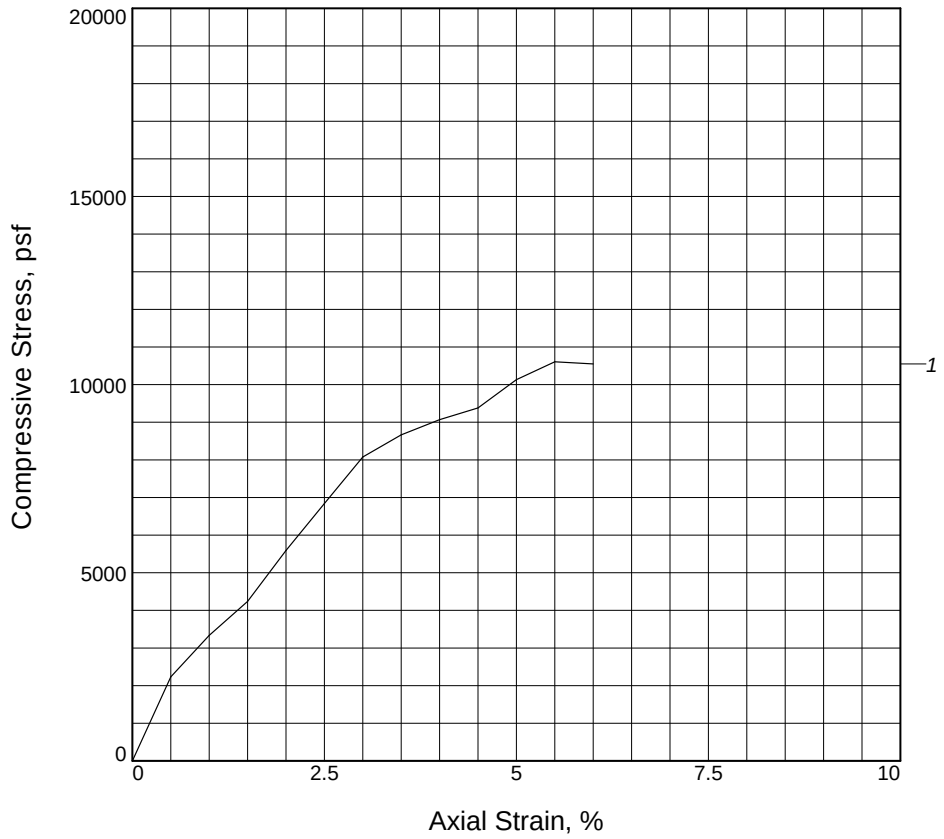
Project: Jefferson City Elementary

Location: B-1
Sample Number: N/A **Depth:** 4.0 - 6.0'

UNCONFINED COMPRESSION TEST
Construction Materials Laboratory
Johnson City, Tennessee

Tested By: SM **Checked By:** SM

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	10608			
Undrained shear strength, psf	5304			
Failure strain, %	5.5			
Strain rate, in./min.	N/A			
Water content, %	30.7			
Wet density, pcf	112.8			
Dry density, pcf	86.3			
Saturation, %	88.8			
Void ratio	0.9178			
Specimen diameter, in.	1.40			
Specimen height, in.	2.80			
Height/diameter ratio	2.00			

Description: Tan Red Silty Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.65	**Type:** Undisturbed

Project No.: 726167
Date Sampled:
Remarks:

Figure _____

Client: Skanska USA

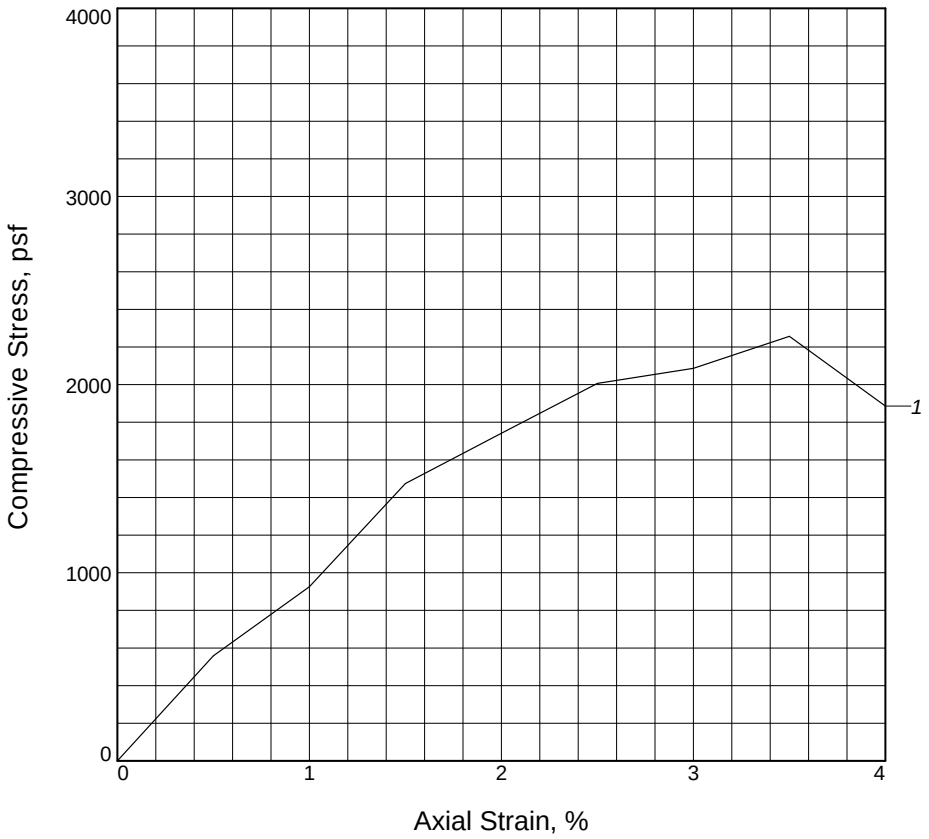
Project: Jefferson City Elementary

Location: B-1
Sample Number: N/A **Depth:** 6.0' - 8.0'

UNCONFINED COMPRESSION TEST
Construction Materials Laboratory
Johnson City, Tennessee

Tested By: SM **Checked By:** SM

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	2257			
Undrained shear strength, psf	1128			
Failure strain, %	3.5			
Strain rate, in./min.	N/A			
Water content, %	22.4			
Wet density, pcf	127.0			
Dry density, pcf	103.8			
Saturation, %	99.9			
Void ratio	0.5943			
Specimen diameter, in.	1.40			
Specimen height, in.	2.80			
Height/diameter ratio	2.00			

Description: Tan Red Silty Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.65	**Type:** Undisturbed

Project No.: 726167
Date Sampled:
Remarks:

Figure _____

Client: Skanska USA

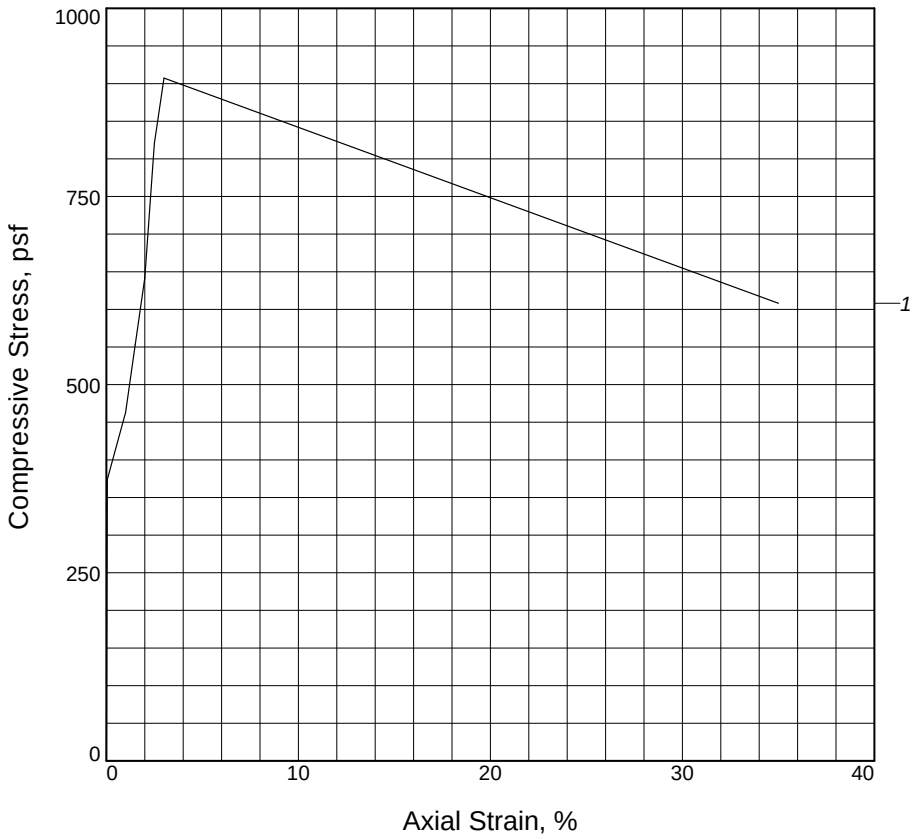
Project: Jefferson City Elementary

Location: B-2
Sample Number: N/A **Depth:** 0.0' - 2.0'

UNCONFINED COMPRESSION TEST
Construction Materials Laboratory
Johnson City, Tennessee

Tested By: SM **Checked By:** SM

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	907			
Undrained shear strength, psf	454			
Failure strain, %	3.0			
Strain rate, in./min.	N/A			
Water content, %	22.1			
Wet density, pcf	126.7			
Dry density, pcf	103.8			
Saturation, %	98.7			
Void ratio	0.5943			
Specimen diameter, in.	1.40			
Specimen height, in.	2.80			
Height/diameter ratio	2.00			

Description: Tan Red Silty Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.65	**Type:** Undisturbed

Project No.: 726167
Date Sampled:
Remarks:

Figure _____

Client: Skanska USA

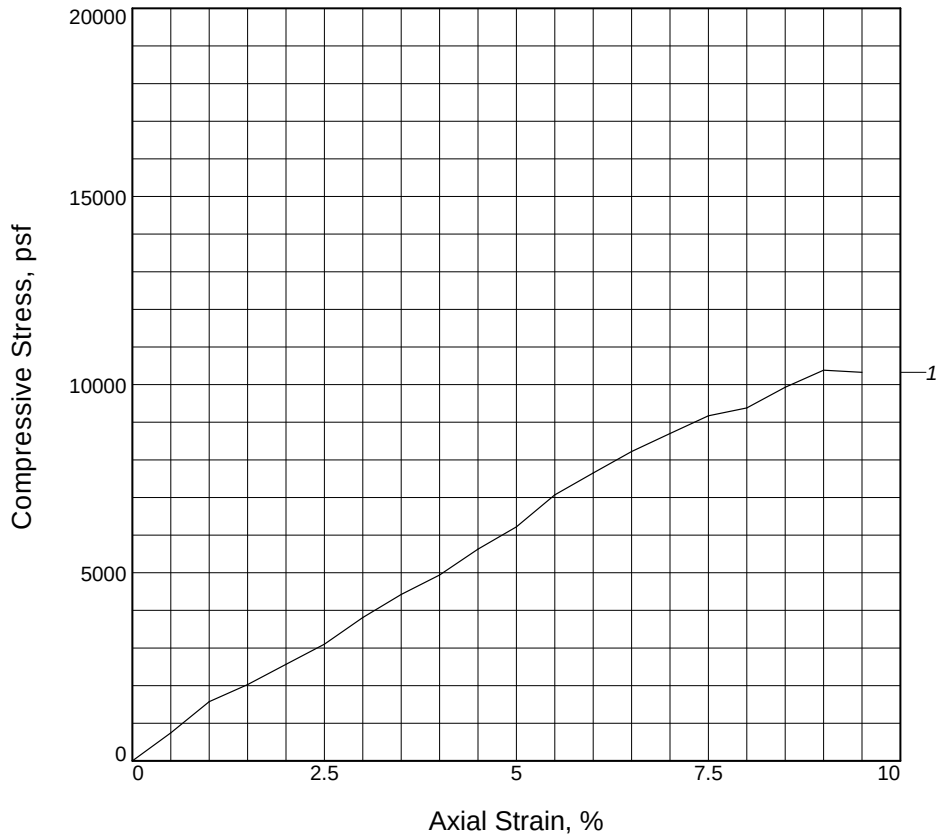
Project: Jefferson City Elementary

Location: B-2
Sample Number: N/A **Depth:** 2.0' - 4.0'

UNCONFINED COMPRESSION TEST
Construction Materials Laboratory
Johnson City, Tennessee

Tested By: SM **Checked By:** SM

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	10385			
Undrained shear strength, psf	5193			
Failure strain, %	9.0			
Strain rate, in./min.	N/A			
Water content, %	23.1			
Wet density, pcf	122.4			
Dry density, pcf	99.4			
Saturation, %	92.3			
Void ratio	0.6639			
Specimen diameter, in.	1.40			
Specimen height, in.	2.80			
Height/diameter ratio	2.00			

Description: Tan Red Silty Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.65	**Type:** Undisturbed

Project No.: 726167
Date Sampled:
Remarks:

Figure _____

Client: Skanska USA

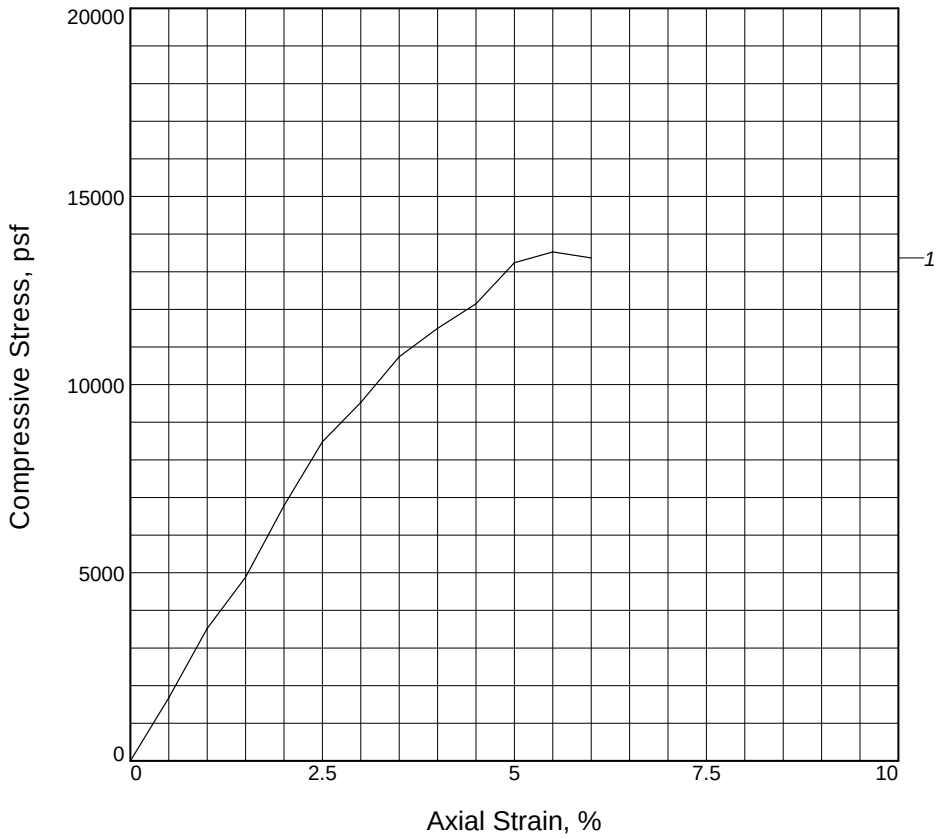
Project: Jefferson City Elementary

Location: B-2
Sample Number: N/A **Depth:** 4.0' - 6.0'

UNCONFINED COMPRESSION TEST
Construction Materials Laboratory
Johnson City, Tennessee

Tested By: SM **Checked By:** SM

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	13525			
Undrained shear strength, psf	6763			
Failure strain, %	5.5			
Strain rate, in./min.	N/A			
Water content, %	30.9			
Wet density, pcf	118.6			
Dry density, pcf	90.6			
Saturation, %	99.2			
Void ratio	0.8257			
Specimen diameter, in.	1.40			
Specimen height, in.	2.80			
Height/diameter ratio	2.00			

Description: Tan Red Silty Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.65	**Type:** Undisturbed

Project No.: 726167
Date Sampled:
Remarks:

Figure _____

Client: Skanska USA

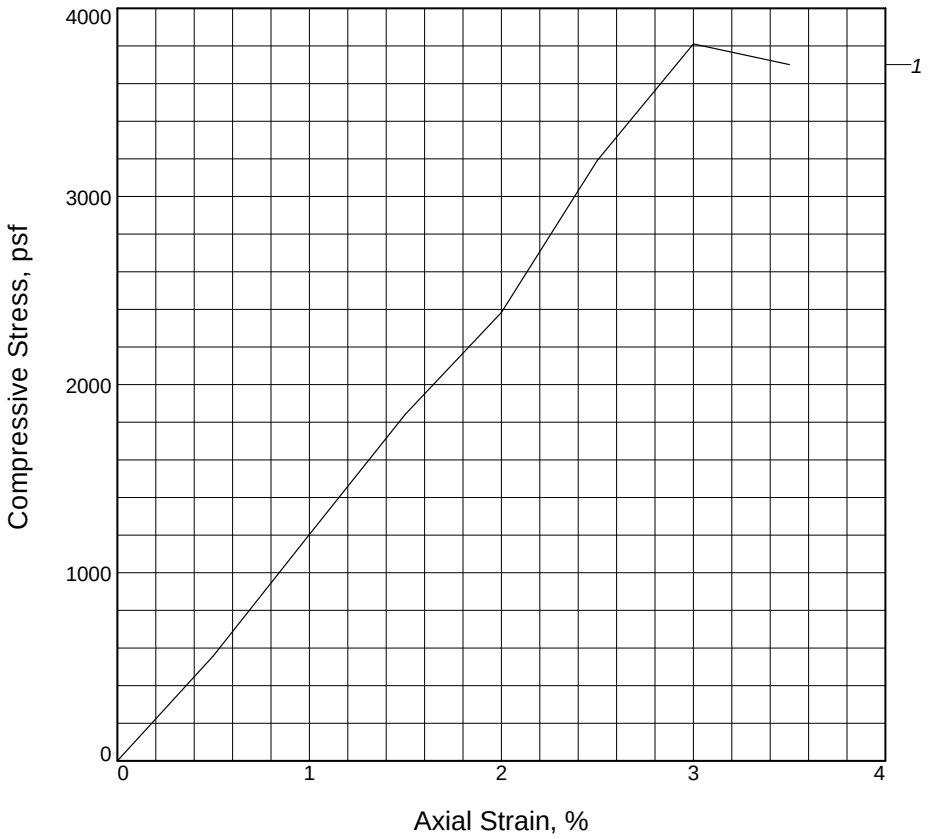
Project: Jefferson City Elementary

Location: B-2
Sample Number: N/A **Depth:** 6.0' - 8.0'

UNCONFINED COMPRESSION TEST
Construction Materials Laboratory
Johnson City, Tennessee

Tested By: SM **Checked By:** SM

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	3811			
Undrained shear strength, psf	1905			
Failure strain, %	3.0			
Strain rate, in./min.	N/A			
Water content, %	18.8			
Wet density, pcf	84.0			
Dry density, pcf	70.7			
Saturation, %	37.1			
Void ratio	1.3397			
Specimen diameter, in.	1.40			
Specimen height, in.	2.80			
Height/diameter ratio	2.00			

Description: Tan Red Silty Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.65	**Type:** Undisturbed

Project No.: 726167
Date Sampled:
Remarks:

Figure _____

Client: Skanska USA

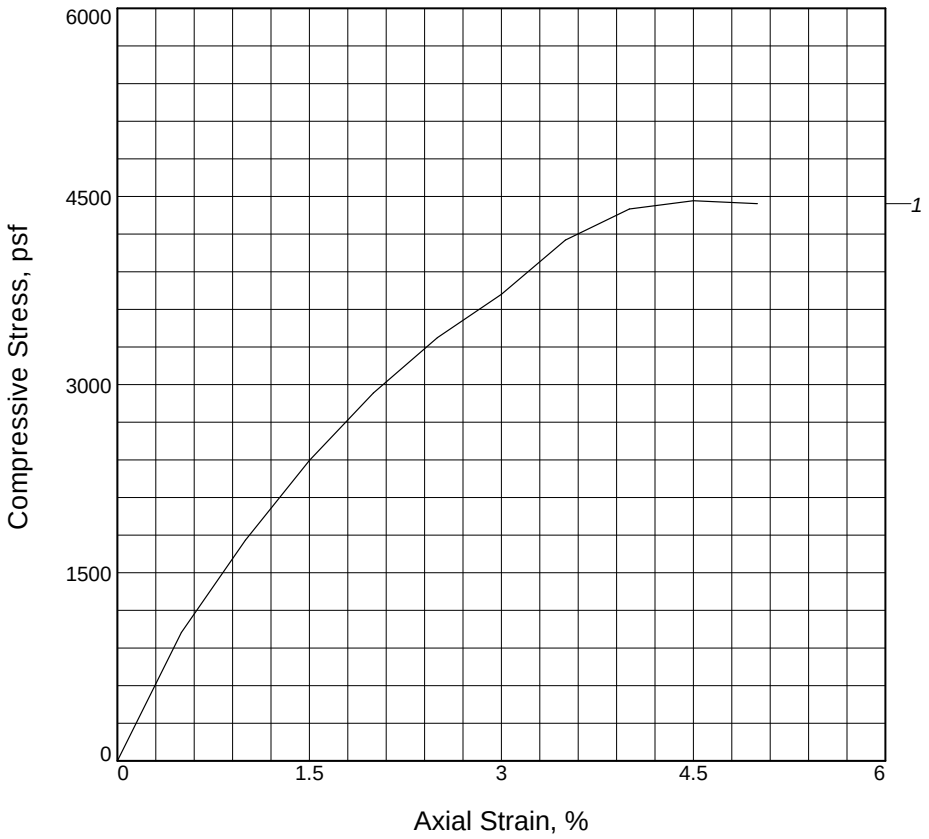
Project: Jefferson City Elementary

Location: B-3
Sample Number: N/A **Depth:** 0.0' - 2.0'

UNCONFINED COMPRESSION TEST
Construction Materials Laboratory
Johnson City, Tennessee

Tested By: SM **Checked By:** SM

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	4467			
Undrained shear strength, psf	2233			
Failure strain, %	4.5			
Strain rate, in./min.	N/A			
Water content, %	24.1			
Wet density, pcf	118.5			
Dry density, pcf	95.5			
Saturation, %	87.1			
Void ratio	0.7315			
Specimen diameter, in.	1.40			
Specimen height, in.	2.80			
Height/diameter ratio	2.00			

Description: Tan Red Silty Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.65	**Type:** Undisturbed

Project No.: 726167
Date Sampled:
Remarks:

Figure _____

Client: Skanska USA

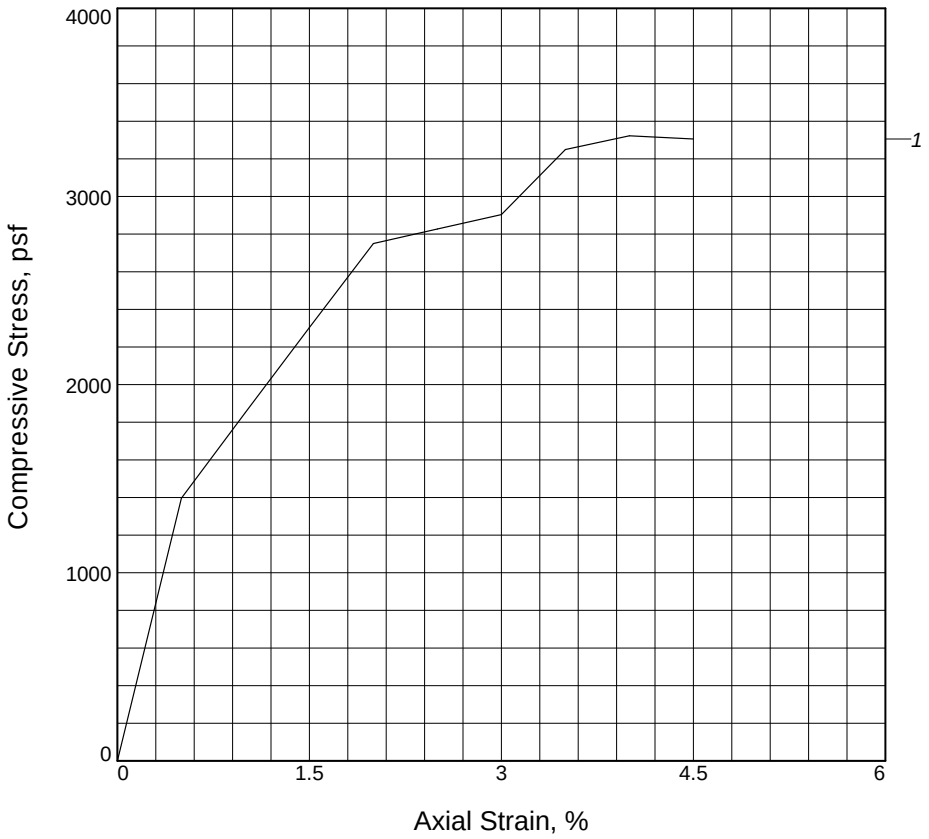
Project: Jefferson City Elementary

Location: B-3
Sample Number: N/A **Depth:** 2.0' - 4.0'

UNCONFINED COMPRESSION TEST
Construction Materials Laboratory
Johnson City, Tennessee

Tested By: SM **Checked By:** SM

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	3323			
Undrained shear strength, psf	1661			
Failure strain, %	4.0			
Strain rate, in./min.	N/A			
Water content, %	20.1			
Wet density, pcf	128.7			
Dry density, pcf	107.1			
Saturation, %	98.0			
Void ratio	0.5443			
Specimen diameter, in.	1.40			
Specimen height, in.	2.80			
Height/diameter ratio	2.00			

Description: Tan Red Silty Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.65	**Type:** Undisturbed

Project No.: 726167
Date Sampled:
Remarks:

Figure _____

Client: Skanska USA

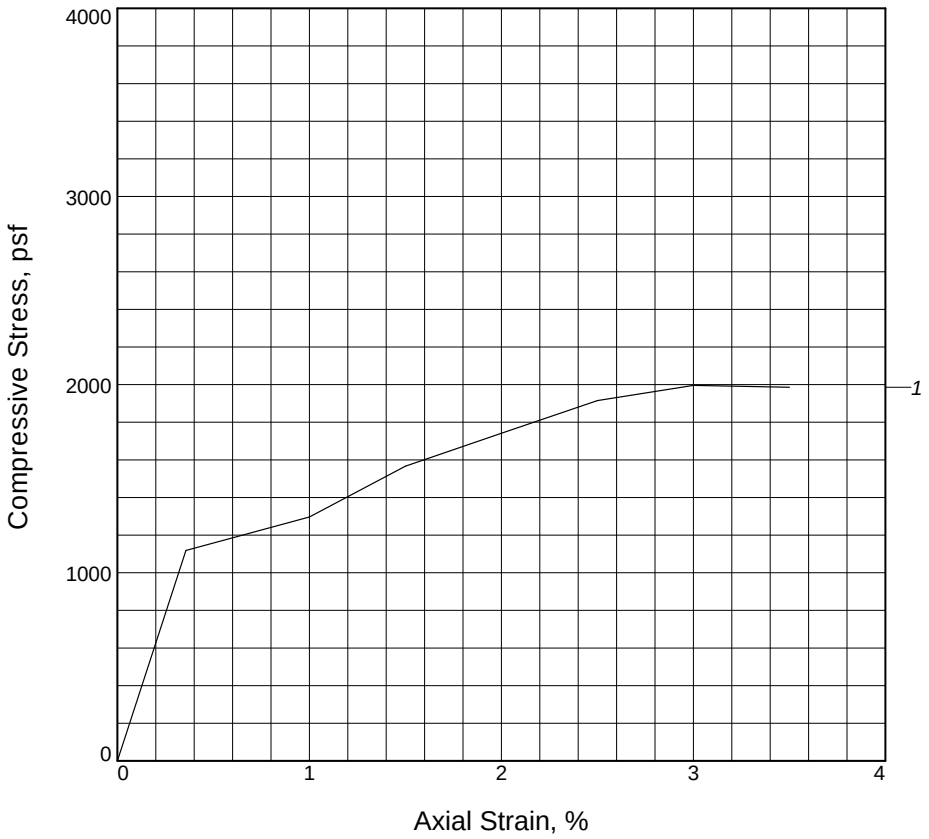
Project: Jefferson City Elementary

Location: B-3
Sample Number: N/A **Depth:** 4.0' - 6.0'

UNCONFINED COMPRESSION TEST
Construction Materials Laboratory
Johnson City, Tennessee

Tested By: SM **Checked By:** SM

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	1996			
Undrained shear strength, psf	998			
Failure strain, %	3.0			
Strain rate, in./min.	N/A			
Water content, %	23.6			
Wet density, pcf	122.2			
Dry density, pcf	98.9			
Saturation, %	92.9			
Void ratio	0.6727			
Specimen diameter, in.	1.40			
Specimen height, in.	2.80			
Height/diameter ratio	2.00			

Description: Tan Red Silty Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.65	**Type:** Undsiturbed

Project No.: 726167
Date Sampled:
Remarks:

Figure _____

Client: Skanska USA

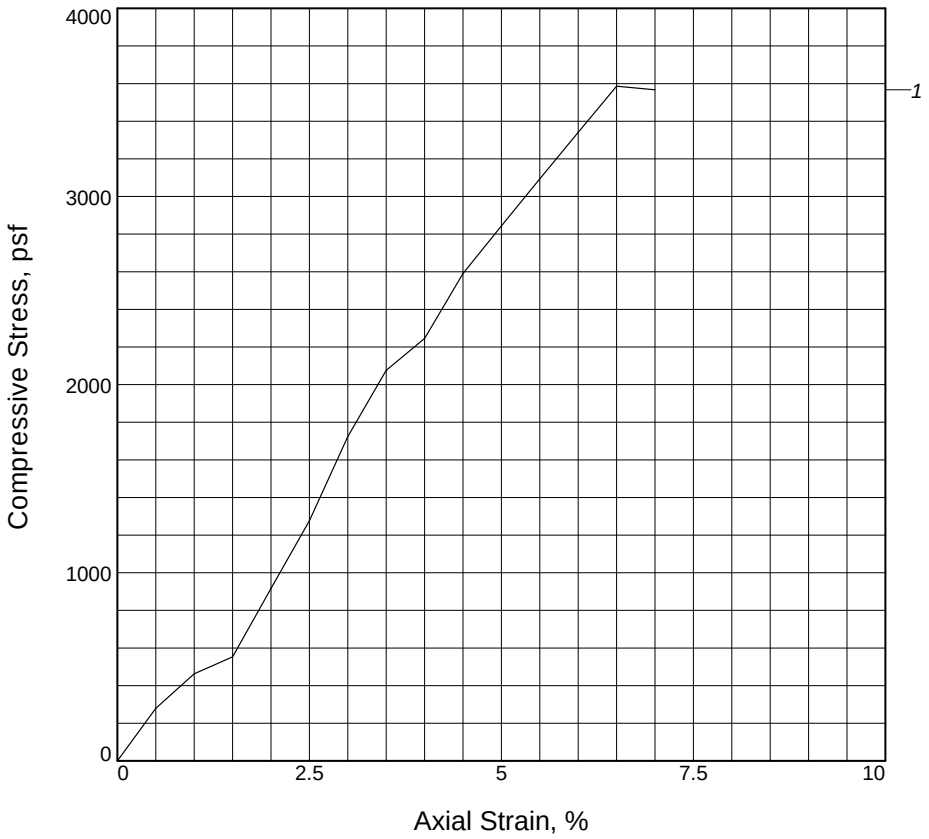
Project: Jefferson City Elementary

Location: B-4
Sample Number: N/A **Depth:** 2.0' - 4.0'

UNCONFINED COMPRESSION TEST
Construction Materials Laboratory
Johnson City, Tennessee

Tested By: SM **Checked By:** SM

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	3586			
Undrained shear strength, psf	1793			
Failure strain, %	6.5			
Strain rate, in./min.	N/A			
Water content, %	14.2			
Wet density, pcf	111.1			
Dry density, pcf	97.2			
Saturation, %	53.8			
Void ratio	0.7012			
Specimen diameter, in.	1.40			
Specimen height, in.	2.80			
Height/diameter ratio	2.00			

Description: Tan Red Silty Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.65	**Type:** Undisturbed

Project No.: 726167
Date Sampled:
Remarks:

Figure _____

Client: Skanska USA

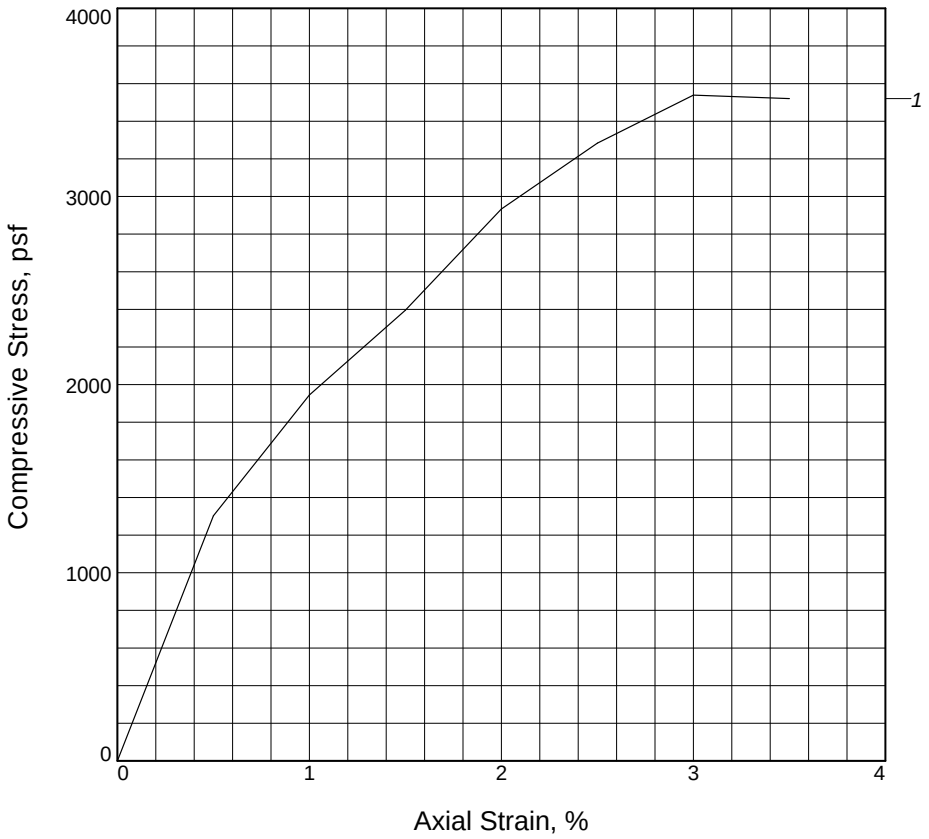
Project: Jefferson City Elementary

Location: B-4
Sample Number: N/A **Depth:** 0.0 ' - 2.0'

UNCONFINED COMPRESSION TEST
Construction Materials Laboratory
Johnson City, Tennessee

Tested By: SM **Checked By:** SM

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	3539			
Undrained shear strength, psf	1769			
Failure strain, %	3.0			
Strain rate, in./min.	N/A			
Water content, %	25.3			
Wet density, pcf	119.6			
Dry density, pcf	95.5			
Saturation, %	91.4			
Void ratio	0.7331			
Specimen diameter, in.	1.40			
Specimen height, in.	2.80			
Height/diameter ratio	2.00			

Description: Tan Red Silty Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.65	**Type:** Undisturbed

Project No.: 726167
Date Sampled:
Remarks:

Figure _____

Client: Skanska USA

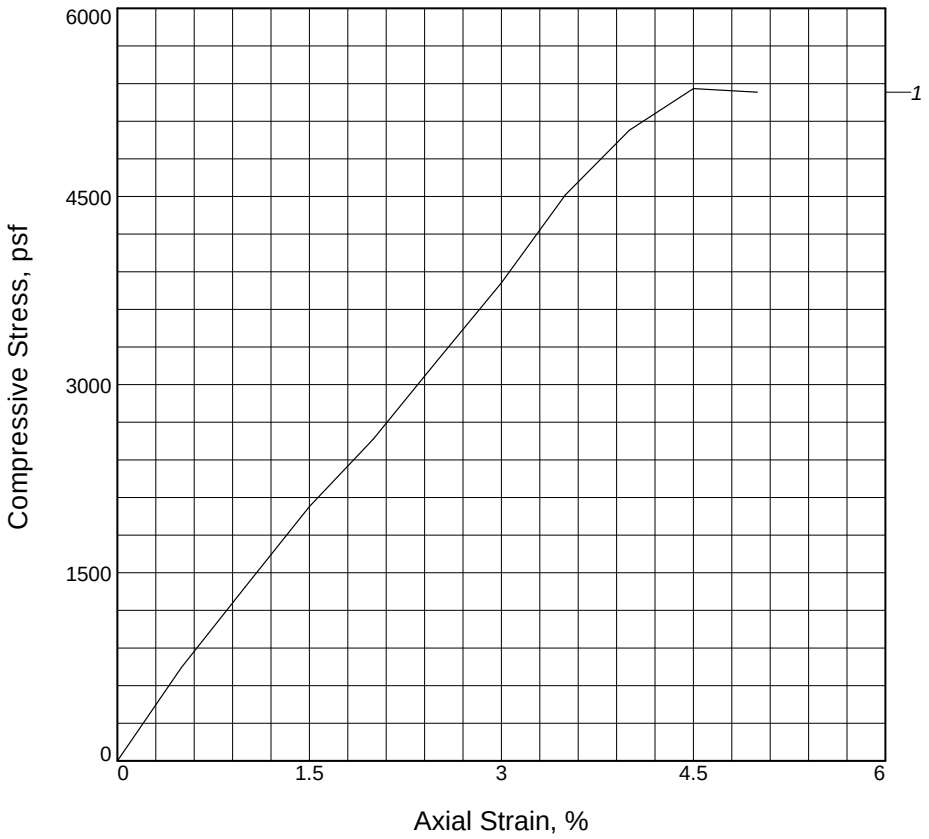
Project: Jefferson City Elementary

Location: B-3
Sample Number: N/A **Depth:** 6.0' - 8.0'

UNCONFINED COMPRESSION TEST
Construction Materials Laboratory
Johnson City, Tennessee

Tested By: SM **Checked By:** SM

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	5360			
Undrained shear strength, psf	2680			
Failure strain, %	4.5			
Strain rate, in./min.	N/A			
Water content, %	24.1			
Wet density, pcf	123.6			
Dry density, pcf	99.6			
Saturation, %	96.8			
Void ratio	0.6607			
Specimen diameter, in.	1.40			
Specimen height, in.	2.80			
Height/diameter ratio	2.00			

Description: Tan Red Silty Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.65	**Type:** Undsiturbed

Project No.: 726167
Date Sampled:
Remarks:

Figure _____

Client: Skanska USA

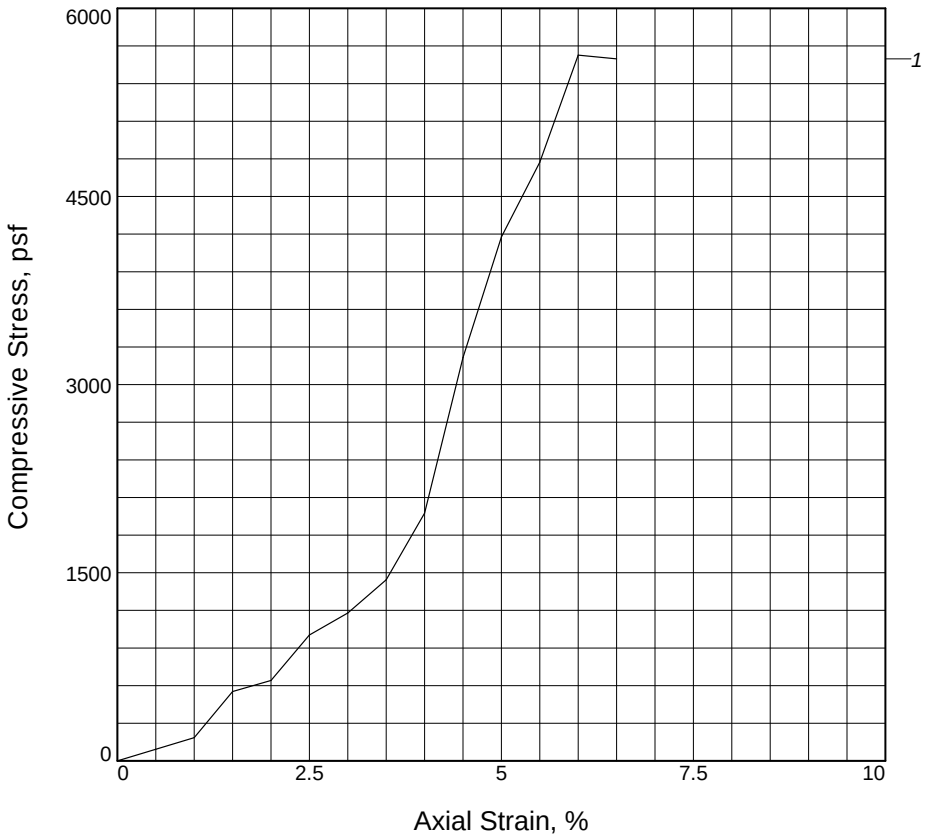
Project: Jefferson City Elementary

Location: B-4
Sample Number: N/A **Depth:** 4.0' - 6.0'

UNCONFINED COMPRESSION TEST
Construction Materials Laboratory
Johnson City, Tennessee

Tested By: SM **Checked By:** SM

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	5628			
Undrained shear strength, psf	2814			
Failure strain, %	6.0			
Strain rate, in./min.	N/A			
Water content, %	26.7			
Wet density, pcf	122.1			
Dry density, pcf	96.4			
Saturation, %	98.7			
Void ratio	0.7154			
Specimen diameter, in.	1.40			
Specimen height, in.	2.80			
Height/diameter ratio	2.00			

Description: Tan Red Silty Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.65	**Type:** Undisturbed

Project No.: 726167
Date Sampled:
Remarks:

Figure _____

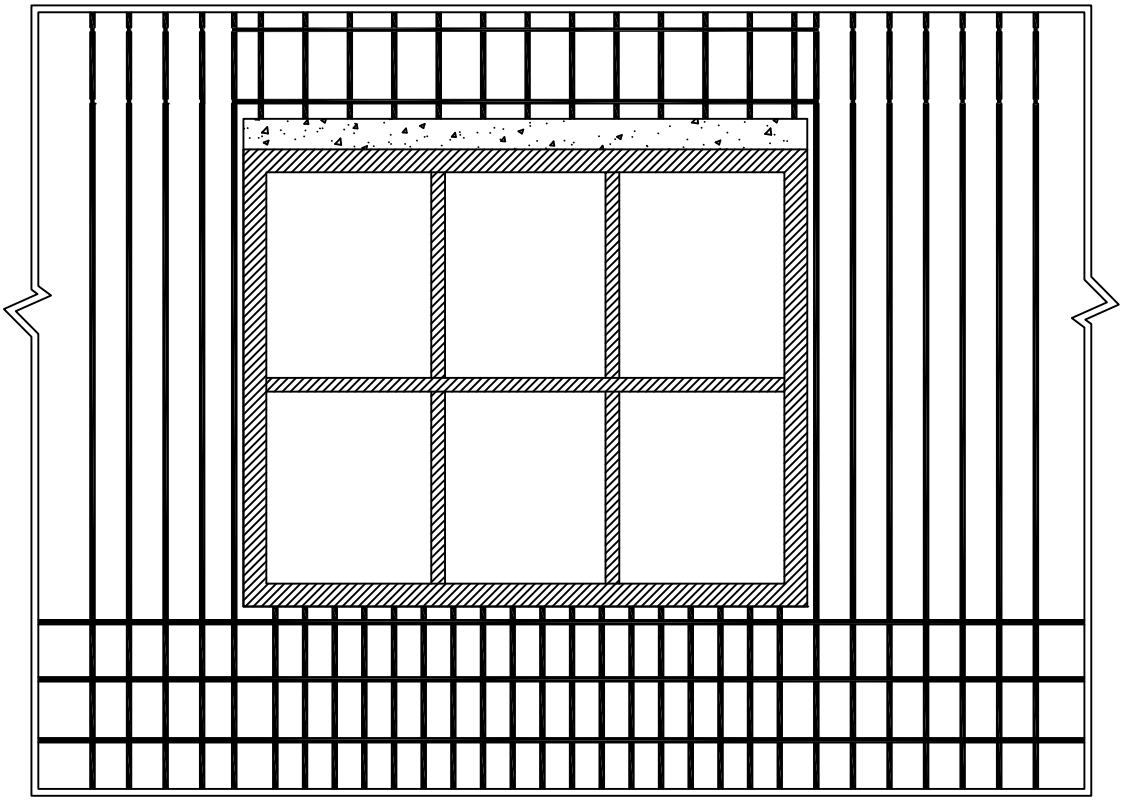
Client: Skanska USA

Project: Jefferson City Elementary

Location: B-4
Sample Number: N/A **Depth:** 6.0' - 8.0'

UNCONFINED COMPRESSION TEST
Construction Materials Laboratory
Johnson City, Tennessee

Tested By: SM **Checked By:** SM



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GPR SKETCH
SUBSURFACE EXPLORATION
JEFFERSON ELEMENTARY SCHOOL

JEFFERSON CITY, TN

FOR: JEFFERSON CITY SCHOOLS

DRAWN BY: AJ	NOTES: NOT TO SCALE	
PROJ #: 726167		
SCALE: NONE	DATE: 4/15/2026	DWG: GPR

GENERAL NOTES

WATER LEVEL MEASUREMENT:

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levelsat other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soil, the accurate determination of groundwater levels may not be suitable with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION:

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength. Qu, psf	Standard Penetration or N-value (55) Blows/Ft.	Consistency
< 500	0 - 1	Very Soft
500-1,000	2 - 4	Soft
1,000 - 2,000	4 - 8	Medium Stiff
2,000 - 4,000	8 - 15	Stiff
4,000 - 8,000	15 - 30	Very Stiff
8,000+	> 30	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	Relative Density
0 - 3	Very Loose
4 - 9	Loose
10 - 29	Medium Dense
30 - 50	Dense
>50	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75mm)
Sand	#4 to #200 sieve (4.75 to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	<5
With	5 -12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

ATTERBERG LIMITS

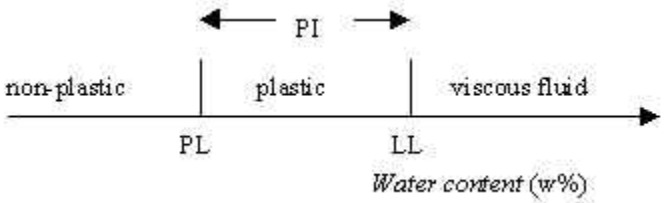
ASTM D4318-17

The objective of the Atterberg limits test is to obtain basic index information about the soil used to estimate strength and settlement characteristics. It is the primary form of classification for cohesive soils.

Fine-grained soil is tested to determine the liquid and plastic limits, which are moisture contents that define boundaries between material consistency states. These standardized tests produce comparable numbers used for soil identification, classification and correlations to strength.

The liquid (LL) and plastic (PL) limits define the water content boundaries between non-plastic, plastic and viscous fluid states. The plasticity index (PI) defines the complete range of plastic state. Figure 1 illustrates it nicely.

Figure 1: Atterberg limits illustration.



Liquid Limit (LL)

The liquid limit defines the boundary between plastic and viscous fluid states. It is determined using a standard "Liquid Limit Device," which drops a shallow cupfull of soil 1 cm consistently. When a groove cut through the sample closes 1/2", the number of drops is recorded and a moisture content sample processed.

Repeating the procedure for a total of four drop-count ranges provides enough data to plot on a semi-log scale. From the plot, the moisture content at 25 drops defines the Liquid Limit.

Plastic Limit (PL)

The plastic limit defines the boundary between non-plastic and plastic states. It is determined simply by rolling a thread of soil and adjusting the moisture content until it breaks at 1/8 inch diameter.

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) — ASTM D2487-17

The Unified Soil Classification System (USCS) is a nationally recognized standard for classifying soils in accordance with their engineering properties. The parameters considered in this system are:

- Particle Size
- Water Holding and Plasticity
- Organic Content

The system identifies three major soil divisions; coarse-grained soils, fine-grained soils, and highly organic soils. These three divisions are further subdivided into a total of 15 basic soil groups. Based on the results of visual observations and prescribed laboratory tests, the soil is cataloged into basic soil groups, which include variations of gravel, sands, silty, clays and highly organic soils.

STANDARD PENETRATION TEST (SPT) — ASTM D1586-18

This test uses a thick-walled sample tube, with an outside diameter of 2 inches, an inside diameter of 1 3/8 inches, and a length of around 32 inches. This tube is driven into the ground at the bottom of a borehole by blows from a slide hammer with a weight of 140 lb falling through a distance of 30 in. The sample tube is driven into the ground and then the number of blows needed for the tube to penetrate each 6 inch increment up to a depth of 18 inches is recorded. The sum of the number of blows required for the second and third 6 inches of penetration is termed the "standard penetration resistance" or the "N-value".

In cases where 50 blows are insufficient to advance it through a 6 inch interval the penetration after 50 blows is recorded. The blow count provides an indication of the soil consistency and can be correlated to the bearing capacity of the soil.

SOIL GRADATION TEST — ASTM D7928-21

The soil gradation test is performed to determine the grain size distribution of a soil type. The soil is passed through a set of sieves and separated into three groups by size. Particles larger than a #4 sieve are classified as gravel, those smaller than a #4 but larger than a #200 sieve are sands and particles less than a #200 sieve are classified as fines. In some cases, a hydrometer test may be performed on the fine particles to further classify them into silts and clays. This information is used to assist in soil classification.

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SECTION 00 41 13 – BID FORM

TO: Jefferson County Finance Department
ATTN: Purchasing Agent
1244 Gay Street
P.O. Box 1749
Dandridge, TN 37725

FROM: _____ (Name of Bidder)
_____ (Address of Bidder)
_____
_____

FOR: Jefferson Elementary School Renovation
321 W. Broadway Blvd.
Jefferson City, TN 37760

The Bidder acknowledges in submitting this bid that:

1. This Bidder has received, read and understands the Bidding Documents and this bid is made in accordance therewith.
2. This Bidder has visited the site and become familiar with the local conditions under which the work is to be performed and has correlated all observations with the requirements of the Bidding Documents.
3. This Bidder has received the following addenda:

   Addendum No. _____ dated _____. Addendum No. _____ dated _____.
   Addendum No. _____ dated _____. Addendum No. _____ dated _____.
   Addendum No. _____ dated _____. Addendum No. _____ dated _____.

4. The required Bid Security, in the amount of five percent (5%) of the total amount bid, is attached hereto.
5. The person who signs this bid on behalf of the Bidder is required to be legally empowered to bind the bidder to a Contract.
6. Failure to complete this Bid Form or to provide required attachments may be cause for rejection of the bid.
7. Bidder understands and agrees that the lump sum bid price includes all taxes such as sales, use, excise, licenses, etc., now or hereafter imposed by federal, state or other government agencies upon the equipment, labor and materials specified, and that all said taxes shall be paid by the Contractor.
8. This Bidder agrees to:

   A. Honor this bid for a period of forty-five (45) days following the date of the scheduled opening of bids.
   B. Enter into and execute a contract, if presented on the basis of this bid, and to furnish the bond(s) and certificates(s) of insurance as required.

C. Accomplish the work in accordance with the Contract Documents.
D. Achieve substantial completion of the project within 540 days from and including the date stipulated in the Notice to Proceed.
E. Accept the conditions for actual damages.

BASE BID

This Bidder agrees to complete the work of the Base Bid for this project for the lump sum of (show amount in both words and figures):

_____ and _____/100ths Dollars

$_____

This bid is submitted by:

Authorized Signature: _____ Date: _____

Type or print
Name and Title: _____

On Behalf of
(Name of Bidder): _____

Bidder's Address: _____

_____

Bidder's Telephone
Number: _____

END OF SECTION 00 41 13

SECTION 00 52 00 – AGREEMENT FORM

PART 1 – GENERAL

1.1 SUMMARY

The Agreement Form shall be American Institute of Architects Document A101 "Standard Form of Agreement Between Owner and Contractor – Stipulated Sum", 2017 Edition. A copy is included for reference purposes.

END OF SECTION 00 52 00

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Document A101® – 2017

Standard Form of Agreement Between Owner and Contractor *where the basis of payment is a Stipulated Sum*

AGREEMENT made as of the Twenty-first day of April in the year Two Thousand Twenty-Six
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

and the Contractor:
(Name, legal status, address and other information)

for the following Project:
(Name, location and detailed description)

Sample

The Architect:
(Name, legal status, address and other information)

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:
The author of this document may have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201®–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 THE WORK OF THIS CONTRACT

3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

4 CONTRACT SUM

5 PAYMENTS

6 DISPUTE RESOLUTION

7 TERMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[ ] The date of this Agreement.

[ ] A date set forth in a notice to proceed issued by the Owner.

[ ] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

[ ] Not later than ( ) calendar days from the date of commencement of the Work.

[ ] By the following date:

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§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

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§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the day of the month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than ( ) days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- **.1** That portion of the Contract Sum properly allocable to completed Work;
- **.2** That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- **.3** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- **.4** For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- **.5** Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:

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(Insert any other conditions for release of retainage upon Substantial Completion.)

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

%

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[ ] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[ ] Litigation in a court of competent jurisdiction

[ ] Other *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the

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Owner's convenience.)

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with a building information modeling exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with a building information modeling exhibit, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

.4 Building information modeling exhibit, dated as indicated below:
(Insert the date of the building information modeling exhibit incorporated into this Agreement.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

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.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[ ] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
(Printed name and title)	*(Printed name and title)*

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AIA® Document A101® – 2017 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the day of in the year
(In words, indicate day, month and year.)

for the following **PROJECT**:
(Name and location or address)

Sample

THE OWNER:
(Name, legal status and address)

THE CONTRACTOR:
(Name, legal status and address)

ADDITIONS AND DELETIONS:
The author of this document may have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Document A201®–2017, General Conditions of the Contract for Construction. Article 11 of A201®–2017 contains additional insurance provisions.

TABLE OF ARTICLES

A.1 GENERAL

A.2 OWNER'S INSURANCE

A.3 CONTRACTOR'S INSURANCE AND BONDS

A.4 SPECIAL TERMS AND CONDITIONS

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

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§ A.2.3 Required Property Insurance

§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:
(Indicate below the cause of loss and any applicable sub-limit.)

Causes of Loss	Sub-Limit

§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:
(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures

If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

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§ A.2.4 Optional Extended Property Insurance.
The Owner shall purchase and maintain the insurance selected and described below.
(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

[ ] **§ A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance**, to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.

[ ] **§ A.2.4.2 Ordinance or Law Insurance**, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

[ ] **§ A.2.4.3 Expediting Cost Insurance**, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

[ ] **§ A.2.4.4 Extra Expense Insurance**, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

[ ] **§ A.2.4.5 Civil Authority Insurance**, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

[ ] **§ A.2.4.6 Ingress/Egress Insurance**, for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

[ ] **§ A.2.4.7 Soft Costs Insurance**, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

§ A.2.5 Other Optional Insurance.
The Owner shall purchase and maintain the insurance selected below.
(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

[ ] **§ A.2.5.1 Cyber Security Insurance** for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information. *(Indicate applicable limits of coverage or other conditions in the fill point below.)*

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[ ] **§ A.2.5.2 Other Insurance**
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage	Limits

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than ($) each occurrence, ($) general aggregate, and ($) aggregate for products-completed operations hazard, providing coverage for claims including

- **.1** damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
- **.2** personal injury and advertising injury;
- **.3** damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
- **.4** bodily injury or property damage arising out of completed operations; and
- **.5** the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

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.1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.

.2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.

.3 Claims for bodily injury other than to employees of the insured.

.4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.

.5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.

.6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.

.7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.

.8 Claims related to roofing, if the Work involves roofing.

.9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.

.10 Claims related to earth subsidence or movement, where the Work involves such hazards.

.11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than ($) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than ($) each accident, ($) each employee, and ($) policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than ($) per claim and ($) in the aggregate.

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§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.
(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

[ ] **§ A.3.3.2.1** Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:
(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

[ ] **§ A.3.3.2.2 Railroad Protective Liability Insurance**, with policy limits of not less than ($) per claim and ($) in the aggregate, for Work within fifty (50) feet of railroad property.

[ ] **§ A.3.3.2.3 Asbestos Abatement Liability Insurance**, with policy limits of not less than ($) per claim and ($) in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

[ ] **§ A.3.3.2.4** Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

[ ] **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

[ ] **§ A.3.3.2.6 Other Insurance**
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits

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§ A.3.4 Performance Bond and Payment Bond

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:
(Specify type and penal sum of bonds.)

Type	Penal Sum ($0.00)
Payment Bond	
Performance Bond	

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

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SECTION 00 72 00 – GENERAL CONDITIONS

PART 1 - GENERAL

"General Conditions of the Contract for Construction", American Institute of Architects Document A201, 2017 Edition, Articles 1 through 14, shall be part of this Document and is incorporated herein as fully as if here set forth.

END OF SECTION 00 72 00

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AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

Sample

THE OWNER:
(Name, legal status and address)

THE ARCHITECT:
(Name, legal status and address)

ADDITIONS AND DELETIONS:
The author of this document may have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™–2017, Guide for Supplementary Conditions.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

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§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon written protocols governing the transmission and use of, and reliance on, Instruments of Service or any other information or documentation in digital form.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to written protocols governing the use of, and reliance on, the information contained in the model shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

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ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

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§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the

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purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

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§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct,

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but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as

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constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The

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Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site
The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching
§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up
§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work
The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights
The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification
§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the

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Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

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§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

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§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- **.1** assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- **.2** assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

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§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

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§ 6.3 Owner's Right to Clean Up
If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General
§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders
§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives
§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

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.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

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§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others

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whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;

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or

.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

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§ 9.7 Failure of Payment
If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion
§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use
§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

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§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- **.1** employees on the Work and other persons who may be affected thereby;

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.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed

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by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve

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the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to

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fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

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§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or

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approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in

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Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- **.1** that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- **.1** cease operations as directed by the Owner in the notice;
- **.2** take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- **.3** except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

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§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

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.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner

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may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially

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similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

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SECTION 00 73 00 - SUPPLEMENTARY CONDITIONS

PART 1 – GENERAL

Relation to General Conditions of the Contract: The following supplements modify the "General Conditions of the Contract for Construction," AIA Document A201, 2007 Edition. Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

ARTICLE 1: GENERAL PROVISIONS

1.2 CORRELATION AND INTENT OF THE DOCUMENTS

Add the following new subparagraph 1.2.1.1 in its entirety:

1.2.1.1 If there is any conflict or discrepancy within or between any of the Contract Documents involving the quality or quantity of Work required, it is the intention of the Contract that the Work of highest quality or greatest quantity shown or specified shall be furnished.

1.4 INTERPRETATION

Add the following new subparagraph 1.4.1 in its entirety:

1.4.1 Whether or not the word “all" is used in the Contract Documents, coverage is intended to be complete, except where partial coverage is specifically and expressly noted. In all cases where an item is referred to in the singular number, it is intended that the reference shall apply to as many such items as are required to complete the work. Words such as “install", “provide", “furnish", and “supply" shall be construed as meaning complete furnishing, installing, and constructing unless modified by additional information.

ARTICLE 2: OWNER

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

Replace subparagraph 2.2.5 with the following:

2.2.5 The Contractor will be furnished free of charge twenty (20) copies of Drawings and Project Manuals. Additional sets will be furnished at the cost of reproduction, postage, and handling.

ARTICLE 3: CONTRACTOR

3.1 GENERAL

Add the following new subparagraph 3.1.4 in its entirety:

3.1.4 No verbal agreement or conversation with any officer, representative, agent, or employee of the Owner or Architect, either before or after the execution of this contract shall affect or modify the terms or obligations herein contained.

3.2 REVIEW OF CONTRACT DOCUMENT AND FIELD CONDITIONS BY CONTRACTOR

A. Add the following new subparagraph 3.2.1.1 in its entirety:

3.2.1.1 The Contractor and its subcontractors and vendors shall examine carefully the various conditions and limitations under which the work is to be performed including, but not limited to, the following:

.1 The location, conditions, character, and arrangement of the site, its environs, and contiguous properties thereto.

.2 The availability and competence of labor required to properly complete the Work.

.3 The weather conditions, climatic range and precipitation generally prevailing in the region and immediate vicinity of the site.

.4 The availability and cost of materials, tools, equipment, and resources necessary to properly complete the Work.

.5 Other similar matters.

Neither Owner nor Architect assumes any responsibility or liability for the above listed matters or others similar thereto, nor for their determination or existence.

B. Add the following new subparagraph 3.2.1.2 in its entirety:

3.2.1.2 Neither Owner nor Architect warrant the accuracy of grades, elevations, dimensions, clearances, or locations indicated on the Drawings issued by the Architect nor for Work installed by separate contractors. The Contractor shall verify the accuracy of all such grades, elevations, dimensions, clearances, and locations to its satisfaction. Dimensions of existing or other Work at the site shall be verified by the Contractor for connection to Work under this contract. Failure of the Contractor to verify grades, elevations, dimensions, clearances, or locations resulting in errors in the Work shall be the sole responsibility of the Contractor and correction of such errors resulting from such failure shall be corrected at no additional cost to the Owner.

C. Add the following new subparagraph 3.2.5 in its entirety:

3.2.5 If the Contractor discovers any errors, inconsistencies or ommissions in the Documents, no work affected thereby shall be started, or if started, shall be stopped immediately until the Contractor and the Architect agree upon clarification of the errors, inconsistencies or ommissions.

3.4 LABOR AND MATERIALS

A. Add the following to the end of subparagraph 3.4.2:

After the Contract has been executed, the Owner and the Architect will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in the General Requirements (Division 1 of the Specifications).

B. Add the following new subparagraphs 3.4.2.1 in its entirety:

3.4.2.1 By making requests for substitutions based on Subparagraph 3.4.2, above, the Contractor:

.1 represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;

.2 represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;

.3 certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and

.4 will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

C. Add the following new subparagraphs 3.4.4 in its entirety:

3.4.4 The standards of the work required throughout shall be of such grade as will bring results in compliance with the specifications and recognized construction industry standards. All materials permanently installed in the project shall be new unless otherwise specified or approved by the Architect. New materials shall have been recently manufactured and shall not be obsolete or untested.

3.7 PERMITS, FEES AND NOTICES

Add the following new Subparagraphs 3.7.5 and 3.7.6 their entirety:

3.7.6 The Contractor shall pay for all highway fees and for all damages to sidewalks, streets, or other public or private property, or to any public utilities.

3.7.7 The Contractor shall secure all certificates of inspection and of occupancy which may be required by authorities having jurisdiction over the work, including the Board of Fire Underwriters' certificates and the State Fire Marshal's inspection for occupancy. These shall be delivered to the Architect upon completion of the work.

3.8 ALLOWANCE

Delete the semicolon at the end of sup-paragraph 3.8.2.2 and add the following:

, except that if installation is included as part of an allowance in Division 1-16 of the Specifications, the installation cost, labor, overhead and profit, for greater or lesser quantities of Work shall be determined in accordance with Sub-Paragraph 7.3.6;

3.14CUTTING AND PATCHING OF WORK

Add the following new Subparagraphs 3.14.3 and 3.14.4 in their entirety:

3.14.3 Perform all cutting of work in place in a neat workmanlike manner and patch and restore to good condition and appearance. Do not cut any structural members under any circumstances, except where expressly and particularly authorized by the Architect.

3.14.4 Cutting of work necessary for installation of mechanical and electrical work is specified in Division 15 and 16, but patching of finished work required because of such cutting shall be performed by trades having experience in that type of work..

3.16 ACCESS TO WORK

Add the following new subparagraph 3.16.1 in its entirety:

3.16.1 The Contractor shall provide the Testing Agency retained by the Owner access to the Work in preparation and progress wherever located.

ARTICLE 4: ARCHITECT

4.2 ADMINISTRATION OF THE CONTRACT

Add the following new subparagraph 4.2.15 in its entirety:

4.2.15 The Architect shall not have the authority or the responsibility to supervise or direct the construction operations.

ARTICLE 5: SUBCONTRACTORS

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

Delete Subparagraph 5.2.3 in its entirety.

5.3 SUBCONTRACTURAL RELATIONS

Add the following new subparagraphs 5.3.1 and 5.3.2 in their entirety:

5.3.1 The contractor shall be directly responsible for all of the Work included in the Contract, whether performed by his own forces or by his subcontractors. Except in extreme emergencies, all instructions, clarifications, and approvals will be given by the Architect to subcontractors only through the Contractor and all shop drawings, samples and correspondence from the subcontractors shall be submitted to the Architect through the Contractor.

5.3.2 Insofar as it does not affect the quality of workmanship or materials, the Contractor shall settle all questions of responsibility arising among his various subcontractors and shall determine the extent of Work and responsibility of each of the subcontractors.

ARTICLE 6: CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

No modifications required.

ARTICLE 7: CHANGES IN THE WORK

7.2 CHANGE ORDERS

Add the following new subparagraph 7.2.2 and 7.2.3 in their entirety:

7.2.2 Change Order Proposals, except those so minor that their propriety can be seen by inspection, shall include, but not be limited to, a complete itemization of costs including labor, materials, and subcontracts on a form similar to Schedule of Values. Where major cost items involve Subcontracts, they shall also be itemized. In no case will a change involving over $500.00 be approved without such itemization.

7.2.3 For extra work performed other than work involving separate contracts, the combined allowance for overhead and profit included in total cost to the Owner shall be based on the following schedule:

.1 To Contractor for Work, which will be performed with its own forces: 10% for overhead and 5% for profit on the net additional cost including bond costs.

.2 To Subcontractor for Work, which it performs with its own forces: 10% for overhead and 5% for profit on the net additional cost including bond costs.

.3 To Contractor for Work performed by other than its own forces: 5% for profit.

.4 If a change results in a credit to the Owner from the Contractor or the Subcontractor, the credit shall be net cost without crediting the overhead and profit.

7.3 CONSTRUCTION CHANGE DIRECTIVES

A. In subparagraph 7.3.3.3, delete the words "a mutually acceptable fixed or percentage fee" and insert in their place the words "overhead and profit as stipulated in subparagraph 7.2.4".

B. Add the following new subparagraph 7.3.11 in its entirety:

7.3.11 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials, and Subcontracts.

ARTICLE 8: TIME

8.3 DELAYS AND EXTENSIONS OF TIME

A. In Subparagraph 8.3.2, add the following words to the end of the sentence:

except that neither the Owner nor the Architect shall be obligated or liable to the Contractor for, and the Contractor hereby expressly waives any claims against the Owner and the Architect on account of any damages, costs, or expenses of any nature which the Contractor, its subcontractors, or sub-subcontractors or nay other person may incur as a result of any delays, interferences, suspensions, changes in sequence or the like arising from or out of any act or omission of the Owner or the Architect, it being understood and agreed that the Contractor's sole and exclusive remedy in such event shall be an extension of the Contract Time, but only in accordance with the provisions of the Contract Documents.".

B. Delete Paragraph 8.3.3 in its entirety and substitute the following:

8.3.3 Notwithstanding anything to the contrary in the Contract Documents, an extension in the Contract Time, to the extent permitted under Paragraph 8.3.1, shall be the sole remedy of the Contractor for any (1) delay in the commencement, prosecution or completion of the Work, (2) hindrance or obstruction in the performance of the Work, (3) loss of productivity, or (4) other similar claims (collectively referred to in this Paragraph 8.3.3 as Delays) whether or not such Delays are foreseeable, unless a Delay is caused by acts of the Owner constituting active interference with the Contractor's performance of the Work, and only to the extent such acts continue after the Contractor furnishes the Owner with notice of such interference. In no event shall the Contractor be entitled to any compensation or recovery of any damages, in connection with any Delay, including, without limitation, consequential damages, lost opportunity casts, impact damages or similar remuneration. The Owner's exercise of any rights or remedies under the Contract Documents (including, without Work), regardless of the extent or frequency of the Owner's exercise of such rights or remedies, shall not be construed as active interference with the Contractor's performance of the Work.

ARTICLE 9: PAYMENTS AND COMPLETION

9.2 SCHEDULE OF VALUES

Add the following at the end of subparagraph 9.2:

The Schedule of Values shall be divided into not less than one part for each section of the Specifications.

9.3 APPLICATIONS FOR PAYMENT

A. Add the following new clause 9.3.1.3:

9.3.1.3 Progress payments may be requested monthly and shall be for 90% of the approved amount properly allocable to materials and equipment incorporated in the work and materials covered with applicable insurance and suitably stored in approved location on the date of the request. After 50% of the work has been completed, the Architect may at any time recommend that any of the remaining partial payments be paid in full.

B. Add the following at the end of subparagraph 9.3.2:

The Owner and the Architect reserve the right to request additional information including, but not limited to, invoices for material stored. Furnish a separate Certificate of Insurance covering full value of any material stored off site and subsequent transportation to the job site. Owner shall be named insured on the Certificate of Insurance.

9.6 PROGRESS PAYMENTS

Add the following at the end of subparagraph 9.6.2:

Failure by the Contractor to pay such payments shall, when brought to the attention of Owner or Architect, result in sufficient funds being withheld from current or future Applications. Such failure of the Contractor when properly substantiated shall be brought to the attention of the Surety.

9.10 FINAL COMPLETION AND FINAL PAYMENT

A. In subparagraph 9.10.2 , change "and (5)" to read "and (6)", and add a new clause (5) as follows:

", (5) all Certificates of Occupancy required by the Contract Documents and Authorities having jurisdiction,"

B. In subparagraph 9.10.2 (6), delete the words "if required by the Owner".

ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

Add the following new subparagraph 10.1.1 in its entirety:

10.1.1 Neither Owner nor Architect assumes any responsibility or liability for safety of the Site, Work, Workplace, Property, or Persons, these being the sole responsibility of the Contractor.

10.2 SAFETY OF PERSONS AND PROPERTY

A. Add the following to the end of clause 10.2.1.3:

The Contractor shall be solely responsible, at its own exposure, for all necessary measures to protect adjacent properties from damage.

B. Add the following new subparagraph 10.2.4.1 in its entirety:

10.2.4.1 When use or storage of explosives, or other hazardous materials, substances or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall give the Owner reasonable advance notice.

ARTICLE 11: INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

Add the following new clauses 11.1.2.1, 11.1.2.2, and 11.1.2.3 in their entirety:

11.1.2.1 Insurance to be purchased and maintained by the Contractor shall be in a company or companies to which the Owner has no reasonable objection.

11.1.2.2 Worker's Compensation and Employer's Liability Insurance shall be obtained and maintained during the term of the Contract and all work performed thereunder, covering each and every worker employed in connections with the Work under the Contract, as provided for in each and every statute applicable to Worker's Compensation.

11.1.2.3 The Contractor's Comprehensive General Liability Insurance shall be obtained and maintained during the term of the Contract, including broad form Contractual Liability coverage, with the following limits of liability:

.1 Bodily Injury and Personal Injury Liability

$1,000,000 - each person

$3,000,000 - each occurrence aggregate limit

$1,000,000 - aggregate products (see .3 below)

.2 Property Damage Liability

$1,000,000 - each occurrence

$1,000,000 - aggregate operations

$1,000,000 - aggregate contractual

$1,000,000 - aggregate products (see .3 below)

.3 Products / Completed Operations Liability Insurance shall be provided for a period of not less than one (1) year after Completion of the Work. Such insurance shall include XCU coverage with respect to Explosion, Collapse, and Underground Damage.

.4 Comprehensive Automobile Liability Insurance shall be obtained with not less than the following limits of liability:

.1 Bodily Injury Liability:

$1,000,000 - each person

$3,000,000 - each accident

.2 Property Damage Liability:

$500,000 - each accident

.3 This insurance shall apply to all owned, non-owned, or hired automobiles to be used by the Contractor in the furtherance of the Work.

.5 The Contractor shall either (1) require each of his Subcontractors to procure and to maintain during the life of his subcontract Subcontractor's Comprehensive General Liability, Automobile Liability, and Property Damage Liability Insurance of the type and in the same amounts as specified in this subparagraph, or (2) insure the activity of his Subcontractors in his own policy. The Contractor's and Subcontractors' liability insurance shall include adequate protection against any of the special hazards which may be encountered in the performance of this Contract, including those enumerated below:

Premises and Operation
Explosion and Hazards
Underground Hazards
Products and Completed Operations
Contractual Liability
Broad Form Property Coverage
Personal Injury Endorsements
Workmen's Compensation

Automobile Liability

.6 The Contractor shall furnish certificate(s) of the insurance, which shall contain thirty (30) days prior written notice to the Owner of cancellation of or material change in the insurance.

.7 All policies insuring the Contractor and Subcontractors pursuant to paragraphs 11.1.2, and all subparagraphs, shall be endorsed to include, as additional insureds, both the Owner and Architect.

11.3 PROPERTY INSURANCE

A. Modify the first sentence of Subparagraph 11.3.1 as follows:

a) Delete "Unless otherwise provided, the Owner" and substitute "the Contractor".

b) After the word “companies”, insert the words: “satisfactory to the Owner and”.

c) Add the following sentences:

The form of policy for this coverage shall be Completed Value. If the Owner is damaged by the failure of the Contractor to maintain such insurance, then the Contractor shall bear all reasonable costs properly attributable thereto.

B. Delete Clause 11.3.1.2, in its entirety.

C. Delete Clause 11.3.1.3, in its entirety.

D. In the first sentence of Subparagraph 11.3.2, delete the word “Owner” and insert in its place the word “Contractor” and, after the word “insurance”, delete the words “required by the Contract Documents or by Law”.

F. Delete Subparagraph 11.3.4.

G. Delete Subparagraph 11.3.6 and substitute the following:

11.3.6 Before an exposure to loss may occur, the Contractor shall file with the Owner two certified copies of the policy or policies providing this Property Insurance coverage, each containing those endorsements specifically related to the Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Contractor.

H. Modify Subparagraph 11.3.7 by substituting "Contractor" for "Owner" at the end of the first sentence.

I. Modify Subparagraph 11.3.8 by Substituting "Contractor" for "Owner" as fiduciary; except that at the first reference to "Owner" in the first sentence, the word "this" should be substituted for "Owner's."

J. Modify Subparagraph 11.3.9 by substituting "Contractor" for "Owner" each time the latter word appears.

K. Modify Subparagraph 11.3.10 by substituting "Contractor" for "Owner" each time the latter word appears.

11.4 PERFORMANCE BOND AND PAYMENT BOND

A. Delete Subparagraph 11.4.1 and substitute the following:

11.4.1 The Contractor shall furnish and pay the cost for a Performance Bond and a Labor and Material Payment Bond in the amount of the Contract as security for the faithful performance of the Contract and payment of all obligations arising thereunder. Bonds shall be on a form approved by the Owner. Bonds shall be written by a Surety Company licensed to do business in the State of Tennessee and approved by the Owner.

B. Add the following new clauses 11.4.2 and 11.4.3:

11.4.2 The Contractor shall deliver the required bonds to the Owner not later than three days following the date the Agreement is entered into, or if the Work is to be commenced prior thereto in response to a letter of intent, the Contractor shall, prior to the commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished.

11.4.3 The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

ARTICLE 12: UNCOVERING AND CORRECTION OF WORK

12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

Add the following new subparagraphs 12.2.1.1 and 12.2.1.2:

12.2.1.1 If all or a portion of the mechanical or electrical system is used beneficially by any party other than the installing Contractor, with the prior written authorization of the Owner, the guarantee and warranty period shall commence on the date when such system or portion thereof is placed in operation. The beneficial user, if other than the Owner, shall restore such system or portion thereof to a first class operating condition without cost to the Owner and before acceptance by the Owner.

12.2.1.2 Guarantee and warranty requirements shall extend to correction, without cost to the Owner, of all work found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage resulting from such defects or nonconformance with contract documents exclusive of repairs required as a result of improper maintenance or operation, or of normal wear.

ARTICLE 13: MISCELLANEOUS PROVISIONS

No modifications required.

ARTICLE 14: TERMINATION OR SUSPENSION OF THE CONTRACT

No modifications required.

ARTICLE 15: CLAIMS AND DISPUTES

15.1.5 CLAIMS FOR ADDITIONAL TIME

A. In subparagraph 15.1.5.1, delete the words “cost and of” from the second sentence.

B. In subparagraph 15.1.5.2, after the word “by”, delete the word “data” and insert the words “Local Climatological Data, Monthly Summary, recorded by the Weather Service Office nearest to the site as compiled and published by the National Climatic Data Center, Asheville, North Carolina...”

C. Add the following new subparagraphs 15.1.5.3 and 15.1.5.4 in their entirety:

15.1.5.3 Claims for increase in the Contract Time shall set forth in detail the circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days’ increase in the Contract Time claimed as a consequence of each such cause of delay. The Contractor shall provide such supporting documentation as the Architect or the Owner may require including, where appropriate, a revised construction schedule indicating all the activities affected by the circumstances forming the basis of the Claim.

15.1.5.4 The Contractor shall not be entitled to a separate increase in the Contract Time for each one of the number of causes of delay which may have concurrent or interrelated effects on the progress of Work, or for concurrent delays due to the fault of the Contractor.

15.3 MEDIATION

A. Delete all references to arbitration.

15.4 ARBITRATION

A. Delete Paragraph 15.4 in its entirety.

B. Delete all references to arbritation.

END OF SECTION 00 73 00

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SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Work under other contracts.
3. Use of premises.
4. Owner's occupancy requirements.
5. Specification formats and conventions.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: **JEFFERSON ELEMENTARY SCHOOL (JES) RENOVATION**

B. Project Location: **321 W Broadway Blvd.**
Jefferson City, TN 37760

C. Owner: **Jefferson County Government Board of Education**
P.O. Box 1739
1244 Gay Street
Dandridge, TN 37725

D. Architect: **Blankenship & Partners, LLC**
1112 E. Weisgarber Rd, 2nd Floor, Knoxville, Tennessee 37909
Phone: 865-251-2585

E. The Work consists of the following:

1. Provide labor materials, equipment, and services, and perform work necessary for the construction of the Project located in Andersonville, Tennessee. Project consists of a one-story training facility for EMS personnel.

2. Construct the new building, site improvements, parking lot, entrance lobby, two large classrooms, offices, restrooms, and other interior spaces as finished space, complete and ready for occupancy, including electrical work, built-in equipment, and necessary incidental work.

3. The work includes, but is not necessarily limited to, electrical work, concrete paving, turf and grasses, waterproofing, structural steel, masonry, aluminum storefront, aluminum entrances, flashing and trim, interior metal stud gypsum board partitions, electrical, lighting, telecommunications, interior finishes, and all necessary incidental work.

E. General Building Construction. Project will be constructed under a single prime contract.

1.3 WORK UNDER OTHER CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

1.4 USE OF PREMISES

A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Construction Limit Lines.

B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to Contractor Staging Area indicated on Drawings and to that portion of the Contract Limits allotted for the current Phase as indicated on Drawings.

a. Normal working hours shall not be restricted.

2. Owner Occupancy: Allow for Owner occupancy of Project site and use by the public, except for that portion of the Contract Limits allotted for the current Phase as indicated on Drawings.

1.5 OWNER'S OCCUPANCY REQUIREMETS

A. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the work Work to be occupied before Owner occupancy.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
3. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

1.6 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 33 division format and CSI/CSC's "Master Format" numbering system.

1. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated,

shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

    a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

5. PRODUCTS (Not Used)

6. EXECUTION (Not Used)

END OF SECTION 01 10 00

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SECTION 01 21 00 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements governing the following:

1. Lump-sum allowances.
2. Testing and inspecting allowances.

B. See Division 01 Section "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.

1.2 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. Purchase products and systems selected by Architect from the designated supplier.

1.3 LUMP-SUM ALLOWANCES

A. DEFINTIION

A lump sum allowance is a monetary amount established herein for inclusion in the Contract sum to cover defined costs of a prescribed item not specified in detail, with provision, as detailed in General Conditions, that variation between such amount and the finally determined cost of the prescribed item will be reflected in a Modification appropriately adjusting the Contract Sum. Reference the General Conditions for the definition of covered costs.

B. DELIVERY SCHEDULE

The contractor shall designate in the construction progress schedule the delivery of products specified under each lump sum allowance.

C. CONTRACTOR'S DUTIES IN SELECTION OF LUMP SUM ALLOWANCE PRODUCTS

1. Assist the Designer and Owner in determining qualified suppliers or installers.

2. Obtain bids from suppliers or installers when requested by the Designer.

3. Make appropriate recommendations for consideration of the Designer.

4. Notify the Designer promptly of:

a. Reasonable objections to a supplier or party under consideration for work under the allowance.
b. Effect on the Construction Schedule anticipated by selections under consideration.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALLOWANCES

Item No.	Allowance included in the base bid.	Unit ($)	Name/Work Included
1.	No allowances are entered here.		
2.			
3.			
4.			

END OF SECTION 01 21 00

SECTION 01 22 00 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

B. Related Sections include the following:

1. Division 01 Section "Allowances" for procedures for using unit prices to adjust quantity allowances.
2. Division 01 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
3. Division 01 Section "Quality Requirements" for general testing and inspecting requirements.
4. Division 01 Section Payment Procedures for procedures for measurement and payment for Unit Prices.

1.3 DEFINITIONS

A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

A. Include work in the Base Bid and Alternates as specified for the Quantity Allowance of Unit Price Items and propose, subject to Owner acceptance, the following Unit Prices for inclusion in the Owner and Contractor Agreement as specified in Section 01 22 00 Unit Prices.

B. Unit Price Definitions Table: to be completed by Contractor and also included on Bid Form.

Item No.	Price ($)	Quantity Allowance	In	Unit	Name/Work Included
1	/CY	300	B	Cubic Yard	Unsuitable Soil Beyond the Design Depth Under-cut and Off-Site Disposal.
2	/CY	300	B	Cubic Yard	Engineered Fill, Procured, Placed and Compacted
3	/CY	50	B	Cubic Yard	Trench Rock, Excavation and Off-Site Disposal
4	/CY	0	B	Cubic Yard	Mass Rock, Excavation and Off-Site Disposal
5	/SY	0	B	Square Yard	Geogrid, Procured and Installed.
6	/SY	0	B	Square Yard	Geotextile, Procured and Installed.
7	/CY	50	B	Cubic Yards	Crushed Stone, Procured, Placed and Compacted.
8	/CY	50	B	Cubic Yard	Flowable Concrete Fill, Procured and Placed.

B = Material Quantity Allowances are included in the Base Bid.

END OF SECTION 01 22 00

SECTION 01 23 00 - ALTERNATES

1. Section includes identification of each Alternate by number and describes the basic changes to be incorporated into the Work if a particular alternate is made a part of the work by specific provisions in the Agreement between the Owner and the Contractor.

2. Related Sections are referenced in the definition of each Alternate.

3. Coordination of related work and modifications to surrounding work as required to properly integrate each Alternate, and to provide the complete construction required by the Contract Documents, is the responsibility of the Contractor.

4. Description of Alternate:

   A. No Alternates are listed here.

END OF SECTION 01 23 00

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SECTION 01 25 00 – NOTICE TO PROCEED

FORM 01 25 00

NOTICE TO PROCEED

DATE:

<<Date>>

TO:

<<General Contractor Name>>

<<Address Line 1>>

<<Address Line 2>>

PROJECT:

<<Project Title from Anderson County>>

NOTICE TO PROCEED:

You are hereby given Notice to Proceed with the referenced contract effective <<Date>>.

The contract completion date is therefore established as <<Date>>.

DESIGNER'S AUTHORIZING SIGNATURE:

_____

<<Name and Title>>

cc. <<Name and Title>>

END OF FORM

END OF SECTION 01 25 00

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SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections include Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 SUBMITTALS

A. "Proposal for Change" Form:
1. Identification: Include the following Project identification on the "Proposal for Change":
   a. Project name and location.
   b. Name of Owner.
   c. Contract Date.
   d. Name of Architect.
   e. Architect's project number.
   f. Contractor's name and address.
   g. Date of submittal.
2. Number of Copies: Submit 3 (three) copies of each "Proposal for Change". Architect will return one copy with "Change Order" or "Construction Change Directive".
3. Provide sequential numbers for each "Proposal for Change" and provide reference to architect's proposal request number, if applicable.

1.4 MINOR CHANGES IN THE WORK

Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.5 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. "Proposal Request" issued by the Architect is for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.

2. Within 14 (fourteen) days after receipt of "Proposal Request", submit a "Proposal for Change" including estimated cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

   a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

   b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

   c. Include costs of labor and supervision directly attributable to the change.

   d. Include an updated "Contractor's Construction Schedule" that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a "Proposal for Change" to the Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

4. Include costs of labor and supervision directly attributable to the change.

5. Include an updated "Contractor's Construction Schedule" that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

6. Comply with requirements in Division 01 Section "Material and Equipment" if the proposed change requires substitution of one product or system for product or system specified.

C. Architect's Action:

1. If necessary, Architect will request additional information or documentation for evaluation within 7 (seven) days of receipt of a "Proposal Request".

2. Architect will notify Contractor of acceptance or rejection of "Proposal Request" within 21 (twenty-one) days of receipt of request, or 14 (fourteen) days of receipt of additional information or documentation, whichever is later.

1.6 CHANGE ORDER PROCEDURES

On Owner's approval of a "Proposal for Change", Architect will issue a "Change Order" for signatures of Owner and Contractor on AIA Document G701.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive:

1. Architect may issue a "Construction Change Directive" on AIA Document G714. "Construction Change Directive" instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a "Change Order".

2. "Construction Change Directive" contains a complete description of change in the Work. It also designates method to be followed to determine change in the contract sum or the contract time.

B. Documentation:

1. Maintain detailed records on a time and material basis of work required by the "Construction Change Directive".

2. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 01 26 00

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SECTION 01 26 20 – WEATHER DELAYS

PART 1 – GENERAL

1.1 EXTENSION OF CONTRACT TIME

If a Claim is made for an extension of time based upon weather delays in accordance with the General Conditions, an extension may be granted only for the number of Weather Delay Days in excess of the number of days listed for the applicable month on the Standard Baseline.

1.2 STANDARD BASELINE FOR ADVERSE WEATHER

A. The Standard baseline is defined as the number of calendar days for each month during which construction activity exposed to weather conditions is expected to be prevented and suspended by cause of Adverse Weather. Suspension of construction activity for the number of days each month as listed in the Standard Baseline is included in the Work and is not eligible for extension of Contract Time.

B. The Agencies (UT, TBR and STREAM) have established a Standard Baseline for the State of Tennessee as follows:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12	11	8	7	7	6	7	5	4	5	6	11

1.3 ADVERSE WEATHER AND WEATHER DELAY DAYS

A. Adverse Weather is defined as the occurrence of one or more of the following conditions within a twenty-four (24) hour day that prevents construction activity exposed to weather conditions or access to the site:

1. Precipitation (rain, snow, or ice) in excess of one-tenth (0.10") liquid measure.
2. Temperatures that do not rise above that required for the day's construction activity, if such temperature requirement is specified or accepted as standard industry practice.
3. Sustained wind in excess of twenty-five (25) miles per hour.
4. Dry Out (or Mud) Days under the following conditions.
   a. more precipitation days occur than listed in the Standard Baseline.
   b. there is a hindrance to site access or sitework and Contractor has taken all reasonable accommodations to avoid such hindrance; and,
   c. no more than one (1) Dry Out Day is allocated for each additional day of precipitation more than the Standard Baseline that total 1.0 inch or more, liquid measure, unless specifically recommended by the Designer.

B. A Weather Delay Day may be counted if Adverse Weather prevents work on the project for fifty percent (50%) or more of the contractor's scheduled work day and critical path construction activities were included in the day's schedule, including a weekend day or holiday if Contractor has scheduled construction activities that day.

1.4 DOCUMENTATION AND SUBMITTALS

A. An extension of the Contract Time for Adverse Weather must be requested in writing to the Designer within 45 calendar days of applicable Adverse Weather occurrence along with all required support information. Such requests made after the 45 calendar day limitation will not be considered.

B. Submit daily jobsite work logs showing which and to what extent critical path construction activities have been affected by weather on a monthly basis.

C. Submit actual weather data to support claim for time extension obtained from nearest NOAA weather station or other independently verified source approved by Designer at beginning of project.

D. Organize Claim documentation to facilitate evaluation on a basis of calendar month periods and the Standard Baseline.

E. Submit in accordance with the requirements of the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 20

SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections include the following:

1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of “Contractor's Construction Schedule” and “Submittals Schedule”.
3. Division 01 Section "Closeout Procedures" for requirements to obtain “Certificate of Substantial Completion”.

1.3 DEFINITIONS

“Schedule of Values”: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing “Contractor's Applications for Payment”.

1.4 SUBMITTALS

A. “Schedule of Values”

1. Submit the “Schedule of Values” to Architect at earliest possible date but no later than 7 (seven) days before the date scheduled for submittal of initial “Application for Payment”.
2. Submit a current copy of the “Schedule of Values” with each “Application for Payment”.

B. “Application for Payment”

1. Submit 3 (three) signed and notarized original copies of each “Application for Payment” to Architect by a method ensuring receipt within 24 (twenty four) hours. One copy shall include waivers of lien and similar attachments if required.
2. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

C. Waiver of Liens and Claims: Submit with each “Application for Payment”.

D. Permits, Licenses, and Certificates: Submit with “Initial Application for Payment”.

E. Insurance Certificates and Bonds: Submit with “Initial Applications for Payment”.

F. Contractor's Affidavit of Payment of Debts and Claims: Submit with “Final Application for Payment”.

G. Contractor's Affidavit of Release of Liens: Submit with “Final Application for Payment”.

1.5 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the “Schedule of Values” with preparation of “Contractor's Construction Schedule”.

1. Correlate line items in the “Schedule of Values” with other required administrative forms and schedules, including the following:

    a. “Application for Payment” forms with Continuation Sheets.
    b. “Submittals Schedule”.
    c. “Contractor's Construction Schedule”.

B. Format and Content: Use the “Project Manual” table of contents as a guide to establish line items for the “Schedule of Values”. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the “Schedule of Values”:

    a. Project name and location.
    b. Name of Architect.
    c. Architect's project number.
    d. Contractor's name and address.
    e. Date of submittal.

2. Arrange the “Schedule of Values” in tabular form with separate columns to indicate the following for each item listed:

    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Name of Subcontractor.
    d. Name of Manufacturer or Fabricator.
    e. Name of Supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value.
    h. Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of “Applications for Payment” and “Progress Reports”. Coordinate with the “Project Manual” table of contents. Provide several line items for principal subcontract amounts, where appropriate.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the “Schedule of Values” for each part of the Work where “Applications for Payment” may include materials or equipment purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
    b. If items are stored off-site, indicate location where items are stored and provide a "Bill of Sale" including values and a “Certificate of Insurance” showing Owner as an Additional Insured.

6. Provide separate line items in the “Schedule of Values” for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Each item in the “Schedule of Values” and “Applications for Payment” shall be complete.
8. Provide separate line items in the “Schedule of Values” for temporary facilities and other major cost items that are not direct cost of actual work-in-place.
9. Provide separate line items in the “Schedule of Values” for general overhead and profit.
10. Schedule Updating: Update and resubmit the “Schedule of Values” before the next “Application for Payment” when “Change Orders” or “Construction Change Directives” result in a change in the Contract Sum.

1.6 APPLICATIONS FOR PAYMENT

A. Each "Application for Payment" shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

B. Payment Application Times: The date for each progress payment is indicated in the "Agreement between Owner and Contractor". The period of construction Work covered by each "Application for Payment" is the period indicated in the Agreement.

C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 "Continuation Sheets" as form for "Applications for Payment".

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the "Schedule of Values" and "Contractor's Construction Schedule". Use updated schedules if revisions were made.
2. Include amounts of "Change Orders" and "Construction Change Directives" issued before last day of construction period covered by application.

E. Waivers of Liens and Claims: With each "Application for Payment", submit waivers of liens and claims from every entity who is lawfully entitled to file a lien or claim, including but not limited to subcontractors, sub-subcontractors, and suppliers, for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

F. "Initial Application for Payment": Administrative actions and submittals that must precede or coincide with submittal of first "Application for Payment" include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Products list.
5. Schedule of unit prices.
6. Submittals Schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Acceptance of existing conditions.
10. Copies of building permits.
11. Copies of authorizations, licenses, and certificates from authorities having jurisdiction for performance of the Work.
12. Initial progress report.
13. Minutes of pre-construction conference.
14. Insurance Certificates and Bonds:
    a. Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
    b. With each Application for Payment update the current status of insurance or bonding coverage.
15. Data needed to acquire Owner's insurance.
16. Initial settlement survey and damage report if required.

G. "Application for Payment" at Substantial Completion: After Architect issues the "Certificate of Substantial Completion", submit an "Application for Payment" showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect "Certificates of Partial Substantial Completion" issued previously for Owner occupancy of designated portions of the Work.

H. "Final Payment Application": Submit "Final Application for Payment" with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims".
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens".
6. AIA Document G707, "Consent of Surety to Final Payment".
7. Evidence that payments, debts, and claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final, liquidated damages settlement statement.

1.7 INSURANCE CERTIFICATES AND BONDS

A. Submit with "Initial Application for Payment" written information indicating current status of required insurance and/or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
B. If the status of required insurance and/or bonding coverage changes, submit with the next "Application of Payment" written information indicating the change and the current status of required insurance or bonding coverage.
C. If Owner needs to acquire insurance, provide information indicating the date that Owner's insurance needs to take effect.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination Drawings.
2. Administrative and supervisory personnel.
3. Subcontractor List.
4. Key Personnel List.
5. Project meetings.
6. Requests for Interpretation (RFIs).

B. Related Sections include the following:

1. Division 01 Section "Construction Progress Documentation" for preparing and submitting “Contractor's Construction Schedule”.
2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

D. Conservation:

1. Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
2. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

1.5 SUBMITTALS

A. "Coordination Drawings": Prepare "Coordination Drawings" if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Content: Project-specific information, drawn accurately to scale. Do not base "Coordination Drawings" on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:

a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.

b. Indicate required installation sequences.

c. Indicate dimensions shown on the "Contract Drawings" and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 24 by 36 inches.

3. Number of Copies:

a. Submit 1 (one) opaque copy of each submittal.

b. Retain 1 (one) copy as a "Project Record Drawing" and provide additional copies where "Coordination Drawings" are required for operation and maintenance manuals.

4. Refer to individual Sections for "Coordination Drawing" requirements for Work in those Sections.

B. "List of Key Personnel": Within 15 (fifteen) days of "Notice to Proceed", submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site and other administrative and supervisory personnel as required for proper performance of the Work.

1. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers.

2. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
3. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

C. "Subcontract List": Within 15 (fifteen) days of "Notice to Proceed", submit a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.

D. Meeting Records: Minutes of pre-construction conference.

E. Meeting Records: Minutes of pre-installation conference.

F. Meeting Records: Minutes of progress meetings.

1.6 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within 3 (three) days of the meeting.

B. Pre-Construction Conference: Schedule a pre-construction conference before starting construction, at a time convenient to Owner, and Architect, but no later than 15 (fifteen) days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

a. Tentative construction schedule.
b. Critical work sequencing and long-lead items.
c. Designation of key personnel and their duties.
d. Procedures for processing field decisions and Change Orders.
e. Procedures for RFIs.
f. Procedures for testing and inspecting.
g. Procedures for processing Applications for Payment.
h. Distribution of the Contract Documents.

i. Submittal procedures.

j. Preparation of Record Documents.

k. Work restrictions.

l. Responsibility for temporary facilities and controls.

m. Construction waste management and recycling.

n. Parking availability.

o. Office, work, and storage areas.

p. Equipment deliveries and priorities.

q. First aid.

r. Security.

s. Progress cleaning.

t. Working hours.

3. Minutes: Record meeting minutes including significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present, to parties who should have been present, and to Architect.

C. Pre-Installation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. The Contract Documents.

b. Options.

c. Related RFIs.

d. Related Change Orders.

e. Purchases.

f. Deliveries.

g. Submittals.

h. Review of mockups, if required.

i. Possible conflicts.

j. Compatibility problems.

k. Time schedules.

l. Weather limitations.

m. Manufacturer's written recommendations.

n. Warranty requirements.

o. Compatibility of materials.

p. Acceptability of substrates.

q. Temporary facilities and controls.

r. Space and access limitations.

s. Regulations of authorities having jurisdiction.

t. Testing and inspecting requirements.

u. Installation procedures.

v. Coordination with other work.

w. Required performance results.

x. Protection of adjacent work.

y. Protection of construction and personnel.

3. Minutes: Record meeting minutes including significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present, to parties who should have been present, and to Architect.

5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at regular intervals, acceptable to Architect and Owner. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of Owner**,** and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. “Contractor's Construction Schedule”:

1) Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to “Contractor's Construction Schedule”. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

2) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.

2) Sequence of operations.

3) Status of submittals.

4) Deliveries.

5) Off-site fabrication.

6) Access.

7) Site utilization.

8) Temporary facilities and controls.

9) Work hours.

10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Material Locations Report.
14) Status of correction of deficient items.
15) Field observations.
16) RFIs and RFI Log.
17) Status of proposal requests.
18) Pending changes.
19) Status of Change Orders.
20) Pending claims and disputes.
21) Documentation of information for payment requests.

3. Minutes: Record meeting minutes including significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present, to parties who should have been present, and to Architect.
5. Schedule Updating: Revise "Contractor's Construction Schedule" after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the minutes of each meeting.

1.8 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an "RFI" in the form specified.

1. "RFIs" shall originate with Contractor. "RFIs" submitted by entities other than Contractor will be returned with no response.
2. Contractor shall review and attempt to respond to questions submitted by sub-contractors and suppliers before submitting an "RFI" to the Architect.
3. Coordinate and submit "RFIs" in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
4. "RFIs" shall be submitted in an electronic format that the Architect can forward to consultants and the Architect can modify with the response.

B. Content of the "RFI": Include a detailed, legible description of item needing interpretation and the following:

1. Project name.
2. Date.
3. Name of Contractor.
4. Name of Architect.
5. "RFI" number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.

8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the “RFI”.
10. Contractor's signature.
11. Attachments:
    a. Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
    b. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Software-Generated “RFIs”:
1. Software-generated form with substantially the same content as indicated above.
2. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each “RFI”, determine action required, and return it. Allow 7 (seven) working days for Architect's response for each “RFI”. “RFIs” received after 1:00 p.m. will be considered as received the following working day.
1. The following “RFIs” will be returned without action:
    a. Requests that are not in electronic format.
    b. Requests for approval of submittals.
    c. Requests for approval of substitutions.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete “RFIs” or “RFIs” with numerous errors.
2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
3. Architect's action on “RFIs” that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit “Proposal for Change” according to Division 01 Section "Contract Modification Procedures". If Contractor believes the “RFI” response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 (ten) days of receipt of the “RFI” response.

E. On receipt of Architect's action, update the “RFI Log” and immediately distribute the “RFI” response to affected parties. Review response and notify Architect within 7 (seven) days if Contractor disagrees with response.

F. “RFI Log”: Prepare, maintain, and submit a tabular log of “RFIs” organized by the “RFI” number. Submit and review log at progress meeting. Include the following:
1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. “RFI” number including “RFIs” that were dropped and not submitted.
5. “RFI” description.
6. Date the “RFI” was submitted.

7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, “Construction Change Directive”, and “Proposal Request”, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.
4. Daily construction reports.
5. Material location reports.
6. Field condition reports.
7. Special reports.
8. Construction Photographs.

B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for submitting the Schedule of Values.
2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
3. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
4. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 SUBMITTALS

A. Qualification Data: For scheduling consultant, if required.

B. “Submittals Schedule”: Submit 1 (one) copy of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Architect's final release or approval.

C. “Preliminary Construction Schedule”: Submit 1 (one) opaque copy.

D. “Contractor's Construction Schedule”:

1. Submit 1 (one) opaque copy of initial schedule, large enough to show entire schedule for entire construction period.

2. Submit an electronic copy of schedule, using software indicated, on CD-R, and labeled to comply with requirements for submittals. Include type of schedule (Initial or Updated) and date on label.

E. "Daily Construction Report": Submit 1 (one) copy at weekly intervals.

F. "Material Location Report": Submit 1 (one) copy at progress meeting.

G. "Field Condition Report": Submit 1 (one) copy at time of discovery of differing conditions.

H. "Special Reports": Submit 2 (two) copy directly to the Architect at time of unusual event.

I. "Construction Photographs": Submit 2 (two) prints of each photographic view within 7 (seven) days of taking photographs. Submit construction photographs in the following format:

1. Digital Images: Provide two digital images on two 8 ½ by 11 inch sheets of paper punched for standard 3-ring binder.

J. Meeting Records: Minutes of pre-scheduling conference.

1.4 QUALITY ASSURANCE

A. Scheduling Consultant: Engage an experienced specialist in scheduling and reporting. This requirement will be waived if Contractor employs skilled personnel with experience in scheduling and reporting techniques. Submit qualification for scheduling consultant or personnel. Scheduling personnel shall attend all meetings related to Project progress, alleged delays, and time impact.

B. Pre-Scheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to the "Preliminary Construction Schedule" and "Contractor's Construction Schedule", including, but not limited to, the following:

1. Review software limitations and content and format for reports.

2. Verify availability of qualified personnel needed to develop and update schedule.

3. Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.

4. Review delivery dates for Owner-furnished products.

5. Review time required for review of submittals and resubmittals.

6. Review requirements for tests and inspections by independent testing and inspecting agencies.

7. Review time required for completion and startup procedures.

8. Review and finalize list of construction activities to be included in schedule.

9. Review submittal requirements and procedures.

10. Review procedures for updating schedule.

11. Minutes: Record meeting minutes including significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

12. Reporting: Distribute minutes of the meeting to each party present, to parties who should have been present, and to Architect.

1.5 COORDINATION

A. Coordinate "Contractor's Construction Schedule" with the "Schedule of Values", list of subcontracts, "Submittals Schedule", progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate “Submittals Schedule” with list of subcontracts, the “Schedule of Values”, and “Contractor's Construction Schedule”.
2. Initial Submittal: Submit concurrently with “Preliminary Construction schedule”. Include submittals required during the first 60 (sixty) days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of “Contractor's Construction Schedule”.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling".

B. Time Frame: Extend schedule from date established for the “Notice to Proceed” to date of Final Completion. Contract completion date shall not be changed by submission of a schedule that shows an early or late completion date, unless specifically authorized by “Change Order”.

C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 (twenty) days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 (sixty) days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in “Contractor's Construction Schedule” with “Submittals Schedule”.
4. Startup and Testing Time: Include time for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Work Restrictions: Show the effect of the following items on the schedule:
   a. Provisions for future construction.
   b. Seasonal variations.
   c. Environmental control.
2. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

a. Subcontract awards.

b. Submittals.

c. Purchases.

d. Mockups and Sample Panels.

e. Fabrication.

f. Sample testing.

g. Deliveries.

h. Installation.

i. Tests and inspections.

j. Adjusting.

k. Curing.

l. Startup and placement into final use and operation.

3. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

a. Structural completion.

b. Permanent space enclosure.

c. Completion of mechanical installation.

d. Completion of electrical installation.

e. Substantial Completion.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion**.**

F. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

G. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

A. General: Submit preliminary construction schedule within 7 (seven) days of date established for the "Notice to Proceed".

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 (sixty) days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. General: Submit construction schedule at the earliest date possible, but no later than with the first Application for Payment.

B. Initial Issue of Schedule: Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.

2. Description of activity.
3. Principal events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Average size of workforce.

C. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in the Contract Time.

2.5 REPORTS

A. "Daily Construction Reports": Prepare a "Daily Construction Report" recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (refer to special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial Completions and occupancies.

19. Substantial Completions authorized.

B. "Material Location Reports": At regular intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

C. "Field Condition Reports": Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

A. General: Submit special reports directly to Architect within 2 (two) day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Architect in advance when these events are known or predictable.

2.7 CONSTRUCTION PHOTOGRAPHS

A. "Construction Photographs":

1. Identification: On back of each print provide an applied label or rubber-stamped impression with the following information:

   a. Name of Project.

   b. Name and address of photographer.

   c. Name of Architect.

   d. Name of Contractor.

   e. Date photograph was taken.

   f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

2. Retain 1 (one) set of "Construction Photographs" as a Project Record Document.

3. Digital Images: Submit a complete set of digital image electronic files concurrently with Project Record Document. Identify electronic media with date photographs were taken. Submit images that have the same aspect ratio as the sensor, uncropped.

B. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.

C. "Preconstruction Photographs": Before starting construction, take a minimum of 3 (three) photographs of Project site and surrounding properties from different vantage points. Show existing conditions adjacent to property. Architect may indicate desired vantage points.

D. "Periodic Construction Photographs": Take a minimum of 3 (three) photographs weekly, coinciding with cutoff date associated with each Application for Payment. Take photographs from select vantage points to

best show status of construction and progress since last photographs were taken. Architect may indicate desired vantage points.

E. "Final Completion Construction Photographs": Take a minimum of 3 (three) photographs after date of Substantial Completion. Take photographs from select vantage points to best show final condition of the project, the project site, and adjacent property. Architect may indicate desired vantage points.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule 1 (one) week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect, Owner, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 32 00

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SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for submittal requirements for, but not limited to, the following:
   a. “Applications for Payment”.
   b. “Schedule of Values”.
2. Division 01 Section "Contract Modification Procedures" for submittal requirements for, but not limited to: “Proposal for Change”.
3. Division 01 Section "Project Management and Coordination" for submittal requirements for, but not limited to, the following:
   a. “Coordination Drawings”.
   b. “List of Key Personnel”.
   c. “Subcontractor List”.
   d. “Minutes” of Meetings and Conferences.
4. Division 01 Section "Construction Progress Documentation" for submittal requirements for, but not limited to, the following:
   a. “Submittals Schedules”.
   b. “Construction Photographs”.
   c. “Contractor's Construction Schedule”.
   d. Special Reports.
5. Division 01 Section "Quality Requirements" for submittal requirements for, but not limited to, the following:
   a. Sample Panels.
   b. Qualification Data.
   c. “Schedule of Tests and Inspection”.
   d. Reports.
   e. Permits, Licenses, and Certificates.
   f. Manufacturer’s Instructions.
   g. Design Data.
6. Division 01 Section "Product Requirements" for submittal requirements for, but not limited to, the following:

a. “Product List”.

b. “Substitution Request”.

c. “Comparable Product Request”.

7. Division 01 Section "Execution" for submittal requirements for, but not limited to, ”Final Property Survey”.

8. Division 01 Section "Operation and Maintenance Data" for submittal requirements for, but not limited to, “Operation and Maintenance Manuals”.

9. Division 01 Section "Closeout Procedures" for submittal requirements for, but not limited to, the following:

a. Request for Substantial Completion Inspection.

b. “Punch List”.

c. “Warranties”.

10. Division 01 Section "Project Record Documents" for submittal requirements for, but not limited to, the following:

a. “Record Drawings”.

b. “Record Specifications”.

c. “Record Product Data”.

d. “Miscellaneous Record Submittals”.

e. “Record Construction Photographs”.

11. Division 01 Section "Demonstration and Training" for submittal requirements for, but not limited to, the following:

a. Instructional program outline.

b. Instructional program attendance record.

c. Instructional program evaluation record.

d. Demonstration and training DVD.

12. Divisions 02 through 49 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTALS

Material Safety Data Sheets (MSDSs)

1.5 ELECTRONIC COPIES OF CAD DRAWINGS

General: Electronic copies of CAD Drawings of the Contract Drawings will not be provided. Drawings will be available in PDF format only.

1.6 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

3. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 (fifteen) days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

3. Resubmittal Review: Allow 15 (fifteen) days for review of each resubmittal.

4. Concurrent Consultant Review: Where the Contract Documents indicate that submittals shall be transmitted simultaneously to Architect and to Architect's consultants, allow 21 (twenty one) days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

a. Submittals that shall be transmitted simultaneously to Architect and to Architect's consultants include, but are not limited, to the following:

1) Submittals related to Civil Engineering Work.

2) Submittals related to Landscaping Work.

3) Submittals related to Structural Engineering Work.

4) Submittals related to Mechanical Engineering Work.

5) Submittals related to Electrical Engineering Work.

C. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.

2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect..

3. Include the following information on label for processing and recording action taken:

a. Project name.

b. Date.

c. Name and address of Architect.

d. Name and address of Contractor.

e. Name and address of subcontractor.

f. Name and address of supplier.

g. Name of manufacturer.

h. Submittal number or other unique identifier, including revision identifier. Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

i. Number and title of appropriate Specification Section.

j. Drawing number and detail references, as appropriate.

k. Location(s) where product is to be installed, as appropriate.

l. Other necessary identification.

D. Deviations: Highlight or otherwise specifically identify deviations from the Contract Documents on submittals.

E. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

F. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.

1. Transmittal Form: Use AIA Document G810 or Contractor's standard transmittal form, approved by Architect.

2. Transmittal Form: Provide locations on form for the following information:

a. Project name.

b. Date.

c. Destination (To:).

d. Source (From:).

e. Names of subcontractor, manufacturer, and supplier.

f. Category and type of submittal.

g. Submittal purpose and description.

h. Specification Section number and title.

i. Drawing number and detail references, as appropriate.

j. Transmittal number, numbered consecutively.

k. Submittal and transmittal distribution record.

l. Remarks.

m. Signature of transmitter.

3. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.

G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.

2. Note date and content of revision in label or title block and clearly indicate extent of revision.

3. Re-submit submittals until they are marked "Approved" or "Approved Subject to Correction Noted".

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Use only final submittals with mark indicating "Approved" or "Approved Subject to Correction Noted".

J. Maintain copy of final "Approved" or "Approved Subject to Correction Noted" action submittals and information submittals at Project site. Provide access to submittals for Architect's reference during normal working hours.

K. Maintain copy of final "Approved" or "Approved Subject to Correction Noted" action submittals and information submittals for transmittal to the Owner as part of Project Record Documents.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

B. Action Submittals include, but are not limited to, the following:

1. Product Data.
2. Shop Drawings.
3. Samples.
4. “Application for Payment”.
5. Mockups and Sample Panels.
6. “Substitution Request”.
7. “Operation and Maintenance Manuals”.

C. Concurrent Consultant Review: Where the Action Submittals are to be reviewed by Architect's Consultants, transmit submittals directly to Architect’s Consultants. Include 1 (one) additional copy for Architect’s Consultants records and transmit 1 (one) copy directly to the Architect, unless otherwise indicated.

D. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
   a. Manufacturer's written recommendations.
   b. Manufacturer's product specifications.
   c. Manufacturer's installation instructions.
   d. Standard color charts.
   e. Manufacturer's catalog cuts.
   f. Wiring diagrams showing factory-installed wiring.
   g. Printed performance curves.
   h. Operational range diagrams.
   i. Mill reports.
   j. Standard product operation and maintenance manuals.
   k. Compliance with specified referenced standards.
   l. Testing by recognized testing agency.
   m. Application of testing agency labels and seals.
   n. Notation of coordination requirements.
4. Submit Product Data before or concurrent with Samples.

5. Number of Copies: Submit 3 (three) copies of Product Data, unless otherwise indicated. Architect will return 2 (two) copies. Mark up and retain one returned copy as a Project Record Document.

E. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Dimensions.

b. Identification of products.

c. Fabrication and installation drawings.

d. Roughing-in and setting diagrams.

e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.

f. Shopwork manufacturing instructions.

g. Templates and patterns.

h. Schedules.

i. Design calculations.

j. Compliance with specified standards.

k. Notation of coordination requirements.

l. Notation of dimensions established by field measurement.

m. Relationship to adjoining construction clearly indicated.

n. Seal and signature of professional engineer if specified.

o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 24 by 36 inches.

3. Number of Copies: Submit 5 (five) opaque (bond) copies of each submittal. Architect will return 2 (two) of 3 (three) copies. Retain one returned copy as a Project Record Document. See requirements for concurrent consultant review for additional copies.

F. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.

b. Product name and name of manufacturer.

c. Sample source.

d. Number and title of appropriate Specification Section.

3. Concurrent Consultant Review of Samples: Where the Samples are to be reviewed by Architect's Consultants, do not include any additional sets. Transmit a copy of the “Transmittal From” to the Architect.

4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine

final acceptance of construction associated with each set. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.

5. Samples for Initial Selection:

   a. Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

   b. Number of Samples: Submit 1 (one) full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

   a. Number of Samples: Submit 2 (two) sets of Samples. Architect will retain 1 (one) Sample sets; remainder will be returned. Retain the returned Sample set as a Project Record Sample.

      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least 3 (three) sets of paired units that show approximate limits of variations.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

   1. Number of Copies: Submit 1 (one) copy of each submittal, unless otherwise indicated. Architect will not return copies.

   2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

   3. Retain 1 (one) copy as a Project Record Document.

B. Concurrent Consultant Review: Where the Informational Submittals are to be reviewed by Architect's Consultants, transmit 1 (one) submittal directly to Architect’s Consultants and 1 (one) copy directly to the Architect, unless otherwise indicated.

C. Informational Submittals include, but are not limited to, the following:

   1. Bonds.

   2. Permits, Licenses, and Certificates.

   3. Coordination Drawings.

   4. Data.

   5. Forms.

   6. Instructions.

   7. Instructional program outline and training manual and DVD.

   8. Lists

   9. Photographs.

10. Plans.
11. Record Documents.
12. Reports.
13. Schedules.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect's action does not constitute a waiver of requirement to comply with the Contract Documents. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1. Approved: The Architect has found no corrections or modifications that need to be made. That part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final acceptance will depend upon that compliance.
2. Approved Subject to Corrections Noted: The Architect has found limited corrections or modifications that need to be made. Items noted for correction must not be fabricated or furnished without corrections as noted. The submission must be corrected and resubmitted for record purposes only.
3. Resubmit: The Architect has found major corrections or modifications that need to be made. The item is rejected as not in accordance with the contract requirements, or for other justified cause. The submission must be corrected and resubmitted. No item is to be fabricated or furnished under this stamp.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.

D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01 33 00

SECTION 01 33 01 - STRUCTURAL SUBMITTALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Structural submittals include shop drawings, design calculations, diagrams, illustrations, schedules, performance charts, nomenclature charts, samples, brochures and other data prepared by the Contractor or any subcontractor, manufacturer, supplier, fabricator, or distributor and which illustrate some portion of the Project.

B. Submittals by the Contractor are not a part of the Contract Documents.

1.2 RELATED SECTIONS

A. Section 01 33 00 - Submittal Procedures.

1.3 SUBMITTAL PROCEDURES

A. Prior to the initial submittal, Contractor shall submit to the Architect/Structural Engineer a completed Submittal Information and Schedules form given in Appendix I.

B. Submittals shall be accompanied by a transmittal letter with the following information:

1. Project name.

2. Contractor's name.

3. Date submitted.

4. Description of items submitted; identify work and product by Specification Section.

5. Number of drawings and other pertinent data.

C. Provide blank space on each submittal for the Architect/Structural Engineer's review stamp.

D. The type and number of submittals for each item shall be in accordance with Section 01 33 00.

E. Contractor shall direct specific attention on the submittal to any deviation from the Contract Documents.

F. Electronic submittals shall comply with the following standards:

1. Structural submittals made in electronic format must be in a generally accepted format that can be viewed by Adobe Reader or similar, and capable of receiving comments and notations in Adobe Writer, Blubeam Revu or similar. When creating the file, no permissions should be restricted - All actions should be ALLOWED. Submittals should be issued as a single BOUND set with each page bookmarked with the correct sheet number. Submittals not formatted in this

manner will be returned to the contractor for review and resubmittal. Send electronic files to the architect.

2. All structural submittals made in electronic format with an original size that is larger than 8½" x 11" must be accompanied by one (1) hard copy for review and use by the Structural Engineer.

1.4 CONTRACTOR RESPONSIBILITY

A. Contractor shall make all submittals in advance of installation or construction to allow the Architect/Structural Engineer sufficient time for review.

B. Contractor shall stamp and sign each sheet of shop drawings and product data, and sign or initial each sample to certify compliance with requirements of Contract Documents. SUBMITTALS RECEIVED WITHOUT THE CONTRACTOR'S STAMP OF REVIEW WILL BE RETURNED TO THE CONTRACTOR FOR REVIEW AND RESUBMITTAL.

C. Contractor shall understand that the submittal of the required documents does not constitute compliance with the requirements of the Contract Documents; only submittals reviewed by the Architect/Structural Engineer constitute compliance.

D. It is the Contractor's responsibility to furnish equipment, materials, and labor for the Project which meets the requirements of the codes and authorities quoted as well as the Contract Documents. Proprietary items specified herein only establish a minimum functional and aesthetic standard and it is incumbent upon the Contractor to ascertain conformance of these proprietary items or any proposed substitution with the codes and authorities.

E. By reviewing, approving and submitting shop drawings, product data, or samples, Contractor thereby represents that he has determined and verified all field measurements, field construction criteria, materials, member sizes catalog numbers, and similar data and that he has checked and coordinated shop drawings with the requirements of the Project and of the Contract Documents.

F. Work requiring shop drawings, whether called for by the Contract Documents or requested by the Contractor, shall not commence until the submission has been reviewed by the Architect/Structural Engineer. Work may commence if the Contractor verifies the accuracy of the Architect/Structural Engineer's corrections and notations and complies with them without exception and without requesting change in Contract Sum or Contract Time.

1.5 ARCHITECT/STRUCTURAL ENGINEER REVIEW

A. Architect/Structural Engineer will review submittals with reasonable promptness. For scheduling purposes, allow 10 business days in Structural Engineer's office exclusive of delivery time.

B. Architect/Structural Engineer's review or corrections refer only to the general arrangement and conformance of the subject of the submittals with the design concept of the project and with the information given in the Contract Documents. Under no conditions should the Contractor consider the review to include the dimensions, quantities, and details of the items nor the approval of an assembly in which the item functions.

C. Architect/Structural Engineer's review shall not relieve the Contractor from responsibility for errors or omissions in the submittals.

D. Architect/Structural Engineer's review of submittals shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents unless the Contractor has directed specific attention to the deviation at the time of submission and the Architect/Structural Engineer has given written approval to the specific deviation.

E. Architect/Structural Engineer's review of submittals shall not be construed as authorizing any change in the Contract Sum or Contract Time.

F. Structural Engineer will return a maximum of three reviewed hard copies for submittals that are not submitted electronically.

1.6 SHOP DRAWINGS

A. Present in a clear and thorough manner. Title each drawing with Project name and number; identify each element of drawings by reference to sheet number and detail of Contract Documents.

B. All shop drawings shall list the Contract Documents used in their production (date, title, revision number, etc.).

C. Reproduction of Structural Drawings for shop drawings is not permitted.

D. Identify field dimensions; show relationship to adjacent or critical features of Work or products.

E. Electronic shop drawings submitted shall meet the requirements of Section 1.03.

F. A copy of the marked structural shop drawings with the Architect/Structural Engineer's review stamp is to be maintained at the job site. If electronic shop drawings are being used, a hard copy with all final markups is to be maintained at the job site.

1.7 PRODUCT DATA

A. Submit only pages which are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number. Show reference standards, performance characteristics, and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances.

B. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information which is not applicable.

C. Provide manufacturer's preparation, assembly, and installation instructions.

1.8 SAMPLES

A. Submit full range of manufacturer's standard finishes except where more restrictive requirements are specified, indicating colors, textures, and patterns.

B. Submit samples to illustrate functional characteristics of products, including parts and attachments as required by Architect/Structural Engineer.

C. Approved samples which are of proper size may be incorporated in Work.

D. Label each sample with identification.

E. Field Finishes: Provide full samples at Project, at location acceptable to Architect/Structural Engineer, as required by individual Specification Section. Install each sample complete and finished. Acceptable finishes in place may be retained in completed work.

1.9 RESUBMITTALS

A. When submittals are returned to the Contractor with the Architect/Structural Engineer's corrections the Contractor shall make the required corrections. A record copy of one corrected set shall be resubmitted to the Structural Engineer.

B. Contractor shall direct specific attention on the resubmittal to all revisions including those requested by the Architect/Structural Engineer on previous submission.

1.10 DISTRIBUTION

A. Distribute reproductions of shop drawings, copies of product data, and samples which bear the Architect/Structural Engineer's review stamp to job site file, Record Documents file, subcontractors, suppliers, other affected contractors, and other entities requiring information.

B. Only reviewed shop drawings are considered acceptable for use during construction.

1.11 SEISMIC INFORMATION

A. Submit seismic data in accordance with the Seismic Submittal Information given in Appendix II.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION 01 33 01

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APPENDIX I
SUBMITTAL INFORMATION AND SCHEDULES

PROJECT _____

CONTRACTOR _____

CONTRACTOR'S ADDRESS _____

_____

PROJ. MANAGER _____ PHONE (___) _____ FAX (___) _____

SUPERINTENDENT _____ PHONE (___) _____ FAX (___) _____

MOBILIZATION DATE _____

PROJECTED SUBMITTAL DATES

FOUNDATION, CONCRETE & REINFORCING		STRUCTURAL STEEL		MASONRY	
SUBMITTAL	DATE	SUBMITTAL	DATE	SUBMITTAL	DATE
Site Preparation & Equipment Information		Fabricator / Erector Qualifications		Grout & Mortar Mix	
Concrete Mix Design		Anchor Rod & Embedded Items		Block Prism & Comp. Strength	
Foundation Reinforcing		Erection & Detail Drawings		Reinforcing	
				Written Procedures	
		Joists			
		Deck			
		Stair Drawings			

Remarks:

COMPLETED BY _____ DATE _____

END OF APPENDIX I

APPENDIX II
SEISMIC SUBMITTAL INFORMATION

1.1 PREFACE

A. Items of equipment incorporated in, and installed in or on the building shall be fabricated and installed to resist vertical loads and lateral forces stated in the International Building Code, 2012 Edition.

B. Project has the following Seismic Coefficients:

Seismic Design Category	C
Risk Category	II
S_{Ds}	0.395g

1.2 SUBMITTAL DATA REQUIRED

A. In order to provide adequate information to the Owner for proper review and evaluation of adequacy of equipment and non-structural items, submit the following information with shop drawings and product data.

1. Certificate from the manufacturers stating that the items furnished by them will maintain unit integrity by resisting lateral forces using the appropriate code required coefficients.

2. Dimensions and details of each piece of equipment, weight of each piece, and its approximate center of gravity.

3. Size and dimensions of supporting assembly structures and the identification of each of its members including secondary elements used as stiffeners and connectors.

4. Calculations prepared and signed by a licensed structural engineer in the Project state to indicate the adequacy of the structures to resist the code mandated vertical loads and lateral forces.

1.3 POSSIBLE BACK CHARGES TO CONTRACTOR

A. If the submittals for equipment and non-structural elements do not contain the data required, they will be returned without action for resubmission with required data. If the submittals are returned to Owner with incomplete or insufficient data which may cause extra work to the Owner or his consultants, the Owner will charge the Contractor for such extra work at the rate of 2.5 times direct personnel expense plus the cost of direct expenses.

END OF APPENDIX II

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Delegated Design Services: Requirements for the Contractor to provide professional design services or certifications.

D. Related Sections include the following:

1. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.

2. Division 01 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.

3. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Sample Panels: Full-size, physical assemblies that are constructed on-site. Sample panels are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups and sample panels establish the standard by which the Work will be judged.

D. Pre-Construction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector:

1. Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
2. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

J. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of 5 (five) previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. General: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement.

C. Contract Documents: If there is any conflict or discrepancy within or between any of the Contract Documents involving the quality or quantity of Work required, it is the intention of the Contract that the Work of highest quality or greatest quantity shown or specified shall be furnished.

1.5 SUBMITTALS

A. Qualification Data: For agencies, individuals, and/or corporations specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.

8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

C. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

E. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.
7. Number of Copies: As required by Division 1 Section “Submittal Procedures”. Provide additional copies to everyone concerned.

F. Manufacturer's Field Reports: Provide the number of Copies as required by Division 1 Section “Submittal Procedures”. Provide additional copies to everyone concerned.

G. Design Data:

1. Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2. Number of Copies: As required by Division 1 Section "Submittal Procedures". Provide additional copies to everyone concerned.

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.7 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 24 (twenty four) hours in advance of time when Work that requires testing or inspecting will be performed.

3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Pre-Construction Testing: Where testing agency is indicated to perform pre-construction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:
   a. Provide test specimens representative of proposed products and construction.
   b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
   c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
   d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
   e. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

D. Manufacturer's Field Services:

1. Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections.
2. Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
   a. Name, address, and telephone number of factory-authorized service representative making report.
   b. Statement on condition of substrates and their acceptability for installation of product.
   c. Statement that products at Project site comply with requirements.
   d. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
   e. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   f. Statement whether conditions, products, and installation will affect warranty.
   g. Other required items indicated in individual Specification

E. Mockups and Sample Panels: Before installing portions of the Work requiring mockups or sample panels, build mockups or sample panels for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups or sample panels in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect 7 (seven) days in advance of dates and times when mockups or sample panels will be constructed.

3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Architect's Action: Architect will review each mockup or sample panel and approve mockup or sample panel in writing, indicating corrections or modifications required, in writing. Architect's action does not constitute a waiver of requirement to comply with the Contract Documents. Allow 7 (seven) days for initial review and each re-review of each mockup or sample panel.
5. Obtain Architect's approval, in writing, of mockups or sample panels before starting work, fabrication, or construction.
6. Maintain mockups or sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups or sample panels when directed, unless otherwise indicated.

F. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

G. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

H. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

I. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting. Schedule times for tests, inspections, obtaining samples, and similar activities.

J. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 (thirty) days of date established for the Notice to Proceed.

K. Distribution: Distribute schedule to Owner, Architect, Architect's Consultants, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

L. Reports

1. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

2. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

3. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

4. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

5. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

6. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

a. Name of evaluation organization.

b. Date of evaluation.

c. Time period when report is in effect.

d. Product and manufacturers' names.

e. Description of product.

f. Test procedures and results.

g. Limitations of use.

M. Certificates:

1. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

2. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

3. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

4. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

5. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

1.8 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner may engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

B. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.

2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.

3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.

4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.

5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.

6. Retesting and reinspecting corrected work.

1.9 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Submittal:

1. In addition to Shop Drawings, Product Data, and other required submittals, submit 2 (two) copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional. Retain 1 (one) copy as a Project Record Document.

2. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.

2. Description of the Work tested or inspected.

3. Date test or inspection results were transmitted to Architect.

4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to “Test and Inspection Log” for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching".

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

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SECTION 01 42 00 - REFERENCES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract. Architect's approval does not constitute a waiver of requirement to comply with the Contract Documents.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

C. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

D. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. General: In the event Contractor is unable to determine the meaning of an abbreviation or acronym, the Architect will provide such information.

B. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations.

C. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S.".

D. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities.

E. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities.

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the State of Tennessee.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 43 26 - STRUCTURAL TESTING/INSPECTION AGENCY SERVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section summarizes the responsibility of the Contractor and the Structural Testing/Inspection Agency in the performance of the testing/inspection specified in the Contract Documents.

B. Neither the observation of the Architect/Structural Engineer in the administration of the contract, nor tests/inspections by the Testing/Inspection Agency, nor approvals by persons other than the Architect/Structural Engineer shall relieve the Contractor from his obligation to perform the work in accordance with the Contract Documents.

1.2 RELATED SECTIONS

A. Section 01 33 10 - Structural Submittals.

B. Section 01 40 00 - Quality Requirements.

1.3 REFERENCES

A. ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

B. ASTM E329 - Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

C. American Council of Independent Laboratories - Recommended Requirements for Independent Laboratories Qualifications.

1.4 SELECTION AND PAYMENT

A. Owner will employ and pay for the structural testing/inspection services that are required by the Contract Documents.

B. Contractor shall pay for any additional structural testing/inspection required for work or materials not complying with Contract Documents due to negligence or nonconformance.

C. Contractor shall pay for any additional structural testing/inspection required for his convenience.

1.5 CONTRACTOR SUBMITTALS

A. Prior to start of work, submit name of Structural Testing/Inspection Agency, address, telephone number, fax number, and names and qualifications of technicians, inspectors, and engineers who will be working on this project.

B. If multiple Structural Testing/Inspection Agencies are used, submit the information stated above for each firm along with a statement of the testing/inspection responsibilities for each firm.

1.6 STRUCTURAL TESTING/INSPECTION REQUIREMENT SUMMARY

A. Specific structural testing/inspection requirements are given in the following specification sections:

Section 31 23 00 - Excavating, Backfilling, and Compacting for Structures
Section 03 20 00 - Concrete Reinforcement
Section 03 30 00 - Cast-in-Place Concrete
Section 03 60 00 - Non-Shrink Grout
Section 04 22 00 - Structural Concrete Masonry
Section 05 12 00 - Structural Steel
Section 05 21 00 - Steel Joists
Section 05 30 00 - Steel Decking

PART 2 - MATERIALS

Not Used.

PART 3 - EXECUTION

3.1 STRUCTURAL PRECONSTRUCTION MEETING

A. A structural preconstruction meeting may be conducted at the construction site by the Structural Engineer to discuss quality issues. The parties involved may be the Architect, Contractor, Structural Testing/Inspection Agency, appropriate subcontractors, suppliers, and detailers.

3.2 STRUCTURAL TESTING/INSPECTION AGENCY'S RESPONSIBILITIES

A. Cooperate with the Contractor and provide timely service.

B. Upon arriving at the construction site, sign in and notify the Contractor of presence.

C. Select the representative samples that are to be tested/inspected.

D. Perform tests/inspections as outlined in Contract Documents, the applicable codes, and as directed by the Structural Engineer.

E. Report work and materials not complying with Contract Documents immediately to the Contractor and Structural Engineer.

F. Leave copies of field notes with the Contractor prior to leaving the construction site. Field notes shall include the message given to the Contractor, date, time of message, name of Contractor's representative informed, type and location of work or materials tested/inspected, whether the work or materials complies with Contract Documents and name of the Structural Testing/Inspection Agency's representative.

G. Report and distribute results of tests/inspections promptly in the form of written reports. Copies of the reports for this project will be furnished to the Owner, Contractor, Architect, Structural Engineer, and the Local Building Authorities.

H. Structural Testing/Inspection Agency shall not alter requirements of Contract Documents, approve or reject any portion of the work, or perform duties of the Contractor.

I. If providing special inspections, reports shall include all items as required by the International Building Code Special Inspection Statement provided by the Structural Engineer.

3.3 CONTRACTOR'S RESPONSIBILITIES

A. Provide copy of Contract Documents to the Structural Testing/Inspection Agency.

B. Arrange the preconstruction meeting to discuss quality issues.

C. Notify the Structural Testing/Inspection Agency sufficiently in advance of operations to allow assignment of personnel and scheduling of tests.

D. Cooperate with Structural Testing/Inspection Agency and provide access to work.

E. Provide samples of materials to be tested in required quantities.

F. Furnish copies of mill test reports when requested.

G. Provide storage space for Structural Testing/Inspection Agency's exclusive use, such as for storing and curing concrete testing samples.

H. Provide labor to assist the Structural Testing/Inspection Agency in performing tests/inspections.

END OF SECTION 01 43 26

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SECTION 01 45 33 - CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Code-required special inspections.
B. Testing services incidental to special inspections.
C. Submittals.

1.2 RELATED REQUIREMENTS

A. Section 014000 - Quality Requirements.

1.3 ABBREVIATIONS AND ACRONYMS

A. AHJ: Authority having jurisdiction.
B. IAS: International Accreditation Service, Inc.
C. NIST: National Institute of Standards and Technology.

1.4 DEFINITIONS

A. Code or Building Code: ICC (IBC)-2018, Edition of the International Building Code and specifically, Chapter 17 - Special Inspections and Tests.

B. Authority Having Jurisdiction (AHJ): Agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located.

C. Special Inspection:

1. Special inspections are inspections and testing of materials, installation, fabrication, erection or placement of components and connections mandated by the AHJ that also require special expertise to ensure compliance with the approved Contract Documents and the referenced standards.

2. Special inspections are separate from and independent of tests and inspections conducted by Owner for the purposes of quality assurance and contract administration.

1.5 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary 2019 (Reapproved 2022).

B. AISC 360 - Specification for Structural Steel Buildings 2022.

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field 2022.

E. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete 2017.

F. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction 2019.

G. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection 2021.

H. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing 2021.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2022).

J. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel 2018, with Errata (2022).

K. AWS D1.4/D1.4M - Structural Welding Code - Steel Reinforcing Bars 2018, with Amendment (2020).

L. IAS AC89 - Accreditation Criteria for Testing Laboratories 2021.

M. IAS AC291 - Accreditation Criteria for Special Inspection Agencies AC291 2019.

N. ICC (IBC)-2018 - International Building Code 2018.

O. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures 2022.

1.6 SUBMITTALS

A. See Section 013300 for submittal procedures.

B. Special Inspection Agency Qualifications: Prior to the start of work, the Special Inspection Agency is required to:

1. Submit agency name, address, and telephone number, names of full time registered Engineer and responsible officer.

2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

Submit certification that Special Inspection Agency is acceptable to AHJ.

3. Submit documentation that Special Inspection Agency is accredited by IAS according to IAS AC291.

C. Testing Agency Qualifications: Prior to the start of work, the Testing Agency is required to:

1. Submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.

2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

3. Submit certification that Testing Agency is acceptable to AHJ.

4. Submit documentation that Testing Agency is accredited by IAS according to IAS AC89.

D. Fabricator's Qualification Statement: Fabricator is required to submit documentation of fabrication facilities and methods as well as quality control procedures.

E. Special Inspection Reports: After each special inspection, Special Inspector is required to promptly submit at least two copies of report; one to Architect and one to the AHJ.

1. Include:

a. Date issued.
b. Project title and number.
c. Name of Special Inspector.
d. Date and time of special inspection.
e. Identification of product and specifications section.
f. Location in the Project.
g. Type of special inspection.
h. Date of special inspection.
i. Results of special inspection.
j. Compliance with Contract Documents.

2. Final Special Inspection Report: Document special inspections and correction of discrepancies prior to the start of the work.

F. Fabricator Special Inspection Reports: After each special inspection of fabricated items at the Fabricator's facility, Special Inspector is required to promptly submit at least two copies of report; one to Architect and one to AHJ.

1. Include:

a. Date issued.
b. Project title and number.
c. Name of Special Inspector.
d. Date and time of special inspection.
e. Identification of fabricated item and specification section.
f. Location in the Project.
g. Results of special inspection.
h. Verification of fabrication and quality control procedures.
i. Compliance with Contract Documents.
j. Compliance with referenced standard(s).

G. Test Reports: After each test or inspection, promptly submit at least two copies of report; one to Architect and one to AHJ.

1. Include:

a. Date issued.
b. Project title and number.
c. Name of inspector.
d. Date and time of sampling or inspection.
e. Identification of product and specifications section.
f. Location in the Project.
g. Type of test or inspection.
h. Date of test or inspection.
i. Results of test or inspection.
j. Compliance with Contract Documents.

H. Certificates: When specified in individual special inspection requirements, Special Inspector shall submit certification by the manufacturer, fabricator, and installation subcontractor to Architect and AHJ, in quantities specified for Product Data.

1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

1.7 SPECIAL INSPECTION AGENCY

A. Owner will employ services of a Special Inspection Agency to perform inspections and associated testing and sampling in accordance with ASTM E329 and required by the building code.

B. The Special Inspection Agency may employ and pay for services of an independent testing agency to perform testing and sampling associated with special inspections and required by the building code.

C. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.8 TESTING AND INSPECTION AGENCIES

A. Owner may employ services of an independent testing agency to perform additional testing and sampling associated with special inspections but not required by the building code.

B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.9 QUALITY ASSURANCE

A. Special Inspection Agency Qualifications:

1. Independent firm specializing in performing testing and inspections of the type specified in this section.

B. Testing Agency Qualifications:

1. Independent firm specializing in performing testing and inspections of the type specified in this section.

C. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 SCHEDULE OF SPECIAL INSPECTIONS, GENERAL

A. Frequency of Special Inspections: Special Inspections are indicated as continuous or periodic.

1. Continuous Special Inspection: Special Inspection Agency is required to be present in the area where the work is being performed and observe the work at all times the work is in progress.

2. Periodic Special Inspection: Special Inspection Agency is required to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

3.2 SPECIAL INSPECTIONS FOR STEEL CONSTRUCTION

A. Structural Steel: Comply with quality assurance inspection requirements of ICC (IBC)-2018.

B. High-Strength Bolt, Nut and Washer Material:

1. Verify identification markings comply with ASTM standards specified in the approved contract and to AISC 360, Section A3.3; periodic.
2. Submit manufacturer's certificates of compliance; periodic.

C. High-Strength Bolting Installation: Verify items listed below comply with AISC 360, Section M2.5.

1. Snug tight joints; periodic.

D. Structural Steel and Cold Formed Steel Deck Material:

1. Structural Steel: Verify identification markings comply with AISC 360, Section M3.5; periodic.

2. Other Steel: Verify identification markings comply with ASTM standards specified in the approved Contract Documents; periodic.

3. Submit manufacturer's certificates of compliance and test reports; periodic.

E. Weld Filler Material:

1. Verify identification markings comply with AWS standards specified in the approved Contract Documents and to AISC 360, Section A3.5; periodic.

2. Submit manufacturer's certificates of compliance; periodic.

F. Welding:

1. Structural Steel:

a. Complete and Partial Joint Penetration Groove Welds: Verify compliance with AWS D1.1/D1.1M; continuous.
b. Multipass Fillet Welds: Verify compliance with AWS D1.1/D1.1M; continuous.
c. Single Pass Fillet Welds Less than 5/16 inch Wide: Verify compliance with AWS D1.1/D1.1M; periodic.
d. Plug and Slot Welds: Verify compliance with AWS D1.1/D1.1M; continuous.
e. Single Pass Fillet Welds 5/16 inch or Greater: Verify compliance with AWS D1.1/D1.1M; continuous.
f. Floor and Roof Deck Welds: Verify compliance with AWS D1.3/D1.3M; continuous.

2. Reinforcing Steel: Verify items listed below comply with AWS D1.4/D1.4M and ACI CODE- 318, Section 3.5.2.

a. Verification of weldability; periodic.
b. Reinforcing steel resisting flexural and axial forces in intermediate and special moment frames as well as where it is referenced in older codes. Elements of special structural walls of concrete and shear reinforcement; continuous.
c. Shear reinforcement; continuous.
d. Other reinforcing steel; periodic.

3.3 SPECIAL INSPECTIONS FOR CONCRETE CONSTRUCTION

A. Reinforcement, Including Prestressing Tendons, and Verification of Placement: Verify compliance with ACI CODE-318, Chapters 20, 25.2, 25.3, 26.6.1-26.6.3; periodic.

B. Reinforcing Steel, Including Prestressing of Tendons and Placement: Verify compliance with approved Contract Documents and ACI CODE-318, Sections 3.5 and 7.1 through 7.7; periodic.

C. Anchors Cast in Concrete: Verify compliance with ACI CODE-318; periodic.

D. Bolts Installed in Concrete: Where allowable loads have been increased or where strength design is used, verify compliance with approved Contract Documents and ACI CODE-318, Sections 8.1.3 and 21.2.8 prior to and during placement of concrete; continuous.

E. Anchors Post-Installed in Hardened Concrete: Verify compliance with ACI CODE-318.

1. Adhesive Anchors: Verify horizontally or upwardly-inclined orientation installations resisting sustained tension loads - Section 17.8.2.4; continuous.

2. Other Mechanical and Adhesive Anchors: Verify as per Chapter 17.8.2; periodic.

F. Design Mix: Verify plastic concrete complies with the design mix in approved Contract Documents and with ACI CODE-318, Chapter 19, 16.4.3, 26.4.4; periodic.

G. Concrete Sampling Concurrent with Strength Test Sampling: Each time fresh concrete is sampled for strength tests, verify compliance with ASTM C172/C172M, ASTM C31/C31M, and ACI CODE-318, Sections 5.6 and 5.8 and record the following, continuous:

1. Slump.

2. Air content.

3. Temperature of concrete.

H. Specified Curing Temperature and Techniques: Verify compliance with approved Contract Documents and ACI CODE-318, Sections 5.11 through 5.13; periodic.

I. Formwork Shape, Location and Dimensions: Verify compliance with approved Contract Documents and ACI CODE-318, Section 6.1.1; periodic.

J. Materials: If the Contractor cannot provide sufficient data or documentary evidence that concrete materials comply with the quality standards of ACI CODE-318, the AHJ will require that the Special Inspector verify compliance with the appropriate standards and criteria in , Chapter 3.

3.4 SPECIAL INSPECTIONS FOR SOILS

A. Materials and Placement: Verify each item below complies with approved construction documents and approved geotechnical report.

1. Design bearing capacity of material below shallow foundations; periodic.

2. Design depth of excavations and suitability of material at bottom of excavations; periodic.

3. Materials, densities, lift thicknesses; placement and compaction of backfill: continuous.

4. Subgrade, prior to placement of compacted fill verify proper preparation; periodic.

B. Testing: Classify and test excavated material; periodic.

3.5 SPECIAL INSPECTIONS FOR DRIVEN DEEP FOUNDATIONS (HELICAL PILES)

A. Materials, Equipment and Final Placement: Verify each item below complies with approved construction documents and approved geotechnical report.

1. Material types, sizes and lengths; continuous.
2. Capacities of test elements and additional load tests as required; continuous.
3. Placement locations and plumbness; continuous.
4. Type and size of hammer; continuous.

B. Installation: Observe driving operations and maintain complete and accurate records for each element; continuous.

1. Record number of blows per foot of penetration.
2. Determine penetration required to achieve design capacity.
3. Record tip and butt elevations.
4. Document any damage to foundation element.

3.6 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES

A. Special Inspection Agency shall:

1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
2. Perform specified sampling and testing of products in accordance with specified reference standards.
3. Ascertain compliance of materials and products with requirements of Contract Documents.
4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
5. Perform additional tests and inspections required by Architect.
6. Submit reports of all tests or inspections specified.

B. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

C. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.7 TESTING AGENCY DUTIES AND RESPONSIBILITIES

A. Testing Agency Duties:

1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
2. Perform specified sampling and testing of products in accordance with specified standards.
3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
5. Perform additional tests and inspections required by Architect.
6. Submit reports of all tests or inspections specified.

B. Limits on Testing or Inspection Agency Authority:

1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the work.
3. Agency may not assume any duties of Contractor.

4. Agency has no authority to stop the work.

C. On instructions by Architect, perform re-testing required because of non-compliance with specified requirements, using the same agency.

D. Contractor will pay for re-testing required because of non-compliance with specified requirements.

3.8 CONTRACTOR DUTIES AND RESPONSIBILITIES

A. Contractor Responsibilities, General:

1. Deliver to agency at designated location, adequate samples of materials for special inspections that require material verification.

2. Cooperate with agency and laboratory personnel; provide access to approved documents at project site, to the work, to manufacturers' facilities, and to fabricators' facilities.

3. Provide incidental labor and facilities:

   a. To provide access to work to be tested or inspected.
   b. To obtain and handle samples at the site or at source of Products to be tested or inspected.
   c. To facilitate tests or inspections.
   d. To provide storage and curing of test samples.

4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing or inspection services.

5. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

END OF SECTION 01 45 33

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

B. Temporary utilities include, but are not limited to, the following:

1. Sewers and drainage.
2. Water service and distribution.
3. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
4. Heating and cooling facilities.
5. Ventilation.
6. Electric power service.
7. Lighting.
8. Telephone service.

C. Support facilities include, but are not limited to, the following:

1. Temporary roads and paving.
2. Traffic Controls
3. Project identification and temporary signs.
4. Waste disposal facilities.
5. Janitorial services.
6. Field offices.
7. Storage and fabrication sheds.
8. Lifts and hoists.
9. Temporary stairs.
10. Existing stair usage.
11. Construction aids and miscellaneous services and facilities.

D. Environmental protection facilities include, but are not limited to, the following:

1. Environmental protection.
2. Soil stabilization.
3. Stormwater control.
4. Dewatering facilities and drains.
5. Erosion and sediment controls.
6. Inspection and maintenance of erosion and sediment control measures.

7. Chemicals and pollutants controls.
8. Pest control.

E. Security facilities include, but are not limited to, the following:

1. Site enclosure fence.
2. Security enclosure and lockup.
3. Barricades, warning signs, and lights.
4. Covered walkways.
5. Temporary enclosures.
6. Temporary partitions.
7. Fire protection.

F. Related Sections include the following:

1. Division 01 Section "Summary" for limitations on utility interruptions and other work restrictions.
2. Division 01 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
3. Division 01 Section "Execution" for progress cleaning requirements.
4. Divisions 02 through 49 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.
5. Division 31 Section "Asphalt Paving" for construction and maintenance of asphalt paving for temporary roads and paved areas.
6. Division 32 Section "Concrete Paving" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.

1.3 DEFINITIONS

Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

A. General: Cost or use charges for temporary facilities to be borne by Owner. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:

1. Owner and Owner's personnel.
2. Architect and Architect's consultants.
3. Testing agencies.
4. Personnel of authorities having jurisdiction.

B. Sewer Service: Pay sewer service use charges for sewer usage by all entities for construction operations.

C. Water Service: Pay water service use charges for water used by all entities for construction operations.

D. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations.

1.5 SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Temporary Utility Reports: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

C. Utility Implementation and Termination Schedule: Concurrent with submittal of Contractor's Construction Schedule, submit a schedule indicating implementation and termination of each temporary utility.

D. Erosion and Sediment Control Plan: Before any clearing or excavation, submit written description and site drawings showing erosion and sediment controls.

1. Proposed controls shall be acceptable to the Owner, Architect, and authorities having jurisdiction before earthwork operations are started.

2. Describe the sequences and methods of installing these controls.

3. Show final and intermediate grading plans and storm water storage capacity.

4. Indicate controls, which will ensure that storm water drainage from areas to be stripped or modified passes though a filter system before being discharged.

5. Show measures to be used to control wind erosion.

6. Submit revisions to the Control Plan as conditions change during the course of the Work.

1.6 QUALITY ASSURANCE

A. Comply with applicable provisions of the following specifications and documents, latest edition unless otherwise noted:

1. ANSI A10.6, NECA's "Temporary Electrical Facilities", and NFPA 241.

2. NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

3. All applicable local, state, and federal ordinances, rules and regulations concerning erosion, sedimentation control and storm water run-of.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.

B. Temporary Use of Permanent Facilities: Assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

C. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:

1. Keep temporary services and facilities clean and neat.

2. Relocate temporary services and facilities as required by progress of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pavement: Comply with "Asphalt Paving" and "Concrete Paving" requirements.

B. Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top rails , with galvanized barbed-wire top strand.

C. Portable Chain-Link Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and bottom rails. Provide galvanized steel bases for supporting posts.

D. Lumber and Plywood: Comply with requirements in Division 06 Section "Rough Carpentry".

E. Gypsum Board: Minimum 5/8 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36/C 36M.

F. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

G. Paint: Comply with requirements in Division 09 painting Sections.

H. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.

I. Water: Potable.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.

2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack board.

3. Drinking water and private toilet with water closet and lavatory.

4. Coffee machine and supplies.

5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.

6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations. Store combustible materials apart from building.

2.3 EQUIPMENT

A. General: Provide equipment suitable for use intended.

B. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

C. Drinking-Water Fixtures: Drinking-water fountains or containerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F.

D. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

E. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.

1. Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light. Provide

waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

2. Provide 4-gang outlets, spaced so 100-foot extension cord can reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.

F. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service:

1. Install water service and distribution piping in sizes and pressures adequate for construction.

2. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.

1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.

2. Toilets: Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use. Provide separate facilities for male and female personnel.

3. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Provide separate facilities for male and female personnel.

4. Wash Facilities: Use of Owner's existing wash facilities for personnel who handle materials that require wash up will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. Supply cleaning compounds appropriate for each type of material handled. At Substantial Completion, restore these facilities to condition existing before initial use. Provide separate facilities for male and female personnel.

5. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly. Supply cleaning compounds appropriate for each type of material handled.

6. Drinking Water Facilities: Use of Owner's existing drinking water facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use. Provide separate facilities for male and female personnel.

7. Drinking Water Facilities: Provide drinking-water fixtures.

E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service overhead, unless otherwise indicated.

2. Connect temporary service to Owner's existing power source, as directed by Owner.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

1. Use of Owner's existing lighting will be permitted, as long as it maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use. Provide separate facilities for male and female personnel.

I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install a minimum of 1 (one) telephone line for each field office. Provide an additional dedicated telephone line for each facsimile machine.

1. At each telephone, post a list of important telephone numbers.

a. Police and fire departments.

b. Ambulance service.

c. Contractor's home office.

d. Architect's office.

e. Engineers' offices.

f. Owner's office.

g. Principal subcontractors' field and home offices.

2. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

J. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail for computers in common-use facilities.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas in same location as permanent roads and paved areas. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earth Moving".
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Asphalt Paving".

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

D. Parking: Provide temporary parking areas for construction personnel.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Project Identification and Temporary Signs:

1. Provide 2 (two) 8’-0” by 12’-0” foot Project identification including the following information:
   a. Project Title and Project Rendering, if available.
   b. Owner’s Name
   c. Contractor’s Name and/or Logo.
   d. Architect’s Name and/or Logo.
   e. Architect’s Consultants Name.
2. Install signs where indicated and where necessary to inform public and individuals seeking entrance to Project.
3. Provide signs as required by authorities having jurisdiction.
4. Provide temporary, directional signs for construction personnel and visitors.
5. Maintain and touchup signs so they are legible at all times.
6. Unauthorized signs are not permitted.
7. Obtain a “Sign Permit”, if required.
8. Project Identification and temporary signs shall be constructed out of painted exterior grade play, edge trim and pressure treated lumber or other materials approved by Architect.

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.

1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.

2. Develop a waste management plan for Work performed on Project. Indicate types of waste materials Project will produce and estimate quantities of each type. Provide detailed information for on-site waste storage and separation of recyclable materials. Provide information on destination of each type of waste material and means to be used to dispose of all waste materials.

3. Burning of waste at the project site is not permitted.

H. Janitorial Services: Provide janitorial services on a daily basis for temporary offices, first-aid stations, toilets, wash facilities, lunchrooms, and similar areas.

I. Lifts and Hoists:

1. Provide facilities necessary for hoisting materials and personnel.

2. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

J. Temporary Elevator Use: Refer to Division 14 Sections for temporary use of new elevators.

K. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

L. Temporary Use of Permanent Stairs: Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

3.4 ENVIRONMENTAL PROTECTION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.

B. Soil Stabilization: Apply soil stabilization within 14 days to all disturbed areas that are to be dormant for a period longer than 30 calendar days after reaching final grade.

1. Stabilize soil with mulch anchored per criteria of authorities having jurisdiction.

2. Temporarily revegetate areas that will remain in an interim condition for more than three months.

3. Roads and parking areas indicated to be paved may be covered with an appropriate aggregate base course in lieu of mulch.

4. Soils that will be stockpiled for more than 30 days must be mulched and seeded or covered with plastic or tarpaulin within 14 days after stockpile construction. If covered, securely stake or weight plastic or tarpaulin to prevent displacement.

5. Final stabilization shall be achieved through permanent vegetation and landscaping after construction of all buildings and paved surfaces.

C. Stormwater Control: Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of stormwater from heavy rains.

D. Dewatering Facilities and Drains: Comply with requirements in applicable Division 2 Sections for temporary drainage and dewatering facilities and operations not directly associated with construction activities included in individual Sections. Where feasible, use same facilities. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining property nor endanger permanent Work or temporary facilities.
2. Before connection and operation of permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed.
3. Remove snow and ice as required to minimize accumulations.

E. Erosion and Sediment Control Measures: Temporary erosion and sediment control measures shall be taken during construction. Temporary erosion and sediment controls shall consist of silt dams, traps, silt fence, barriers, and appurtenances at the top of spoil and borrow area slopes and where runoff water exits the site.

1. The sediment capacity of sediment retainage areas shall be sufficient to contain a twenty-five (25) year storm's silt.
2. Prevent sediment from entering adjacent streets and property.
3. Protect existing storm inlets adjacent to the site by a gravel filter approved by the authorities having jurisdiction.
4. Locate stone stabilization pads at all points of vehicular ingress and egress to the construction site.
5. Provide temporary erosion controls consisting of berms at the top of slopes and interceptor ditches at the ends of berms and at those locations which will eliminate or minimize erosion during construction, along with temporary seeding, temporary diversion, chutes, and down pipes and lining of water courses.
6. Hay bales may be used at specific locations to provide temporary filtration of sediment from runoff.
7. Remove and replace hay bales, which have deteriorated, and filter stone or cloth, which has become dislodged.
8. Excavate the future detention/water quality pond and construct the outlet structure/storm sewer such that the pond may function as a sediment basin during development of the site. Construct the sediment basin in accordance with the criteria of the authorities having jurisdiction. Provide temporary lined swales to convey site runoff to the pond.

F. Inspection and Maintenance of Erosion and Sediment Control Measures: Inspect erosion and sediment control measures weekly during construction and immediately after any significant runoff or snowmelt, which results in runoff.

1. Repair or replace any damage to the erosion and sediment control measures at no additional cost to the Owner.
2. Maintain the available silt holding capacity of silt dams, fence traps and barriers until no longer needed. Prior to removal, obtain concurrence of the Owner, Architect and authorities having jurisdiction.
3. Remove accumulated sediment and debris from the erosion and sediment control measures when the sediment level reaches one-half the height of the erosion and sediment control measures, or at any time the sediment or debris adversely impacts the functioning of the erosion and sediment control measures.
4. Maintain retention ponds in a condition which will retain unfiltered water.

G. Chemicals and Pollutants Control Measures:

1. Store construction materials and chemicals that could contribute pollutants to the runoff within an enclosure, container, or dike located around the perimeter of the storage area, to prevent discharge of these materials into runoff from the construction site.
2. Locate areas used for collection and temporary storage of solid and liquid waste away from the storm drainage system. Provide covering or fencing as required to prevent windblown materials; construct perimeter dike to contain liquid runoff. These measures may not be necessary if materials are immediately placed in covered waste containers.

3. Perform equipment maintenance in designated areas using measures such as drip pans to control petroleum products.

4. Immediately clean up and properly dispose of spills of construction related materials such as paints, solvents, or other chemicals.

H. Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest-control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Engage this pest-control service to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Engage this pest-control service to perform an inspection at Substantial Completion to verify that Project is free of pests and their residues at Substantial Completion and provide a written report. Obtain an extended warranty for a period of one year beyond Substantial Completion for the Owner. Perform control operations lawfully, using environmentally safe materials.

3.5 SECURITY

A. Site Enclosure Fence: Before construction operations begin install chain-link or portable chain-link enclosure fence with lockable entrance gates. Locate where indicated, or enclose entire Project site or portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering site except by entrance gates.

1. Provide gates in sizes and at locations necessary to accommodate delivery vehicles and other construction operations.

2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with one set of keys.

B. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

C. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.

D. Covered Walkway: Erect a structurally adequate, protective, covered walkway for passage of persons along adjacent public street. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.

1. Construct covered walkways using scaffold or shoring framing.

2. Provide wood-plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.

3. Extend back wall beyond the structure to complete enclosure fence.

4. Paint and maintain in a manner approved by Owner and Architect.

5. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch- thick exterior plywood.

E. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

2. Vertical Openings: Close openings of 25 sq. ft. or less with plywood or similar materials.

3. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
4. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.
5. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use fire-retardant-treated material for framing and main sheathing.

F. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

1. Construct dustproof, floor-to-ceiling partitions of not less than nominal 4-inch studs, ½ inch gypsum board, inside and outside temporary enclosure.
2. Insulate partitions to provide noise protection to occupied areas.
3. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
4. Protect air-handling equipment.
5. Weatherstrip openings.

G. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
   a. Field Offices: Class A stored-pressure water-type extinguishers.
   b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
   c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposure areas.
4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
5. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
6. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
7. Provide hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles. Provide temporary standpipes where required.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance:

1. Maintain facilities in good operating condition until removal.
2. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures".

END OF SECTION 01 50 00

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. Related Sections include the following:

1. Division 01 Section "References" for applicable industry standards for products specified.
2. Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.
3. Divisions 02 through 49 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment", "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design", including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.4 SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products which will be incorporated in the Work. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.

1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
2. Form: Tabulate information for each product under the following column headings:
   a. Specification Section number and title.
   b. Generic name used in the Contract Documents.

c. Proprietary name, model number, and similar designations.

d. Manufacturer's name and address.

e. Supplier's name and address.

f. Installer's name and address.

g. Projected delivery date or time span of delivery period.

h. Identification of items that require early submittal approval for scheduled delivery date.

3. Initial Submittal: Within 30 (thirty) days after date of notice to proceed of initial product list. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early (first 60 days) in Contract period.

4. Completed List: Within 60 (sixty) days after date of notice to proceed, submit completed product list. Include a written explanation for omissions of data. Do not include products which do not comply with the Contract requirements unless previously approved by the Architect as a Substitution or Comparable Product.

5. Architect's Action: Architect may respond in writing to Contractor within 15 (fifteen) days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.

B. Substitution Request: Submit 3 (three) copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles. Architect will return 2 (two) copy. Retain one returned copy as a Project Record.

1. Substitution Request Form: Use copy of form provided at end of Section. Substitutions will only be considered if condition under Part2 of this Specification Section are met

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified material or product cannot be provided.

b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.

c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

e. Samples, where applicable or requested.

f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.

g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.

j. Cost information, including a proposal of change, if any, in the Contract Sum.

k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.

l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 (seven) days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 (fifteen) days of receipt of request, or 7 (seven) days of receipt of additional information or documentation, whichever is later.

a. Form of Acceptance: Architect’s Supplemental Instruction or Change Order.

b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

C. Comparable Product Request: Submit 3 (three) copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles. Architect will return 2 (two) copy. Retain one returned copy as a Project Record.

1. Comparable Request Form: Use copy of substitution request form provided at end of Section.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors,that will be necessary to accommodate proposed substitution.

b. Detailed comparison of significant qualities of proposed product with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

c. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

d. Samples, where applicable or requested.

e. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.

f. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

g. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

h. Contractor's certification that proposed product complies with requirements in the Contract Documents and is appropriate for applications indicated.

i. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed product to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 (fifteen) days of receipt of request, or 7 (seven) days of receipt of additional information or documentation, whichever is later.

a. Form of Acceptance: Architect’s Supplemental Instruction.

b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.

1.5 QUALITY ASSURANCE

Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to Divisions 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures".

1.8 PRODUCT CERTIFICATES AND TEST REPORTS

A. Product (Material or Mill) Test Reports: If required by other Sections, provide a report from the manufacturer indicating the chemical, physical, and mechanical properties and performance of the material being provided. Comply with specific requirements included in the section requiring test.

B. Research/Evaluation Report:

1. If required by other Sections, provide information demonstrating that the product (material) complies with the project requirements. Comply with specific requirements included in the section requiring the Research/Evaluation Report.
2. Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
   a. Name of evaluation organization.
   b. Date of evaluation.
   c. Time period when report is in effect.
   d. Product and manufacturers' names.
   e. Description of product.
   f. Test procedures and results.
   g. Limitations of use.

C. Compatibility Test Report:

1. If required by other Sections, provide information demonstrating that the product (material) is compatible with other products (materials) that are being used on the project. Comply with specific requirements included in the section requiring the Compatibility Test Report.
2. Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion

D. Field Test Report:

1. If required by other Sections, provide information demonstrating that the installed product (material) complies with the project requirements. Comply with specific requirements included in the section requiring the Field Test Report.
2. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

1.9 MANUFACTURER'S INSTRUCTIONS

Manufacturer's written instructions and recommendations for delivery, storage, handling, installation, protection and maintenance of each product (material).

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

4. Where products are accompanied by the term "as selected," Architect will make selection.

5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.

6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.

2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.

3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.

4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.

5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.

6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.

7. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within 60 (sixty) days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's

additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.

2.3 COMPARABLE PRODUCTS

A. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

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SUBSTITUTION REQUEST FORM

PROJECT DATA

PROJECT: Anderson County Animal Shelter PROJECT NO. 18-04

OWNER: Anderson County
100 N. Main Street
Clinton, Tennessee 37716

ARCHITECT: Blankenship & Partners, LLC.
1112 E. Weisgarber Rd, 2nd Floor
Knoxville, Tennessee 37909

CONTRACTOR'S REQUEST, WITH SUPPORTING DATA

1. Reason for Substitution Request:

_____

_____

_____

_____

_____

_____

2. Comparison of Proposed Substitution with Specified Item:
   a. Section of the Specifications to which this request applies: _____
   b. Data Relative to Specified Item:
      1) Name, Brand: _____
      2) Catalog No.: _____
      3) Manufacturer: _____
   c. Data Relative to Proposed Substitution
      1) Name, Brand: _____
      2) Catalog No.: _____
      3) Manufacturer: _____

d. Significant variations, including elements such as size, weight, durability, performance, and visual effect:

_____

_____

_____

_____

3. Comparison of Product Description:

____ Product data for specified item is attached.

____ Product data for proposed substitution is attached.

____ Drawings and descriptions for specified item are attached.

____ Drawings and descriptions for proposed substitution are attached.

____ Sample for specified item is attached .

____ Sample for proposed substitution is attached .

____ List of similar installation for proposed substitution is attached.

____ Material Test Report for specified item is attached.

____ Material Test Report for proposed substitution is attached.

____ Research/evaluation Report is attached.

4. Change in Contract Sum:

Credit to Owner $ _____

Additional Cost to Owner $ _____

5. Change in Contract Time:

Contract Time _____

____ Copy of Revised Contractor's Construction Schedule is attached.

6. Effect of the proposed substitution on the Work:

Changes or Modifications required to Other Parts of the Work: _____

_____

_____

Changes or Modifications required to Other Contracts: _____

_____

_____

_____

CONTRACTOR'S STATEMENT OF CONFORMANCE

I/we have investigated the proposed substitution. I/we:

1. believe and certify that it is equal or superior in all respects to the originally specified product, except as stated in 2 above;

2. certify that it will perform adequately in the application indicated;

3. will provide the same warranty or guaranty as required in the Contract Documents;

4. have included all cost data and cost implications of the proposed substitution, including, if required, costs to other contractors, and redesign and special inspection costs caused by the use of this product;

5. will coordinate the incorporation of the proposed substitution in the Work;

6. will modify other parts of the Work as may be needed to make all parts of the Work complete and functioning;

7. have verified that use of this substitution conforms to all applicable codes;

Contractor: _____ Date _____

CONTRACTOR'S WAIVER OF RIGHTS

I/we waive future claims for added cost or time to Owner caused by the proposed substitution.

Contractor: _____ Date _____

ARCHITECT'S REVIEW AND ACTION

____ Provide more information in the following categories and resubmit:

_____

_____

____ Sign Contractor's Statement of Conformance and resubmit.

____ The proposed substitution is approved.

____ The proposed substitution is approved, with the following conditions:

_____

_____

____ The proposed substitution is rejected.

The following changes will be made by Change Order:

Addition to/Deduction from the Contract Sum: $ _____

Addition to/Deduction from the Contract Time _____ days

_____ _____

Blankenship & Partners, LLC Date

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SECTION 01 73 00 – EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. Related Sections include the following:

1. Division 01 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 01 Section "Submittal" for submitting surveys.
3. Division 01 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
4. Division 01 Section "Contract Closeout" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Landfill Receipts: If required, submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

D. Final Property Survey: Submit 10 (ten) copies showing the Work performed and record survey data.

1.4 QUALITY ASSURANCE

Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions:

1. The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work. Before construction, verify the location and points of connection of utility services.

2. Submit, with "Initial Application for Payment", a written statement accepting the existing conditions as in compliance with the Contract Documents or listing conditions that are not in compliance with the Contract Documents that will be detrimental to the Work.

B. Existing Utilities:

1. The existence and location of underground and other utilities and construction indicated as existing are not guaranteed.

2. Before beginning site work, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

3. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.

4. Verify the characteristics and capacity of existing utilities, which are being connected to, comply with the project requirements.

5. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

   a. Description of the Work.

   b. List of detrimental conditions, including substrates.

   c. List of unacceptable installation tolerances.

   d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: If required furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.

2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

3. Inform installers of lines and levels to which they must comply.

4. Check the location, level and plumb, of every major element as the Work progresses.

5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.

6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of 2 (two) permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey".

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching". Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 73 00

SECTION 01 73 29 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching of existing construction required by testing of in-place construction or correction of work. This includes cutting and patching existing construction, lawns and planting areas adjacent to the project site for the connections to existing utilities, if required.

B. Related Sections include the following:

1. Divisions 2 through 32 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
2. Division 07 Section "Penetration Firestopping" for patching fire-rated construction.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:

1. Primary operational systems and equipment.
2. Air or smoke barriers.
3. Fire-suppression systems.
4. Mechanical systems piping and ducts.
5. Control systems.
6. Communication systems.
7. Conveying systems.
8. Electrical wiring systems.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Exterior curtain-wall construction.

4. Equipment supports.
5. Piping, ductwork, vessels, and equipment.
6. Noise- and vibration-control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.5 WARRANTY

Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces,

use materials that visually match in-place adjacent surfaces to the fullest extent possible. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

B. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

C. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.

D. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

a. Clean piping, conduit, and similar features before applying paint or other finishing materials.

b. Restore damaged pipe covering to its original condition.

3. Floors and Walls:

a. Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

b. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

E. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 73 29

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SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Warranties.
3. Final cleaning.

B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
2. Division 01 Section "Execution" for progress cleaning of Project site.
3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
4. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
5. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
6. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBMITTALS

A. Request for Substantial Completion Inspection.

B. Certified copy of Architect's Substantial Completion inspection list.

C. Evidence of final, continuing insurance coverage complying with insurance requirements.

D. Pest-control final inspection report and warranty.

E. List of incomplete items (punch list).

1.4 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.5 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures".
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection:

1. Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
2. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.6 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit 2 (two) copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
   a. Project name.
   b. Date.
   c. Name of Architect.
   d. Name of Contractor.
   e. Page number.

1.7 WARRANTIES

A. Submittal Time:

1. Unless otherwise indicated, submit written warranties with the Final Application for Payment.
2. Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within 15 (fifteen) days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

d. Remove tools, construction equipment, machinery, and surplus material from Project site.

e. Remove snow and ice to provide safe access to building.

f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

h. Sweep concrete floors broom clean in unoccupied spaces.

i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.

j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

k. Remove labels that are not permanent.

l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

m. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

n. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

o. Replace parts subject to unusual operating conditions.

p. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

q. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

r. Clean ducts, blowers, and coils if units were operated without filters during construction.

s. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

t. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01 77 00

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SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Maintenance manuals for the care and maintenance of products, materials, finishes, systems and equipment.

B. Related Sections include the following:

1. Division 01 Section "Submittal" for submitting copies of submittals for operation and maintenance manuals.
2. Division 01 Section "Contract Closeout" for submitting operation and maintenance manuals.
3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
4. Divisions 02 through 32 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

A. Final Submittal:

1. Submit 1 (one) copy of each manual in final form at least 15 (fifteen) days before final inspection. Architect will return copy with comments within 15 (fifteen) days after final inspection.
2. Correct or modify each manual to comply with Architect's comments. Submit 3 (three) copies of each corrected manual within 15 (fifteen) days of receipt of Architect's comments.

1.5 COORDINATION

Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.
6. Name and address of Architect.
7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents:

1. List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
2. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
   a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
   b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL", Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.

b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.

10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.

2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds:

1. Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
2. Include procedures to follow and required notifications for warranty claims.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training videotape, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds:

1. Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.

2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data:

1. Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

2. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.

2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Project Record Documents."

G. Comply with Division 01 Section "Contract Closeout" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous Record Submittals.

B. Related Sections include the following:

1. Division 01 Section "Contract Closeout" for general closeout procedures.
2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Divisions 02 through 32 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Submit 1 (one) set of marked-up Record Prints.

B. Record Specifications: Submit 1 (one) copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data:

1. Submit 1 (one) copy of each Product Data submittal.
2. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

D. Record Miscellaneous Record Submittals: Submit 1 (one) set of Miscellaneous Record Submittals.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

b. Accurately record information in an understandable drawing technique.

c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.

b. Revisions to details shown on Drawings.

c. Depths of foundations below first floor.

d. Locations and depths of underground utilities.

e. Revisions to routing of piping and conduits.

f. Revisions to electrical circuitry.

g. Actual equipment locations.

h. Duct size and routing.

i. Locations of concealed internal utilities.

j. Changes made by Change Order or Construction Change Directive.

k. Changes made following Architect's written orders.

l. Details not on the original Contract Drawings.

m. Field records for variable and concealed conditions.

n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.

4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.

6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Identification: As follows:

a. Project name.

b. Date.

c. Designation "PROJECT RECORD DRAWINGS".

d. Name of Architect.

e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders**,** Record Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders**,** Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Miscellaneous Record Submittals: Maintain and submit as part of final completion submittals, 1 (one) copy of each miscellaneous submittal required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work.

B. Miscellaneous Record Submittals include, but are not limited to, certificates and informational submittals retained that do not relate to a specific product.

C. Assemble Record Submittals retained for Project Record Documents by specification sections. Bind or file record submittals and identify each, ready for continued use and reference.

1. Do not include product data submittals that are part of Record Product Data.
2. Note related Change Orders, Record Drawings, and Record Specifications where applicable.

D. Miscellaneous Record Submittals Binder:

1. Organize submittals into an orderly sequence based on the table of contents of the Project Manual.
2. Bind submittals in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
3. Provide heavy paper dividers with plastic-covered tabs for each product. Mark tab to identify the submittal. Provide a typed description of the submittal, including the name of the product and the name, address, and telephone number of Installer.
4. Identify each binder on the front and spine with the typed or printed title "SUBMITTALS", Project name, and name of Contractor.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 01 78 39

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training DVD.

B. Related Sections include the following:

1. Division 01 Section "Project Management and Coordination" for requirements for pre-instruction conferences.
2. Divisions 02 through 32 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 SUBMITTALS

A. Instruction Program:

1. Submit 2 (two) copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
2. At completion of training, submit 1 (one) complete training manual for Owner's use.

B. Qualification Data: For instructor and photographer.

C. Instructional Program Attendance Report: For each training module, submit list of participants and length of instruction time.

D. Instructional Program Evaluations Report: For each participant and for each training module, submit results and documentation of performance-based test.

E. Demonstration and Training DVD: Submit 2 (two) copies within 7 (seven) days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:
   a. Name of Project.
   b. Name and address of photographer.
   c. Name of Architect.
   d. Name of Contractor.
   e. Date videotape was recorded.
   f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
2. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover

sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

F. Meeting Records: Minutes of pre-instruction conference.

1.4 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

B. Photographer Qualifications: A photographer who is experienced photographing construction projects.

C. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

1. Fire-protection systems, including fire alarm and fire-extinguishing systems.
2. Intrusion detection systems.
3. Conveying systems, including elevators..
4. Medical equipment, including medical gas equipment and piping.
5. HVAC systems, including air-handling equipment and air distribution systems.
6. HVAC instrumentation and controls.
7. Electrical service and distribution, including transformers, switchboards, npanelboards, uninterruptible power supplies, and motor controls.
8. Lighting equipment and controls.
9. Communication systems, including surveillance and voice and data equipment.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
   a. System, subsystem, and equipment descriptions.
   b. Performance and design criteria if Contractor is delegated design responsibility.
   c. Operating standards.
   d. Regulatory requirements.
   e. Equipment function.
   f. Operating characteristics.
   g. Limiting conditions.
   h. Performance curves.
2. Documentation: Review the following items in detail:
   a. Emergency manuals.
   b. Operations manuals.
   c. Maintenance manuals.
   d. Project Record Documents.
   e. Identification systems.
   f. Warranties and bonds.
   g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.
   d. Operating instructions for conditions outside of normal operating limits.
   e. Sequences for electric or electronic systems.
   f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.
   h. Normal shutdown instructions.
   i. Operating procedures for emergencies.
   j. Operating procedures for system, subsystem, or equipment failure.

k. Seasonal and weekend operating instructions.

l. Required sequences for electric or electronic systems.

m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.

b. Checking adjustments.

c. Noise and vibration adjustments.

d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.

b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.

b. Types of cleaning agents to be used and methods of cleaning.

c. List of cleaning agents and methods of cleaning detrimental to product.

d. Procedures for routine cleaning

e. Procedures for preventive maintenance.

f. Procedures for routine maintenance.

g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.

b. Repair instructions.

c. Disassembly; component removal, repair, and replacement; and reassembly instructions.

d. Instructions for identifying parts and components.

e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Owner will furnish an instructor to describe Owner's operational philosophy.

2. Owner will furnish Contractor with names and positions of participants.

C. Scheduling:

1. Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

2. Schedule training with Owner with at least 7 (seven) days' advance notice.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of performance-based test.

E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING DVD

A. General:

1. Engage a qualified commercial photographer to record demonstration and training videotapes. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

2. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. DVD Format: Provide high-quality DVD.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.

D. Narration: Describe scenes on videotape by audio narration by microphone while or dubbing audio narration off-site after DVD is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.

E. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

END OF SECTION 01 79 00

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SECTION 02 24 19 – SELECTIVE DEMOLITION
PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section
.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 015639 "Temporary Tree and Plant Protection" for temporary protection of existing trees and plants that are affected by selective demolition.
3. Section 017300 "Execution" for cutting and patching procedures.
4. Section 013516 "Alteration Project Procedures" for general protection and work procedures for alteration projects.
5. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse and/or storage.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at the Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Engineering Survey: Submit engineering survey of condition of building.

C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

D. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

E. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

G. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.9 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.
2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
3. Owner will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.

F. Historic Areas: Demolition and hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.

G. Storage or sale of removed items or materials on-site is not permitted.

H. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.10 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.

B. Notify warrantor on completion of selective demolition and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.11 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

D. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.

1. Comply with requirements specified in Section 013233 "Photographic Documentation."
2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.

2. Arrange to shut off utilities with utility companies.

3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

   a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
   b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
   c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
   d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
   e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
   f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
   g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

C. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

D. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least 2 hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Work in Historic Areas: Selective demolition may be performed only in areas of Project that are not designated as historic. In historic spaces, areas, and rooms, or on historic surfaces, the terms "demolish" or "remove" shall mean historic "removal" or "dismantling" as specified in Section 024296 "Historic Removal and Dismantling."

D. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

E. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw and then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished and then break up and remove.

E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings

F. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight, if applicable.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

SECTION 02 60 00- OFF-SITE TREATMENT AND DISPOSAL

PART 1 – GENERAL

1.1 SUMMARY

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this section.
B. Related Sections include the following:

1. Division 1 Section "Summary" and Payment Procedures
2. Division 2 Section "Off-Site Transportation"

1.2 PERFORMANCE REQUIREMENTS

A. Provide for off-site disposal of soil and associated construction debris, and any other hazardous materials.
B. Record volumes and character of materials disposed.
C. Ensure that measuring devices used are certified by the appropriate state inspection agency.
D. Provide approved permit required for treatment and disposal as outlined in Division 1010, Section 1.04 A.

PART 2 - PRODUCTS Not Applicable

PART 3 - EXECUTION

3.1 PREPARATION:

A. Prior to the commencement of work, verify the schedule with the Owner's Representative.

3.2 MANIFEST RECORDS:

A. Originate, maintain, and provide Transporter with copies of waste shipment manifest records for all hazardous wastes; verify wastes and quantities of each load shipped.
B. The manifest forms and records shall be consistent with USEPA, TDOT, and U.S. Department of Transportation requirements.
C. The Owner's authorized personnel will sign the hazardous waste manifest. The Owner's Representative will review the manifest for completeness and accuracy prior to final release.

3.3 TREATMENT AND DISPOSAL FACILITY

A. The Subcontractor shall be responsible for ensuring:

1. Acceptance and treatment of the specified waste at the approved retorting and disposal facility.
2. That the facility is properly permitted to accept the stated waste.
3. That the facility provides the stated disposal services.
4. That the disposal facility is in compliance with its permit(s) at the time of waste disposal.

3.4 RECORDKEEPING

A. Provide a final report to the Owner's Representative with written documentation and records verifying receipt and the quantity received of each load at the disposal facility and verification of proper disposal. Copies of the manifest and actual disposal receipt shall be provided to the Owner's Representative.

END OF SECTION 02 60 00

SECTION 02 82 13 - ASBESTOS ABATEMENT

1.01 PROJECT DIRECTORY:

Architect:	Blankenship & Partners **1112 E. Weisgarber Road, Suite 201** Knoxville, Tennessee 37909
Representative: Telephone:	William R. Blankenship, AIA (865) 251-2585
Asbestos Abatement Asbestos Project Designer:	S&ME, Inc. 5801 Middlebrook Pike Knoxville, Tennessee 37921
Representative: Telephone:	Ms. Lori Pieniazek (865) 567-5288
Asbestos Project Desing Reviewer	David M. McCurry A-PD-48819-172577 (423) 534-0187

1.02 PROJECT/WORK IDENTIFICATION:

A. Project name is **Jefferson Elementary School Chalkboard Mastic Abatement Design**. Specifically, this design addresses removal of existing chalkboards and abatement of asbestos-containing mastic associated with chalkboard assemblies throughout Jefferson Elementary School located in Jefferson City, Tennessee.

This Abatement Design is based on bulk asbestos sampling performed by S&ME in July 2026 and laboratory analysis performed by Eurofins Built Environment Testing East, LLC. Two bulk samples, identified as CHALKB ASB-1 and CHALKB ASB-2, were collected from brown/black mastic associated with chalkboard assemblies. Laboratory analysis identified the brown/black mastic in both samples as containing **5 percent chrysotile asbestos**. The associated off-white cementitious material was reported as containing no asbestos detected.

Based on the positive analytical results and the similarity of the mastic associated with the chalkboard assemblies, all similar brown/black mastic located behind or otherwise associated with chalkboards throughout Jefferson Elementary School shall be presumed to contain asbestos and shall be treated, removed, handled, and disposed of as asbestos-containing material (ACM), regardless of whether an individual chalkboard location was sampled.

- The Abatement Design was prepared based on the available project information and documents identified below. The Abatement Contractor shall field verify existing conditions, material locations, dimensions, and quantities prior to submitting a bid and prior to commencement of the Work.
- Asbestos NESHAP (National Emission Standards for Hazardous Air Pollutants) Inspection, performed by Helton and Associates, Inc., May 2024, October 2025, and November 2025;
- Asbestos Hazard Emergency Response Act (AHERA) Management Plan, Jefferson County Schools, Jefferson Elementary School, March 30, 2025;
- Jefferson Elementary School Renovation, Hazmat Plan, Sheet A1.1, prepared by Blankenship & Partners, LLC; and
- Asbestos Bulk Analytical Report, Eurofins Built Environment Testing East, LLC, Lab Code 765184-1, dated July 9, 2026.

This Work involves abatement or removal of the following materials:

Jefferson Elementary School (owner-provided asbestos inspection and Hazmat Plan)

1. **Chalkboards and Associated Components:** Carefully remove existing chalkboards, trim, fasteners, mounting components, and other materials as necessary to access the underlying asbestos-containing mastic. Chalkboards and associated components that become contaminated with asbestos-containing material (ACM) or cannot be adequately decontaminated shall be handled and disposed of as asbestos-contaminated waste. Installation of replacement chalkboards and associated finishes shall be performed by others.
2. **Asbestos-Containing Chalkboard Mastic:** Properly remove and dispose of brown/black mastic located behind or otherwise associated with chalkboards throughout Jefferson Elementary School. Bulk samples CHALKB ASB-1 and CHALKB ASB-2 collected by S&ME identified the brown/black mastic as containing 5 percent chrysotile asbestos.
   Based on the representative positive analytical results, **all similar brown/black mastic located behind or otherwise associated with chalkboards throughout Jefferson Elementary School shall be presumed to contain asbestos and shall be treated, removed, handled, and disposed of as ACM, regardless of whether an individual chalkboard location was sampled.**
3. **Previously Removed Chalkboards:** Where chalkboards have previously been removed and similar brown/black mastic remains on the wall or underlying substrate, the remaining mastic shall be presumed ACM and shall be properly removed and disposed of as asbestos-containing waste.
4. **Wall Substrate:** Following removal of the chalkboards and asbestos-containing mastic, affected wall surfaces shall be free of visible ACM, mastic residue, and asbestos-containing debris. The underlying off-white cementitious material represented by samples CHALKB ASB-1 and CHALKB ASB-2 was reported as *no asbestos detected*. Repair, refinishing, painting, and other restoration of wall surfaces shall be performed by others unless otherwise indicated in the Contract Documents.
5. **Other Suspect Materials:** Any suspect or concealed materials encountered during the Work that are not identified within the Contract Documents and are not clearly identified as non-ACM shall not be disturbed. Work in the affected area shall stop until the material has been evaluated by the Owner's representative.

The Abatement Contractor shall field verify the number, dimensions, locations, and existing conditions of chalkboards and associated mastic throughout Jefferson Elementary School prior to submitting a bid and prior to commencement of the Work. Quantities provided within the Contract Documents are approximate and are not provided for bidding purposes.

The Abatement Contractor shall be responsible for determining the actual quantities necessary to complete the Work.

Field verification of quantities or locations shall not alter the asbestos classification established by this Abatement Design. All similar brown/black mastic associated with chalkboards throughout the school shall be presumed ACM based on the representative positive analytical results and shall be handled accordingly.

Asbestos-Containing Materials

The following material is specifically included in the Work:

1. **Brown/black mastic associated with chalkboards throughout Jefferson Elementary School** – Presumed asbestos-containing material based on representative bulk samples CHALKB ASB-1 and CHALKB ASB-2, each reported as containing 5 percent chrysotile asbestos.

All similar brown/black mastic encountered behind or otherwise associated with chalkboards throughout the school shall be presumed ACM and included in the abatement Work, regardless of whether the individual location was sampled.

1.03 SUMMARY OF WORK:

A. The Work includes removal of existing chalkboards as necessary to access the underlying mastic and the removal, handling, packaging, transportation, and disposal of asbestos-containing mastic associated with chalkboards throughout Jefferson Elementary School. Where chalkboards have previously been removed, remaining similar brown/black mastic on the wall or underlying substrate shall also be included in the Work.

   Based on representative bulk samples CHALKB ASB-1 and CHALKB ASB-2, which each contained 5 percent chrysotile asbestos, all similar brown/black mastic located behind or otherwise associated with chalkboards throughout Jefferson Elementary School shall be presumed to contain asbestos and shall be treated, removed, handled, and disposed of as asbestos-containing material (ACM), regardless of whether an individual chalkboard location was sampled.

B. The Abatement Contractor shall establish regulated work areas and implement appropriate engineering controls, critical barriers, and work practices for removal of the asbestos-containing chalkboard mastic in accordance with these specifications and applicable federal, state, and local requirements. Heating, ventilating and air conditioning (HVAC) supply and return openings serving the regulated work area shall be isolated and sealed as necessary to prevent migration of asbestos fibers or debris outside the work area.

   Removal methods shall be selected to minimize breakage, abrasion, and fiber release. The ACM shall be adequately wetted and maintained in a wet condition during removal. Dry sanding, dry grinding, dry scraping, or other uncontrolled abrasive methods shall not be permitted.

C. Final visual assessments, area air monitoring, and final clearance air sampling shall be performed as required by these specifications prior to release of the regulated work area for subsequent renovation activities. Final visual assessments and clearance air sampling shall be performed by a Tennessee-accredited Asbestos Project Monitor independent of the Abatement Contractor and retained in accordance with the Contract Documents.

D. The Abatement Contractor shall field verify the number, dimensions, locations, quantities, existing conditions of chalkboards and associated mastic throughout Jefferson Elementary School prior to submitting a bid and prior to commencement of the Work. Quantities shown or otherwise provided within the Contract Documents are approximate and are provided for bidding purposes only. The Contractor shall be responsible for determining the actual quantities necessary to complete the Work.

   Field verification of quantities or locations shall not alter the asbestos classification established by this Abatement Design. All similar brown/black mastic associated with chalkboards throughout the school shall be presumed ACM based on the representative positive analytical results and shall be included in the Work.

E. The Work shall include all labor, materials, equipment, controls, temporary protection, removal, cleaning, waste handling, transportation, disposal, and other activities necessary to provide a complete asbestos abatement project in accordance with these specifications.

   The Work shall be considered complete following removal of the specified asbestos-containing mastic; removal of visible ACM and asbestos-containing debris from affected surfaces and work areas; satisfactory final visual assessment; achievement of applicable final clearance criteria; removal of Contractor equipment and waste from the site; and submission of required project closeout and waste disposal documentation.

   Repair, refinishing, painting, and installation of replacement chalkboards or other architectural finishes following completion of asbestos abatement shall be performed by others unless specifically indicated otherwise in the Contract Documents.

For purposes of abatement sequencing, final visual assessment, and final clearance air sampling, Jefferson Elementary School shall be divided into three homogeneous work areas corresponding to the three school wings. Individual classrooms within each wing shall be protected and isolated as required by this Specification but shall not constitute separate homogeneous work areas solely for purposes of final TEM clearance air sampling.

1.04 POTENTIAL ASBESTOS HAZARD:

A. The disturbance or dislocation of ACM may result in the release of asbestos fibers into the building environment, creating a potential health hazard to workers and building occupants. All personnel involved in asbestos-related activities shall be properly trained and licensed for their specific tasks (e.g., accredited asbestos worker, supervisor, etc.) in accordance with State of Tennessee requirements.

B. All workers, supervisory personnel, subcontractors, and consultants present at the site during asbestos abatement activities shall be informed of the presence of ACM, the associated health hazards, and the required work practices and protective measures. Coordination shall be maintained to prevent unauthorized access to the regulated work area and to ensure safe interaction between abatement activities and other site operations.

C. Where personnel may encounter, disturb, or otherwise work in the vicinity of identified or suspect ACM, appropriate continuous control measures shall be implemented to prevent exposure to airborne asbestos fibers. Such measures shall include, but are not limited to, engineering controls, regulated work areas, containment (as applicable), and adherence to the procedures described herein, as well as compliance with all applicable federal, state, and local regulations.

D. Any suspect or concealed materials not clearly identified as non-ACM shall not be disturbed. Work shall stop in the affected area and the material shall be evaluated by the Owner’s representative prior to disturbance.

1.05 ASBESTOS-CONTAINING MATERIALS:

A. The ACM addressed by this Abatement Design consists of brown/black mastic located behind or otherwise associated with chalkboards at Jefferson Elementary School. Representative bulk samples CHALKB ASB-1 and CHALKB ASB-2 collected by S&ME were analyzed by polarized light microscopy (PLM) and each identified the brown/black mastic as containing 5 percent chrysotile asbestos.

Based on the representative positive analytical results, all similar brown/black mastic located behind or otherwise associated with chalkboards throughout Jefferson Elementary School shall be presumed to contain asbestos and shall be treated, removed, handled, and disposed of as ACM, regardless of whether an individual chalkboard location was sampled. This requirement also applies to similar mastic remaining at locations where chalkboards have previously been removed.

B. The Abatement Contractor shall field verify all existing conditions and the number, dimensions, locations, and quantities of chalkboards and associated mastic prior to submitting a bid and prior to commencing the Work. The Contractor shall include all quantities necessary to provide complete removal of the asbestos-containing chalkboard mastic specified herein. Field verification of quantities or locations shall not alter the asbestos classification established by this Abatement Design.

C. Other suspect or concealed materials encountered during the Work that are not identified within the Contract Documents and are not clearly identified as non-ACM shall not be disturbed. Work in the affected area shall stop until the material has been evaluated by the Owner's representative.

1.06 DESCRIPTION OF WORK FOR PROJECT COORDINATION:

A. Minimum administrative and supervisory requirements for coordination of the Work shall include, but are not limited to, the following:
- Administrative and supervisory personnel
- Coordination with the General Contractor and other trades
- Special reports and documentation as required

1.07 ADMINISTRATIVE AND SUPERVISORY PERSONNEL:

A. The titles and requirements of administrative and supervisory personnel shall be in accordance with Tennessee Rule 1200-01-20-.03, "Accreditation of Persons and Firms Engaged in Asbestos Activities." Definitions and requirements are provided in Tennessee Rule 1200-01-20-.01(2), "Asbestos Accreditation Requirements: General."

B. **General Superintendent:** Maintain a full-time General Superintendent experienced in the administration and supervision of asbestos abatement projects, including work practices, protective measures for building and personnel, and disposal procedures. This individual shall serve as the Competent Person as defined by OSHA in 29 Code of Federal Regulations (CFR) 1926 and shall be the Contractor's representative responsible for compliance with all applicable federal, state, and local regulations, particularly those relating to ACM. This person shall have completed an Environmental Protection Agency (EPA)-approved asbestos training course (or equivalent) and shall have a minimum of five years of relevant on-the-job experience and meet all additional requirements of 29 CFR 1926.

C. **Head Foreman:** Maintain one Head Foreman experienced in the supervision of asbestos abatement projects, including work practices, protective measures, and disposal procedures. This individual shall have a minimum of two years of full-time experience in responsible charge of asbestos removal operations of similar scope and magnitude. The Head Foreman shall be available to the Crew Leader via communication such as phone or text at all times while Work is in progress.

D. **Crew Leader(s):** Provide one experienced AHERA-accredited and State of Tennessee licensed Supervisor for every six asbestos workers utilized on the project. Each Supervisor shall have a minimum of one year of experience in asbestos removal operations of similar scope and magnitude. Crew Leader(s) or supervisors shall remain within the Work Area(s) at all times while Work is in progress.

1.08 SPECIAL REPORTS:

A. **General:** Except as otherwise indicated, submit special reports to the General Contractor's Representative within one business day of any occurrence requiring a report. Provide copies to the Architect and other affected parties.

B. **Reporting Unusual Events and Regulatory Inspections:** When an unusual or significant event occurs, or when an inspection is conducted by a regulatory agency or other outside party, prepare and submit a special report documenting the chain of events, personnel involved, response actions taken by the Contractor, and an evaluation of the results or potential impacts. When such events are anticipated, notify the General Contractor's Representative at the earliest possible time.

C. **Reporting Accidents:** Prepare and submit reports for all significant accidents occurring at the site or in connection with the Work. Reports shall document the circumstances, actions taken, and outcomes, and shall comply with applicable industry standards. A significant accident includes any event involving personal injury, property damage, or a situation posing a substantial risk of injury or loss.

D. **Contingency Plan:** Prior to commencing Work, prepare and submit a contingency plan addressing potential emergencies, including but not limited to fire, injury, power failure, negative air system failure, supplied air system failure, or any event requiring modification of decontamination or Work Area isolation procedures. The plan shall include procedures for maintaining containment integrity and safe decontamination. Nothing in this specification shall impede safe egress from the Work Area or the provision of emergency medical assistance.

1.09 DEFINITIONS:

Adequately Wet: To sufficiently mix or penetrate with amended water or similar to prevent the potential release of particulates.

Aerosol: A system consisting of particles, solids, or liquids, suspended in air.

Airlock: System for permitting ingress and egress without permitting air movement between a contaminated area and an uncontaminated area, typically consisting of two curtained doorways protected by two overlapping polyethylene sheets and separated by a sufficient distance such that one passes through one doorway into the chamber, allowing the doorway sheeting to overlap and close off the opening before proceeding through the second doorway. The airlock maintains a pressure differential between the contaminated and uncontaminated areas thereby further minimizing flow-through contamination.

Air Monitoring: The process of measuring the fiber content of a specific volume of air.

Amended Water: Water containing a wetting agent or surfactant with a surface tension of 29 dynes per square centimeter when tested in accordance with ASTM D 1331.

Asbestos: The asbestiform varieties of serpentinite (chrysotile), riebeckite (crocidolite), cummingtonite-grunerite (amosite), anthophyllite, and actinolite-tremolite. For purposes of determining respiratory and worker protection both the asbestiform and non-asbestiform varieties of the above minerals and any of these materials that have been chemically treated and/or altered shall be considered as asbestos.

Asbestos Abatement Consultant: General Contractor's or building owner's representative during asbestos abatement activities. The asbestos-abatement consultant may provide such asbestos related services such as project monitoring, additional inspection services, project design services, and air clearance testing upon completion of asbestos abatement activities. The contracted Asbestos-Abatement Consultant will be on site during active asbestos removal activities.

Asbestos-Containing Material (ACM): Any material containing more than one percent asbestos of any of the six legally recognized types of asbestos or mixture of types.

Asbestos-Containing Waste Material: Any material which is or is suspected of being or any material contaminated with an asbestos-containing material which is to be removed from a Work Area for disposal.

Authorized Visitor: The Owner, General Contractor, General Contractor's Representative, the Architect, the Asbestos Abatement Consultant, or a representative of any federal, state and local regulatory or other agency having authority over the project.

Barrier: Any surface or material that seals off the Work Area to inhibit the movement of fibers (such as a critical barrier).

Breathing Zone: A hemisphere forward of the shoulders with a radius of approximately six inches to nine inches.

Certified Industrial Hygienist (CIH): An industrial hygienist certified in Comprehensive Practice by the Board for Global EHS Credentialing (BGC).

Clean Room: An uncontaminated area or room which is part of the worker decontamination enclosure system, with provisions for storage of workers' street clothes and protective equipment. Also known as the "Change Room."

Clearance Monitoring: Area air sampling process using aggressive clearance sampling techniques to determine the airborne concentrations of residual fibers upon conclusion of asbestos abatement and passing of a visual clearance by the accredited air monitor.

Clearance Criteria: Airborne concentration of 0.01 fibers per cubic centimeter (f/cc) of air via phase contrast microscopy (PCM) or 70 structures per square millimeter (S/mm^2) via transmission electron microscopy (TEM) under AHERA.

Critical Barrier: A leak-tight seal applied from within the work area to isolate vents, windows, doors, and any other cavity or opening to the contaminated work area.

Curtained Doorway: A device to allow ingress and egress from one room to another while minimizing air movement between the rooms. Typically constructed by placing two overlapping sheets of plastic over an existing or temporarily framed doorway and securing each along the top of the doorway, with the vertical edge of one along one vertical side of the doorway, and the vertical edge of the other along the opposite vertical side. Two curtained doorways spaced a minimum of three feet apart for an airlock.

Decontamination Enclosure System: A series of connected rooms, with curtained doorways between any two adjacent rooms, for the decontamination of workers or of materials and equipment. A decontamination enclosure system always contains airlocks.

Demolition: The wrecking or taking out of any building component, system, finish or assembly of a facility together with any related handling operation.

Disposal Bag: Six-mil thick leak-tight plastic bags used for transporting asbestos waste from Work Area to disposal site.

Each is labeled as follows:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST
AVOID CREATING DUST

and

R.Q. Hazardous Substance
Solid, N.O.S. (asbestos)
ORM/E, NA-9188

and

Name of Waste Generator:
(Name of Contractor and Owner)

Location of Waste Generated:
(Name of Waste Disposal Facility)

Encapsulation: A form of abatement involving the treatment of regulated ACM (RACM) with a liquid which covers the surface with a protective coating (bridging) or embeds fibers in an adhesive matrix (penetrating) to prevent the release of asbestos fibers.

Enclosure: The construction of an airtight, impermeable, permanent barrier around asbestos-containing material to control the release of asbestos fibers into the air.

Equipment Decontamination Enclosure System: A decontamination enclosure system for materials and equipment, typically consisting of a designated area of the Work Area, a washroom, and an uncontaminated area.

Equipment Room: A contaminated area or room which is part of the worker decontamination enclosure system, with provisions for storage of contaminated clothing and equipment.

Filter: A media component used in respirators to remove solid or liquid particles from the inhaled air.

Friable Asbestos-containing Material: ACM that when dry can be or has been crumbled, pulverized, or reduced to powder by hand pressure, and contains more than one percent asbestos.

Grind: To reduce to powder or small fragments. Grinding includes mechanical chipping or drilling.

HEPA Filter: A High Efficiency Particulate Air (HEPA) filter capable of trapping and retaining 99.97 percent of asbestos fibers greater than 0.3 microns in length.

HEPA Filter Vacuum Collection Equipment (or vacuum cleaner): High Efficiency Particulate Air filtered vacuum collection equipment with a filter system capable of collecting and retaining asbestos fibers. Filters should be of 99.97 percent efficiency for retaining fibers of 0.3 microns or larger.

Holding Area: A chamber between the washroom and uncontaminated area in the equipment decontamination enclosure system. The holding area constitutes an airlock.

Local Exhaust Ventilation System: A local exhaust system, utilizing HEPA filtration capable of maintaining a negative pressure inside the Work Area and a constant air flow from adjacent areas into the Work Area and exhausting that air outside the Work Area.

Lockdown: A procedure whereby the surfaces within the Work Area are coated with latex paint or other suitable sealant, using an airless sprayer, after final visual clearance from the Asbestos Abatement Consultant to fix in place and render non-friable, any traces of asbestos material that may remain.

Negative Pressure: Air pressure lower than surrounding areas, generally caused by exhausting air from a sealed space (Work Area). Negative pressure is observed by the overlapping plastic flaps at the entrance to a negative pressure area floating inward towards the air movement.

Negative Pressure Respirator: A respirator in which the air pressure inside the respiratory inlet covering is positive during exhalation in relation to the air pressure of the outside atmosphere and negative during inhalation in relation to the air pressure of the outside atmosphere.

Owner/Operator: Any person or contractor who owns, leases, operates, controls, or supervises a facility being demolished or renovated, or any person who operates, controls, or supervises the demolition or renovation operation, or both.

Personal Monitoring: Sampling of the asbestos fiber concentrations within the breathing zone of an employee performed in accordance with 29 CFR 1926.1101. The cost and responsibility of personal sampling is that of the abatement contractor.

Protection Factor: The ratio of the ambient concentration of an airborne substance to the concentration of the substance inside the respirator at the breathing zone of the wearer. The protection factor is a measure of the degree of protection provided by a respirator to the wearer.

Regulated Area: Area where asbestos removal operations are performed which is isolated by physical boundaries, which assist in the prevention of the uncontrolled release of asbestos dust, fibers or debris.

Regulated Asbestos-Containing Material (RACM): (a) Friable asbestos-containing material; (b) Category I non-friable ACM that has become friable; (c) Category I non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading; or (d) Category II non-friable ACM that is likely to become or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations.

Removal: The act of removing asbestos-containing or contaminated materials from a structure and depositing in a disposal site permitted to accept the specialty waste (i.e., friable and non-friable asbestos).

Respirator: A device designed to protect the wearer from the inhalation of harmful atmospheres.

Shower Room: A room constituting an airlock, between the clean room and the equipment room in the worker decontamination enclosure system, with hot and cold or warm running water suitably arranged for complete showering during decontamination.

Surfactant: A chemical wetting agent added to water to improve penetration, thus reducing the quantity of water required for a given operation or area.

Testing Laboratory: The term "testing laboratory" is defined as an independent entity engaged to perform specific assessments or tests of the work, either at project site or elsewhere; and to report results of those assessments or tests.

Time Weighted Average (TWA): The average concentration of a contaminant in air during a specific time period (typically an eight-hour workday).

Showerroom: A room between the Work Area and the holding area in the equipment decontamination enclosure system. The shower room constitutes an airlock.

Wet Cleaning: The process of eliminating asbestos contamination from building surfaces and objects by using cloths, mops, or other cleaning utensils which have been dampened with amended water or diluted removal encapsulant and afterwards thoroughly decontaminated or disposed of as asbestos-contaminated waste.

Work Area: The area(s) where asbestos-related work or removal operations are performed which is defined and/or isolated to prevent the spread of asbestos dust, fibers or debris, and entry by unauthorized personnel. Work Area is a Regulated Area as defined by 29 CFR 1926.1101.

1.10 CODES, REGULATIONS, AND STANDARDS:

A. General Applicability of Codes, Regulations, and Standards: Except to the extent that more explicit or more stringent requirements are written directly into the contract documents, all applicable codes, regulations, and standards have the same force and effect and are made a part of the contract documents by reference as if copied directly into the contract documents, or as if published copies are bound herewith.

B. Contractor Responsibility: The Contractor shall assume full responsibility and liability for the compliance with all applicable federal, state and local regulations pertaining to work practices, hauling, disposal, and protection of workers, visitors to the site, and persons occupying areas adjacent to the site. The Contractor is responsible for providing medical examinations and maintaining medical records of personnel as required by the applicable federal, state, and local regulations. The Contractor shall hold harmless the Owner, Architect, General Contractor, General Contractor's Representative and Asbestos Abatement Consultant for

failure to comply with any applicable work, hauling, disposal, safety, health or other regulation on the part of himself, his employees, or his subcontractors.

C. Federal Requirements: Which govern asbestos abatement work or hauling and disposal of asbestos waste materials include but are not limited to the following:

U.S. Department of Labor, OSHA, including but not limited to:

Occupational Exposure to Asbestos, Tremolite, Anthophyllite, and Actinolite; Final Rules Title 29, Part 1910, Section 1001 and Part 1926, Section 1101 of the Code of Federal Regulations

Respiratory Protection
Title 29, Part 1910, Section 134 of the
Code of Federal Regulations

Construction Industry
Title 29, Part 1926, of the
Code of Federal Regulations

Access of Employee Exposure and Medical Records
Title 29, Part 1910, Section 2 of the
Code of Federal Regulations

Asbestos Hazard Emergency Response Act
Title 40 Part 763 (The Final Rule) of the
Code of Federal Regulations

Hazard Communication
Title 29, Part 1910, Section 1200 of the
Code of Federal Regulations

Specifications for Accident Prevention Signs and Tags
Title 29, Part 1910, Section 145 of the
Code of Federal Regulations

U. S. Environmental Protection Agency (EPA) including but not limited to:

Asbestos Abatement Projects Rule
40 CFR Part 762
CPTS 62044, FRL 2843-9
Federal Register, Vol. 50 No. 134, July 12, 1985
P28530-28540

Regulation for Asbestos
Title 40, Part 61, Sub-part A of the
Code of Federal Regulations

National Emission Standard for Asbestos
Title 40, Part 61, Sub-part M (Revised Sub-part B) of the
Code of Federal Regulations

D. EPA Guidance Documents: which discuss asbestos abatement work or hauling and disposal of asbestos waste materials are listed below for the contractor's information only. These documents do not describe the Work and are not a part of the Work of this contract. Public inquiries and technical questions can be fielded by EPA at the following phone number, email, and website address: Public Information Line 734-214-4333, email: otaq@epa.gov, or

website contact address: https://www.epa.gov/air-pollutiontransportation/forms/contact-us-about-airpollution-transportation

Guidance for Controlling Asbestos-Containing Materials in Buildings (Purple Book) EPA 560/5-85-024.

Asbestos in Buildings: National Survey of Asbestos-Containing Friable Materials. EPA 560/5-84-006.

Asbestos in Buildings: Guidance for Service and Maintenance Personnel. EPA 560/5-85-018.

Asbestos Waste Management Guidance. EPA 530-SW-85-007.

Asbestos Fact Book. EPA Office of Public Affairs.

ASTM E - 1368-90 Standard Practice for Visual Inspections of Asbestos Abatement Project.

Asbestos in Buildings. Simplified Sampling Scheme for Friable Surfacing Materials.

E. State Requirements: Abide by all state rules, regulations, ordinances, etc. which govern the specified asbestos abatement work, licensing or hauling and disposal of asbestos waste material.

TN – Division of Air Pollution Control –
Chapter 0400-30-38
"Emission Standards for Hazardous Air Pollutants"

TN – Division of Solid and Hazardous Waste Management
Toxic Substances Program
Rule 1200-01-20,
"Asbestos Accreditation Requirements"

F. Local Requirements: Abide by all local rules, regulations, ordinances, etc. which govern the specified asbestos abatement work, licensing, or hauling and disposal of asbestos waste removal.

1.11 SUBMITTALS:

A. General: The required submittals are identified in this section and/or elsewhere in the Specification. Make submittals to the Architect and contracted Asbestos Abatement Consultant within five to ten business days prior to commencement of abatement activities and at appropriate times (or within 48 hours) in the execution of the Work to allow for sufficient and prompt review by the Architect and the contracted Asbestos Abatement Consultant. Removal work will not commence until submittals are received by the Architect and the contracted Asbestos Abatement Consultant. Revise and resubmit as necessary.

1. Submit either two complete bound sets of the submittals as required in the Contract Documents or submit them electronically to the Architect. If submitting hard copies, separate sets into two copies. Submit complete sets to the Architect for review, in the required number of copies, of "Pre-Job Submittals" on or before the date of the pre-construction meeting. **The Work may not proceed until the complete pre-job submittal package has been reviewed and approved by the Architect and the contracted Asbestos Abatement Consultant.**

2. Submit complete sets to the Architect for his review, in the required number of copies or electronically, of "Post-Job Submittals" following the final completion of the Work. Once

the Architect has logged these documents in, they will be passed onto the contracted Asbestos Abatement Consultant for review. Request for final payment will not be approved until the post-job submittal package has been reviewed by the Architect and the contracted Asbestos Abatement Consultant.

3. Identify individual submittals by name and include a table of contents in each submittal package.

4. Provide either two complete bound sets or provide electronic versions of each submittal package to the Architect and General Contractor's Representative for review.

B. Pre-Job Submittals:

1. Permits: Permits required for the removal, encapsulation, handling of ACM and general contracting will be obtained by the Contractor.

   a. The Contractor shall obtain all permits required by state and/or local regulatory agencies or jurisdictions for the transportation and disposal of asbestos-containing waste.

   b. Post one copy of all permits at the Work site. Keep on file in the Contractor's office one copy of each and provide a current copy of each to the Architect.

2. Submit complete information relative to the following:

   a. Submit a copy of the completed Notification of Demolition and/or Asbestos Renovation Form.

   b. Employee List: Provide a list of supervisors and workers to be utilized on the project, along with their accreditation numbers, accreditation expiration dates, date of last fit test and date of last physician's opinion supporting respirator use.

   c. Submit copies of valid EPA training certificates for all workers and supervisors participating on the project.

   d. Submit names of Supervisory personnel including superintendent, head foreman, and crew leader(s) and their qualifications and training including:

   e. Individually signed Respiratory Training Form or equivalent for each and every worker to be utilized on the project.

   f. Individually signed Certificates of Worker Training or equivalent for each and every worker to be utilized on the project.

   g. Contractor's affidavit that all Contractor's employees on this project have successfully completed medical surveillance as required by 29 CFR 1926 and the statement by a medical doctor.

3. For each Work Area, submit a plan of action: Submit a detailed plan of the procedures proposed for use in complying with the requirements of this specification. Include in the abatement plan a contingency emergency plan, the location and layout of the de-contamination areas, the sequencing of asbestos work, methods to be used to assure the safety of site visitors, disposal plan including location of approved disposal site, and a detailed description of the methods to be used to control pollution and ensure site security. Expand upon the use of portable HEPA ventilation systems, closing out of the building's HVAC system, method of removal to prevent visible emissions from the Work Area, and packaging of removed asbestos debris. Include sequencing and schedule for installation

of architectural finishes/materials. **The plan must be approved by the contracted Asbestos Abatement Consultant prior to commencement of Work.**

C. Submittals During the Work and Post Job Submittals:

1. Submit to the Architect and contracted Asbestos Abatement Consultant training certificates for all new or additional employees at least 48 hours before their assignment to the project.

2. A copy of daily security, worker, and visitor log signed by the superintendent.

3. A copy of employee air monitoring results relative to OSHA respiratory protection level compliance.

4. Waste transport manifests and landfill receipts including the Asbestos Waste Shipment Record (CN-1054) as required by TN Rule 1200-03-11-.02.

D. All post job submittals must be provided to the Architect no later than 45 business days after completion of Work and prior to the final request for payment. Requests for final payment will not be approved until the submittal package has been reviewed with no exceptions taken by the General Contractor’s Representative and Asbestos Abatement Consultant.

1.12 MANUFACTURER'S LITERATURE:

A. Where contents of submitted literature from manufacturers include data not pertinent to the submittal, clearly show which portions of the contents are being submitted for review.

B. Submit a minimum of two hard copies or an electronic version to the Architect for review and file either in hard copy or electronically.

1.13 QUALITY ASSURANCE:

A. Coordination of Submittals

1. Carefully review all aspects of each item being submitted.

2. Verify that each item and its appropriate submittals conform in all respects with the specified requirements.

3. Certify, by affixing signature of Contractor's authorized representative to the corner of each submittal package, that this coordination has taken place.

1.14 IDENTIFICATION OF SUBMITTALS:

A. Number consecutively and clearly identify all submittals. Show identification information on at least the first page of each submittal and elsewhere as necessary for positive identification of submittal.

B. Accompany each submittal package with a letter of transmittal showing all information required for identification and checking.

1.15 GROUPING OF SUBMITTALS:

A. Group submittals into packages identified as "Pre-Job Submittals" and "Post-Job Submittals" as the title package to certify and account for submittal data.

B. Partial submittals may be rejected for noncompliance with the Contract Documents.

1.16 TIMING OF SUBMITTALS:

A. Provide submittals five business days in advance of scheduled dates for commencement, execution or installation to allow time required for review, for securing necessary approvals, and for possible revisions and re-submittals.

B. The Architect/Owner's Representative and contracted Asbestos Abatement Consultant will review submittals within five business days of receipt of complete submittals.

C. Contractor will be held responsible for delays occasioned by incomplete submittal packages.

1.17 GENERAL CONTRACTOR'S ASBESTOS ABATEMENT CONSULTANT OR ARCHITECT REVIEW:

A. Review by the Architect/General Contractor's Representative does not relieve the Contractor from responsibility for errors which may exist in the submitted data. The Contractor will be solely responsible for the means, methods, techniques, sequences, and procedures involved in the execution of the Work.

B. Make revisions as required by the Architect/General Contractor's Representative and/or contracted Asbestos Abatement Consultant and resubmit for approval.

1.18 COORDINATION OF SCHEDULES, MEETINGS, REPORTS - ASBESTOS ABATEMENT:

A. Be competently represented at all meetings and submit schedules and reports as required by the provisions of this section to enable orderly review of the progress of the Work and to provide for a systematic discussion of problems that may be encountered.

1.19 SCHEDULES:

A. The contractor shall provide a schedule upon bid submittal. Contractor may propose a shorter schedule with all General and Supplemental Conditions applying. Contractor will provide detailed schedule including work dates, work shift time, number of employees, dates of start and completion including dates of preparation work, removals and final inspection dates. Revised schedules shall be provided at each meeting highlighting any changes since the previously submitted schedule.

1.20 PRE-CONSTRUCTION MEETING:

A. Attend pre-construction meeting as scheduled prior to the start of the Work to clarify construction contract administration procedures for the items listed below:

- Submittal of executed bonds and insurance certification.
- Execution of the Owner -Contractor Agreement.
- Submittal of Pre-Job Submittals.
- Channels and procedures for communications.
- Construction schedule, including sequence of critical work.
- Distribution of the Contract Documents.
- Designation of responsible personnel.
- Processing of field decisions and change orders.
- Scheduling and coordination.
- Procedures for safety and first aid, security, quality control, housekeeping and related matters.
- Use of premises by Owner and Contractor.
- Owner's requirements.
- Construction facilities and controls provided by Owner.
- Temporary utilities provided by Owner.
- Site layout.
- Security and housekeeping procedures.

- Preliminary schedules.
- Procedures for air monitoring.
- Procedures for maintaining record documents.

1.21 REPORTS:

A. Contractor will maintain, at each Work Area, a daily log documenting the dates and time of, but not limited to, the following items:

- Visitations; authorized and unauthorized.
- Personnel, by name, entering and leaving the Work Area
- Record of materials abated, rooms or areas covered by the day's work.
- Air monitoring test results and manometer recordings.

B. Provide two hard copies or electronic version of each daily log in the "Post Job" submittal package.

ASBESTOS PROJECT MONITORING

1.22 DESCRIPTION OF THE WORK:

A. Independent asbestos project monitoring and air sampling shall be performed during asbestos abatement activities as specified herein. The Project Monitor shall be independent of the Abatement Contractor and shall be accredited by the State of Tennessee as an Asbestos Project Monitor.
B. Employee exposure monitoring, including personal air sampling required by OSHA 29 CFR 1926.1101, shall be the responsibility of the Abatement Contractor and is not included as part of the independent project monitoring described in this Section.
C. Independent project monitoring shall include periodic observation of asbestos abatement activities, representative area air monitoring during active removal, final visual assessment of completed work areas, and final clearance air sampling as specified herein.

1.23 AIR MONITORING:

A. The Asbestos Project Monitor shall be trained and accredited in accordance with applicable State of Tennessee requirements. PCM air sample analysis shall be performed by personnel meeting applicable NIOSH 7400 analyst qualification requirements. Daily PCM and final TEM clearance samples shall be analyzed by a qualified laboratory in accordance with applicable AHERA methodology.
B. Representative area air monitoring shall be conducted during active asbestos abatement activities to evaluate the effectiveness of work area isolation and engineering controls and to identify potential migration of airborne fibers outside the regulated work area.
C. Representative PCM area air samples shall be collected outside active regulated work areas at locations selected by the Asbestos Project Monitor based on work area configuration and site conditions. Sampling locations may include:
    1. Outside the regulated work area;
    2. Adjacent to the entrance to the regulated work area or decontamination area;
    3. Near negative air exhaust, where applicable; and
    4. Other locations determined appropriate by the Asbestos Project Monitor.
D. If air monitoring results or visual observations indicate a potential failure of work area isolation or engineering controls, asbestos abatement activities shall cease as necessary until the condition has been evaluated and corrective measures implemented.

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1.24 ANALYTICAL METHODS:

A. Daily, area, and personal air samples will be analyzed by PCM by a laboratory accredited by the AIHA, using NIOSH, 7400 Method, Issue 3.

B. Final clearance air samples will be analyzed via TEM by a laboratory accredited by the AIHA, using the AHERA Method.

1.25 SCHEDULE OF AIR SAMPLES:

A. General: The number and volume of air samples will be in accordance with the following schedule:

B. Before Start of Work:

1. The Testing Laboratory will secure the following air samples to establish a baseline before start of Work. Background PCM sampling testing methods shall be conducted prior to commencement of abatement activities.

Location Sampled	**Number of Samples**	**Analytical Method**	**Detection Limit (fibers/cc)**	**Flow Rate (LPM)**
Within Proposed Work Area	1–2	NIOSH 7400 PCM	0.01	2.0–12.0
Outside/Adjacent to Proposed Work Area	1–2	NIOSH 7400 PCM	0.01	2.0–12.0

** - Actual minimum detection limits are a result of the laboratory's procedures and volume concentration collected.*

Baseline: is an action level expressed in fibers per cubic centimeter (f/cc) which is ten percent greater than 0.01 fibers per cubic centimeter.

C. During abatement activities, from start of Work through the project decontamination, the Testing Laboratory will conduct representative PCM daily air sampling outside of the work area as follows.

Location Sampled	**Number of Samples**	**Analytical Method**	**Detection Limit (fibers/cc)**	**Flow Rate (LPM)**
Outside/Adjacent to Active Work Area	2–3	NIOSH 7400 PCM	0.01	2.0–12.0
At Entrance to Work Area/Decontamination Area	1	NIOSH 7400 PCM	0.01	2.0–12.0
Near Negative Air Exhaust, where applicable	1	NIOSH 7400 PCM	0.01	2.0–12.0

D. Transmission Electron Microscopy

1. Following completion of asbestos abatement, final cleaning, and satisfactory visual assessment within each designated clearance work area, final aggressive TEM air samples will be collected and analyzed. For purposes of final clearance air sampling, each of the three school wings shall constitute a separate clearance work area. Individual classrooms within a school wing shall not require separate TEM clearance sampling.

2. Samples will be collected on 0.45 micron cassettes with 25 millimeter mixed cellulose ester filter media (MCE):

Location Sampled	**Number of Samples**	**Analysis Method**	**Clearance Criterion**

Inside Each Completed Work Area (per School wing)	5	TEM – AHERA methodology	70 structures/mm² or applicable project clearance criterion
Field Blanks	2 per sampling event	TEM	N/A
Outside/Background Samples	As required by applicable clearance protocol	TEM	For comparison where required

1. Analysis: Structures on each filter will be measured utilizing AHERA Methodology (40 CFR, Part 763, Subpart E, Appendix A)

4. Structure: A microscopic bundle, cluster, fiber or matrix that may contain asbestos as counted by the transmission electron microscopy.

5. Release Criteria: Decontamination of the work site is complete when **the average of the five area samples is at or below 70 str/mm^2**. If any sample is above the 70 str/mm^2 criteria, then the decontamination is incomplete and re-cleaning is required.

1.26 SCHEDULING:

A. Testing by the Testing Laboratory shall be performed in areas and at times during the Work as deemed necessary by the Architect, or General Contractor or as specified in the Contract Documents.

B. Unless otherwise approved by the Architect, or General Contractor, Contractor shall schedule final clearance air testing at least 24 hours prior to the desired time of testing.

C. Unless otherwise approved by the Architect, or General Contractor, Contractor shall notify the parties 72 hours prior to variations in the originally scheduled work hours, in order to receive approval from the Architect, or General Contractor, and General Contractor's Representative to arrange proper testing services.

D. Coordinate other scheduling with Architect, or General Contractor as necessary.

1.27 RESULTS:

A. All testing and analysis will be performed promptly, and results issued expeditiously in order to minimize any possible delay in the progress of the Work.

B. Test results will be available to General Contractor and Contractor as follows:

1. Air sample results by Phase Contrast Microscopy: minimum 48 hours from sample extraction time.

2. Results of other tests deemed necessary by Testing Laboratory: as quickly as possible but not later than 48 hours following completion of test(s) and receipt of results.

1.28 PERSONNEL MONITORING:

A. Contractor shall be responsible for OSHA air monitoring requirements to be performed by an independent laboratory. General Contractor and the General Contractor's Representative will not be performing air monitoring to meet these requirements. The Contractor shall provide a copy of the results to the General Contractor's Representative.

TEMPORARY FACILITIES

1.29 DESCRIPTION OF REQUIREMENTS:

A. General: Provide temporary connection to existing building utilities or provide temporary facilities as required herein or as necessary to carry out the Work.

1.30 MATERIALS AND EQUIPMENT:

A. General: Provide new or used materials and equipment that are undamaged and in serviceable condition. Provide only material and equipment that is recognized as being suitable for the intended use and is in compliance with appropriate standards.

1.31 WATER SERVICE:

A. Temporary Water Service Connection: All connections to the Owner's water system shall include backflow protection.

B. Water Hoses: Employ hoses with a pressure rating greater than the maximum pressure of the water distribution system to provide water into each area and to each Decontamination Unit.

C. Hot Water: Hot water is available from Owner.

D. Relocate, modify and extend services and facilities as required during the course of Work so as to accommodate the entire Work of the project.

1.32 ELECTRICAL SERVICE:

A. General: Provide a weatherproof, grounded temporary power service and distribution system of sufficient size, capacity, and power characteristic to accommodate performance of Work during the construction period. An electrical ground fault circuit interrupter (GFCI) shall be utilized between the power source and the site of containment usage. Install temporary lighting adequate to provide sufficient illumination for safe work and traffic conditions in every area of Work.

A. Power Distribution System: Provide circuits of adequate size and proper characteristics for each use. In general, run wiring overhead and rise vertically where wiring will be least exposed to damage from construction operations.

1.33 FIRE EXTINGUISHERS AND EMERGENCY EXITS:

A. Fire Extinguisher: Locate fire extinguisher(s) where they are most convenient and effective for their intended purpose but provide not less than one extinguisher in each Work Area.

B. The Contractor shall establish, and mark emergency and fire exits from the work area. Emergency procedures shall have priority over established decontamination entry and exit procedures. Audible and visible fire and emergency evacuation alarms shall be instituted and communicated so as to be heard and seen throughout the entire work area.

WORKER PROTECTION

1.34 DESCRIPTION OF WORK:

A. This section describes the equipment and procedures required for protecting workers against asbestos contamination and other workplace hazards except for respiratory.

1.35 WORKER TRAINING:

A. Train, in accordance with 29 CFR 1926.1101 and 40 CFR 763, all workers in the dangers inherent in handling asbestos and breathing asbestos dust and in proper work procedures

and personal and area protective measures. Include but do not limit the topics covered in the course to the following:

1. Methods of recognizing asbestos.
2. Health effects associated with asbestos.
3. Relationship between smoking and asbestos in producing lung cancer.
4. Nature of operations that could result in exposure to asbestos.
5. Importance of and instruction in the use of necessary protective controls, practices and procedures to minimize exposure including:

- Engineering controls
- Work practices
- Respirators
- Housekeeping procedures
- Hygiene facilities
- Protective clothing
- Decontamination procedures
- Emergency procedures
- Waste disposal procedures
- Purpose, proper use, fitting, instructions, and limitations of respirators as required by 29 CFR 1910.134
- Appropriate work practices for the Work
- Requirements of medical surveillance program
- Review of 29 CFR 1926
- Exhaust ventilation systems
- Work practices including hands on or on-job training
- Personal decontamination procedures
- Air monitoring, personnel and area

1.36 PROTECTIVE CLOTHING:

A. Coveralls: Provide disposable full-body coveralls and disposable head covers and require that they be worn by all workers in the Work Area. Provide a sufficient number for all required changes, for all workers in the Work Area.

B. Hard Hats: Provide head protection (hard hats) as required by OSHA for all workers. Require hard hats to be worn at all times that Work is in progress that may potentially cause head injury. Provide hard hats of type with plastic strap type suspension. Require hats to remain in the Work Area throughout the Work. Thoroughly clean, decontaminate and bag hats before removing them from the Work Area at the end of the Work.

C. Footwear: Provide foot covers and footwear with non-skid soles, and where required by OSHA, foot protection for all workers. Do not allow this footwear to be removed from the Work Area for any reason other than disposal of contaminated waste or transfer to another asbestos Work Area.

D. Eye Protection: Provide eye protection (goggles or safety glasses) as required by OSHA for all workers involved in scraping, spraying, or any other activity which may potentially cause eye injury. Goggles or safety glasses will not be worn with full face respirators.

E. Gloves: Provide work gloves appropriate for the task at hand.

1.37 ADDITIONAL PROTECTIVE EQUIPMENT:

A. Disposable coveralls, head covers, and footwear covers, and Type C respiratory protection with backup supplied air, if utilized, shall be provided by the Contractor for the General Contractor's Representative or contracted Asbestos Abatement Consultant, and other authorized representatives who may inspect the job site.

1.38 GENERAL EXECUTION:

A. Contractor shall assume sole responsibility and provide worker protection as required by the most stringent OSHA standards applicable to the Work.

B. Each time the Work Area is entered, all workers shall wear a disposable whole-body suit.

1.39 DECONTAMINATION PROCEDURES:

A. Require all workers to adhere to the following personal decontamination procedures whenever they leave the Work Area:

1. When exiting area, remove disposable coveralls, disposable head covers, and disposable footwear covers or boots in a regulated area with a polyethylene floor sheeting of sufficient size for decontamination.
2. Place discarded protective clothing in an appropriately marked disposal container.
3. Provide an area where workers can wash their hands and face.

1.40 WITHIN WORK AREA:

A. Workers MAY NOT eat, drink, smoke, apply cosmetics, chew gum or use tobacco products in the Work Area. To eat, chew, apply cosmetics, drink or smoke, workers shall follow the procedure described above, then dress in street clothes before entering the non-Work Areas of the building.

RESPIRATORY PROTECTION

1.41 DESCRIPTION OF WORK:

A. Instruct and train each worker involved in abatement in proper respiratory use and require that each worker always wear a respirator, properly fitted, on the face in the Work Area from the start of any operation which may cause airborne asbestos fibers until the Work Area is completely decontaminated. Use respiratory protection appropriate for the fiber level encountered in the workplace.

1.42 STANDARDS:

A. Except to the extent that more stringent requirements are written directly into the Contract Documents, the following regulations and standards have the same force and effect (and are made a part of the Contract Documents by reference) as if copied directly into the Contract Documents, or as if published copies were bound herewith. Where there is a conflict in requirements set forth in these regulations and standards, meet the more stringent requirement.

OSHA - U.S. Department of Labor Occupational Safety and Health Administration, Safety and Health Standards 29 CFR 1910, Section 1001 and Section 1910.134, 29 CFR 1926.

CGA - Compressed Gas Association, Inc., New York, Pamphlet G-7, "Compressed Air for Human Respiration", and Specification G-7.1 "Commodity Specification for Air."

ANSI - American National Standard Practices for Respiratory Protection, ANSI Z88.2-1980.

NIOSH - National Institute for Occupational Safety and Health.

B. All respiratory protection systems shall be approved by NIOSH. Provide at a minimum, HEPA type filters. Also, additional cartridge selections may be added, if required, for solvents, etc., in use.

1.43 GENERAL:

A. Respirators: Select respirators approved by NIOSH, Department of Health and Human Services, for use in atmospheres containing asbestos fibers. Furnish personnel engaged in the removal and demolition of asbestos materials with appropriate respiratory protection.

1.44 FIT TESTING:

A. The contractor shall perform fit testing in accordance with OSHA 29 CFR 1910.134 Respiratory Protection Standard.

1.45 TYPE OF RESPIRATORY PROTECTION REQUIRED

A. After reducing contaminant levels to the lowest feasible level with engineering controls and work practices, provide respiratory protection as necessary to ensure that workers are not exposed to airborne contaminants in excess of the OSHA Permissible Exposure Limits (PEL).

B. Determine the proper level of respiratory protection. Respirator selection shall be based on contaminant levels, filter selection, and respiratory protection factor.

RESPIRATOR	PROTECTION FACTOR
Half-mask air purifying respirator equipped with high-efficiency filters	10
Full face piece air-purifying respirator equipped with high-efficiency filters	50
Powered air-purifying respirator (PAPR) equipped with high-efficiency filters, or supplied-air respirator operated in continuous flow mode	1,000

DECONTAMINATION UNITS

1.46 DESCRIPTION OF WORK:

A. Require that the Personnel Decontamination Unit be the only means of ingress and egress for the Work Area. Require that all materials exit the Work Area through the Equipment Decontamination Unit.

1.47 SUBMITTALS:

A. Before Start of Work, submit written description and/or sketch of Personnel and Equipment Decontamination Units.

1.48 PRODUCTS: Contractor must furnish all labor, materials, equipment, and subcontractors necessary for removal and disposal of ACM in a manner consistent with these specifications. These materials include but are not limited to:

A. *Polyethylene Sheet:* A single polyethylene plastic film in the largest sheet size possible to minimize seams, six-mil thickness, clear.

B. *Reinforced Polyethylene Sheet:* Where plastic sheet is the only separation between the Work Area and building exterior, provide translucent, nylon reinforced, laminated, flame resistant, polyethylene film that conforms to requirements set forth by the National Fire Protection

Association (NFPA) Standard 701, Small Scale Fire Test for Flame-resistant Textiles and Films. Provide largest size possible to minimize seams, six-mil thick, clear.

C. *Duct Tape:* Provide duct tape in two- or three-inch widths, with an adhesive specifically formulated to stick tenaciously to sheet polyethylene.

D. *Shower Pan:* Provide one-piece waterproof shower pan.

E. *Shower Walls:* Provide walls fabricated from rigid, impervious, waterproof material. Structurally support as necessary for stability.

F. *Shower Head and Controls:* Provide a factory-made showerhead. Feed shower with water mixed from hot and cold supply lines. Arrange so that control of water temperature, flow rate, and shut off is from inside shower without outside aid.

G. *Filters:* Provide filter units on drain lines from showers or any other water source carrying asbestos-contaminated water from the Work Area. Provide units with disposal dual filter elements with the primary filter allowing 20 microns and smaller and secondary to pass particles 5 microns and smaller.

H. *Shower Stall:* For Wash Down Station, provide leak tight shower enclosure with integrated drain pan. Structurally support as necessary for stability.

I. *Sump Pump:* Provide unit capable of pumping debris, sand, plaster or other materials washed off during decontamination procedures without damage to mechanism of pump.

1.49 PERSONNEL DECONTAMINATION UNIT

A. Provide a Personnel Decontamination Unit consisting of a serial arrangement of the following connected rooms or spaces: Clean Room, Shower Room, and Equipment Room.

B. Require all persons without exception to pass through this decontamination unit for entry into and exiting from the Work Area for any purpose. Do not allow parallel routes for entry or exit. Do not remove equipment or materials through Personnel Decontamination Unit. Provide temporary lighting within decontamination units as necessary to reach a lighting level of 100-foot candles.

C. Clean Room: Provide a room that is physically and visually separated from the rest of the building for the purpose of changing into protective clothing. Construct using polyethylene sheeting, at least six-mil in thickness, to provide an airtight seal between the Clean Room and the rest of the building. Locate so that access to Work Area from Clean Room is through Shower Room. Separate Clean Room from the building by a sheet polyethylene flapped doorway.

1. Require workers to remove all street clothes in this room, dress in clean disposable coveralls, and on respiratory protection equipment. Do not allow asbestos-contaminated items to enter this room. Require workers to enter this room either from outside the structure dressed in street clothes, or naked (or with a bathing suit) from the showers.

2. An existing room may be utilized as the Clean Room if it is suitably located and of a configuration whereby workmen may enter the Clean Room directly from the Shower Room. Protect all surfaces of room with sheet plastic. Authorization for this must be obtained from the General Contractor's Representative in writing prior to start of construction.

3. Maintain floor of Clean Room dry and clean at all times. Do not allow overflow water from shower to wet floor in the Clean Room.

4. Damp wipe all surfaces twice after each shift change with a disinfectant solution.

5. Provide a continuously adequate supply of disposable bath towels.

6. Provide posted information for all emergency phone numbers and procedures.

7. Provide one storage facility per employee.

D. Shower Room: Provide a completely watertight operational shower to be used for transit by cleanly dressed workers entering the Work Area from the Clean Room, or for showering by workers leaving the Work Area, undressing in the Equipment Room.

E. Construct room by providing a shower pan and two shower walls in a configuration that will cause water running down walls to drip into pan. Install a freely draining floor in shower pan at elevation of top of pan.

1. Separate this room from the rest of the building with airtight walls fabricated of at least six-mil polyethylene.

2. Separate this room from the Clean and Equipment Rooms fabricated of six-mil polyethylene, at least three feet wide.

3. Provide splash proof entrances to Clean and Equipment Rooms.

F. Provide showerhead and controls.

G. Provide temporary extensions of existing hot and cold water and drainage as necessary for a complete and operable shower.

H. Provide a soap dish and a continuously adequate supply of soap and maintain in sanitary condition.

I. Arrange so that water from showering does not splash into the Clean or Equipment Rooms.

J. Arrange shut off and drain pump operation controls so that a single individual can shower without assistance from either inside or outside of the Work Area.

K. Pump waste to drain or to storage for disposal. If pumped to drain, provide 20 micron and five-micron wastewater filters in line to drain or waste water storage. Change filters daily or more often if necessary. Locate filters inside shower unit so that water lost during filter changes is caught by shower pan. Filters must be disposed of as asbestos waste. Filtered wastewater may be discharged to a sanitary sewage system.

L. Equipment Room (Contaminated Area): Require work equipment, footwear and additional contaminated work clothing to be left here. This is a change and transit area for workers. Separate this room from the Work Area by a curtained doorway consisting of three sheets of overlapping six-mil polyethylene sheeting. One sheet shall be secured at the top and left side, the second sheet at the top and right side, and the third sheet on the top and left side (Z-flap design).

M. Work Area: Separate Work Area from the Equipment Room by polyethylene barriers. Damp wipe clean all surfaces after each shift change.

N. Construction:

1. Walls and Ceiling: Construct airtight walls and ceiling using two layers of polyethylene sheeting, at least four-mil in thickness. Attach to existing building components or a temporary framework.

2. Floors: Use two layers (minimum) of six-mil polyethylene sheeting to cover floors in the Equipment, Shower (underneath shower pan), and Clean Rooms.

3. Provide a minimum of two layers of plastic at all times within the Work Area. Use only clear plastic to cover floors. Surfaces scheduled for removal such as floors do not require polyethylene coverings.

4. Doors: Fabricate from three overlapping sheets (Z-flap) with openings a minimum of three feet wide. Configure so that sheeting overlaps adjacent surfaces. Sheets shall close after being released. Provide a minimum length of three feet between entrance and exit of each room.

5. Visual Barrier: Where the decontamination area is immediately adjacent to and within view of occupied areas, provide a visual barrier of opaque polyethylene sheeting at least six-mil in thickness so that worker privacy is maintained, and work procedures are not visible to building occupants. Where the area adjacent to the decontamination area is accessible to the public, construct a solid barrier on the public side of the sheeting to protect the sheeting. Construct barrier with wood or metal studs covered with minimum 1/3"-thick hardboard or 1/4" plywood. Where the solid barrier is provided, sheeting need not be opaque.

O. Electrical: Provide sub panel at Clean Room to accommodate all removal equipment. Power sub panel directly from a building electrical panel. Connect all electrical branch circuits used within the Work Area to a GFCI device.

All electrically powered equipment, including portable power tools utilized during the project shall have ground-fault protection as described in OSHA Construction Standards 29 CFR 1926.404 (b). All equipment and wiring shall be in compliance with National Fire Protection Association (NFPA) Standard 70, and the National Electrical Code. The Owner's maintenance personnel shall connect the Contractor's power source to the Owner's facility.

1.50 DECONTAMINATION SEQUENCE:

A. Entering Work Area:

1. Worker enters Clean Room and removes street clothing, puts on clean disposable coveralls and respirator, and passes through the Shower Room into the Equipment Room.

2. Any additional clothing and equipment left in Equipment Room needed by the worker in the area shall be donned in the Equipment Room.

3. Worker proceeds to Work Area.

B. Exiting Work Area:

1. Before leaving the Work Area, require the worker to remove all gross contamination and debris from coveralls and feet. The worker then proceeds to the Equipment Room and removes all clothing except respiratory protection equipment (or bathing suit). Extra work clothing may be stored in contaminated end of the Equipment Room. Disposable coveralls are placed in a bag for disposal with other material.

2. The worker then proceeds to the shower, still wearing the respirator, and, using soap, washes off completely, paying special attention to the hair.

3. The worker washes off the respirator in the shower, then pulls it from their face, washing the face and the respirator.

4. After completion of the shower, the worker removes the wet filters from the respirator and discards them as asbestos contaminated waste, then proceeds to the Clean Room.

5. The worker dresses in street clothes, properly cleans and stores their respirator, and exits the decontamination unit. Decontamination procedures shall be followed by all individuals leaving the Work Area.

1.51 EQUIPMENT DECONTAMINATION UNITS

A. Provide an Equipment Decontamination Unit for work areas over 1000 square feet consisting of a serial arrangement of rooms, Clean Room, Holding Room, Wash Room for removal of equipment and material from Work Area. Do not allow personnel to enter or exit Work Area through Equipment Decontamination Unit.

B. Wash Down Station: Provide an enclosed wash down unit located in Work Area adjacent to the Wash Room suitable for use as an equipment, waste bag, and container cleaning station.

C. Holding Room: Provide Holding Room as a drop location for tagged ACM passed from the Wash Room. Waste material and equipment will be re-bagged here. Construct Holding Room of 2" x 4" wood framing and polyethylene sheeting, at least six mil in thickness and located so that bagged materials cannot be passed from the Wash Room through the Holding Room to the Clean Room.

D. Clean Room: Provide Clean Room to isolate the Holding Room from the building exterior. Construct Clean Room of 2" x 4" wood framing and polyethylene sheeting, at least six-mil in thickness and locate to provide access to the Holding Room from the building exterior. Separate this room from the exterior by a single flap of six-mil polyethylene sheeting and from the Holding Room by a Z-flap style door.

E. Equipment or Material: Take all equipment or material from the Work Area through the Equipment Decontamination Unit according to the following procedure:

1. At wash down station, thoroughly wet-clean contaminated equipment or sealed polyethylene bags and pass into Room.

2. When passing equipment or containers into the Wash Room, close all doorways of the Equipment Decontamination Unit, other than the doorway between the Wash down Station and the Wash Room. Keep all outside personnel clear of the Equipment Decontamination Unit.

3. Once inside the Wash Room, wet-clean the bags and/or equipment.

4. When cleaning is complete, pass items into Holding Room.

5. Workers from the building exterior enter Holding Area and remove decontaminated equipment and/or containers for disposal.

6. Require workers to wear full protective clothing and wear appropriate respiratory protection.

7. At no time is a worker from an uncontaminated area to enter the enclosure when a removal worker is inside.

1.52 CLEANING OF DECONTAMINATION UNITS

A. Clean debris and residue from inside of Decontamination Units on a daily basis. Damp wipe or hose down all surfaces after each shift change. Clean debris from shower pans on a daily basis.

1.53 SIGNS

A. Post an approximately 20-inch by 14-inch manufactured sign at each entrance to the Work Area displaying the following wording with letter sizes and styles of a visibility required by 29 CFR 1926.1101.

DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
AUTHORIZED PERSONNEL ONLY

B. Provide spacing between respective lines at least equal to the height of the respective upper line.

END OF SECTION 02 82 13

SECTION 02 82 16 - ENGINEERING CONTROL OF ASBESTOS-CONTAINING MATERIALS

1.01 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other applicable specification sections, apply to the Work of this Section.
B. This Section establishes engineering control requirements for removal of non-friable asbestos-containing chalkboard mastic addressed by the Contract Documents.

Products
1.02 HEPA-FILTERED NEGATIVE AIR EQUIPMENT
A. Provide portable HEPA-filtered negative air filtration equipment suitable for asbestos abatement activities and of sufficient capacity to establish and maintain negative pressure within each regulated Work Area relative to adjacent non-work areas.
B. HEPA-filtered negative air equipment shall be equipped with filters appropriate for asbestos abatement applications and shall be operated and maintained in accordance with the manufacturer's recommendations.
C. Provide a sufficient number and capacity of HEPA-filtered negative air units to maintain effective Work Area isolation and minimize migration of airborne fibers, dust, and debris to adjacent areas.
D. Provide HEPA-filtered vacuums and other engineering control equipment necessary to perform the Work in accordance with these specifications and applicable regulatory requirements.
E. Negative air equipment and associated electrical connections shall be suitable for the intended use and shall comply with applicable OSHA electrical safety requirements, NFPA 70, and the National Electrical Code.

Execution
1.03 PREPARATION AND INSTALLATION
A. Install HEPA-filtered negative air equipment following establishment of the regulated Work Area and critical barriers and prior to disturbance or removal of chalkboards or associated asbestos-containing mastic.
B. Position negative air equipment to promote effective air movement throughout the regulated Work Area and to prevent migration of airborne fibers, dust, and debris into adjacent non-work areas.
C. Arrange equipment so that air movement is directed, to the extent practicable, from cleaner portions of the Work Area toward the active abatement area and HEPA-filtered exhaust equipment.
D. Exhaust HEPA-filtered air to an appropriate location outside the building where practicable. Exhaust shall be directed away from building entrances, operable windows, HVAC air intakes, occupied areas, pedestrian areas, and other locations where discharge could affect building occupants or the public.
E. Where exterior exhaust is not practicable, an alternative exhaust arrangement may be used subject to approval by the Asbestos Abatement Consultant and provided the arrangement does not compromise Work Area isolation or expose adjacent areas to asbestos-containing dust or fibers.
F. Seal penetrations through critical barriers associated with negative air equipment or exhaust ducting to maintain the integrity of the regulated Work Area.

1.04 OPERATION OF ENGINEERING CONTROLS
A. Start HEPA-filtered negative air equipment prior to disturbance or removal of chalkboards or associated asbestos-containing mastic.
B. Maintain negative pressure within the regulated Work Area relative to adjacent non-work areas during active asbestos abatement activities. Negative air equipment shall be operated continuously through completion of asbestos removal, final cleaning, final visual assessment, and required final clearance air sampling.
C. Negative air equipment shall be positioned and operated to provide effective air movement throughout the Work Area without creating conditions that unnecessarily disturb asbestos-containing material or spread asbestos-containing dust or debris.
D. The Contractor shall inspect the regulated Work Area, critical barriers, and negative air equipment prior to commencement of asbestos disturbance and periodically throughout the Work. Deficiencies affecting Work Area isolation or operation of engineering controls shall be corrected promptly.

E. The Asbestos Project Monitor may evaluate Work Area isolation and operation of engineering controls during project monitoring activities. The Contractor shall correct deficiencies identified by the Asbestos Project Monitor prior to continuation of asbestos removal activities where necessary to maintain adequate Work Area isolation.
F. If negative pressure is lost, critical barriers are breached, or another condition occurs that could result in migration of asbestos-containing dust or fibers outside the regulated Work Area, asbestos removal activities shall cease as necessary. Work shall not resume until the condition has been corrected and appropriate engineering controls have been restored.
G. If electrical power to the negative air equipment is interrupted, asbestos disturbance activities shall cease until power is restored and the required engineering controls are operational.
H. Negative air equipment shall not be shut down during active asbestos removal or final cleaning activities except where necessary for emergency conditions or as authorized by the Asbestos Abatement Consultant.
I. Following successful final visual assessment and required final clearance air sampling, negative air equipment may be shut down and Work Area barriers removed in accordance with the requirements of the Contract Documents.

1.05 CONTRACTOR RESPONSIBILITIES
A. The Contractor shall be responsible for selecting the number, capacity, arrangement, and location of HEPA-filtered negative air units necessary to maintain effective negative pressure and Work Area isolation based on the size, configuration, and conditions of each regulated Work Area.
B. Engineering controls shall be used in conjunction with wet removal methods, HEPA-filtered vacuuming, critical barriers, regulated Work Areas, and other work practices specified herein. Engineering controls shall not be used as a substitute for proper asbestos removal and cleaning procedures.
C. Equipment shall be maintained in good operating condition throughout the Work. Filters shall be inspected and replaced as necessary in accordance with the manufacturer's recommendations and applicable asbestos work practices.
D. Equipment that becomes contaminated with asbestos shall be properly decontaminated prior to removal from the regulated Work Area or shall be handled and disposed of as asbestos-contaminated waste.

END OF SECTION 02 82 16

SECTION 02 82 33 - REMOVAL AND DISPOSAL OF ASBESTOS-CONTAINING MATERIALS

1.01 WORK INCLUDED:

General: The Contractor shall perform abatement/removal of asbestos-containing materials (ACM) within the subject portions of Jefferson Elementary School impacted by the planned renovation. These materials include, but are not limited to:

- Carefully remove existing chalkboards, trim, fasteners, mounting components, and other materials as necessary to access the underlying asbestos-containing mastic. Chalkboards and associated components that become contaminated with ACM or cannot be adequately decontaminated shall be handled and disposed of as asbestos-contaminated waste.
- Properly remove and dispose of brown/black mastic located behind or otherwise associated with chalkboards throughout Jefferson Elementary School. Representative bulk samples CHALKB ASB-1 and CHALKB ASB-2 collected by S&ME identified the brown/black mastic as containing 5 percent chrysotile asbestos.
- Based on the representative positive analytical results, all similar brown/black mastic located behind or otherwise associated with chalkboards throughout Jefferson Elementary School shall be presumed to contain asbestos and shall be treated, removed, handled, and disposed of as ACM, regardless of whether an individual chalkboard location was sampled.
- At locations where chalkboards have previously been removed, properly remove and dispose of similar brown/black mastic remaining on the wall or underlying substrate as ACM.
- Remove visible asbestos-containing mastic residue and asbestos-containing debris from affected surfaces and Work Areas. Following completion of abatement, affected surfaces shall meet the visual cleanliness and clearance requirements specified herein.
- Any other suspect or concealed materials encountered during the Work that are not identified within the Contract Documents and are not clearly identified as non-ACM shall not be disturbed. Work in the affected area shall stop until the material has been evaluated by the Owner's representative.

Installation of replacement chalkboards, repair or replacement of wall substrates, painting, refinishing, and other architectural restoration following completion of asbestos abatement shall be performed by others unless specifically indicated otherwise in the Contract Documents.

The Abatement Contractor shall be responsible for field verifying the number, dimensions, locations, quantities, and existing conditions of chalkboards and associated mastic throughout Jefferson Elementary School prior to submitting a bid and prior to commencement of the Work. Quantities provided in the Contract Documents are approximate and are provided for bidding purposes only. The Contractor shall include all labor, materials, equipment, controls, waste handling, transportation, disposal, and other services necessary for complete removal of the asbestos-containing chalkboard mastic specified herein.

Field verification of quantities or locations shall not alter the asbestos classification established by this Abatement Design. All similar brown/black mastic associated with chalkboards throughout Jefferson Elementary School shall be presumed ACM based on the representative positive analytical results and shall be included in the Work.

The Asbestos Abatement Designer (S&ME), Asbestos Abatement Design Reviewer (McCurry Environmental Consulting, LLC), Jefferson County Schools, Architect, and other project representatives do not warrant the accuracy of quantities provided for bidding purposes. The Abatement Contractor shall field verify quantities and existing conditions necessary to complete the Work. Conditions or suspect materials encountered that differ materially from those identified in the Contract Documents shall be brought to the attention of the Owner's representative prior to disturbance.

1.02 PRODUCTS

A. Contractor must furnish all labor, materials, equipment, and subcontractors necessary for removal and disposal of ACM in a manner consistent with these specifications. These materials include but are not limited to:

1. Clear polyethylene sheeting (six-mil minimum thicknesses).

2. Staples, nails, spray glue, and tape capable of sealing joints and securing polyethylene to all necessary surfaces.

3. Amended water with surfactant mixed in recommended proportions.

4. Containers to receive and retain ACM with appropriate labels.

5. Warning signs and labels as specified for OSHA, EPA, and Department of Transportation (DOT) requirements.

6. Glove bags specifically designed for their application (when applicable).

7. Encapsulants.

8. Other Materials: All necessary materials for removal and disposal of asbestos in compliance with all applicable codes and regulations, and these specifications.

B. Deliver all materials in the original packages or containers bearing the name of the manufacturer and the brand name.

C. Store all materials subject to damage off the ground, away from wet or damp surfaces, and under cover sufficient to prevent damage or contamination.

D. Damaged or deteriorated materials shall not be used and must be removed from the job site. Materials that become contaminated with asbestos must be disposed of in accordance with the applicable regulations.

1.03 TOOLS AND EQUIPMENT:

A. Provide suitable tools for asbestos removal, including but not limited to: scrapers, brushes, razor knives, wrenches, tools for constructing containment and decontamination units, brooms, carts, and safety equipment.

B. Provide suitable air moving and exhaust equipment, including but not limited to:

1. A method for maintaining pressure differential of -0.02 inches of water column inside containment.

2. HEPA-filtered vacuums and replacement filters.

3. Recording manometer for monitoring the pressure inside containment relative to the outside pressure.

C. No equipment shall cause suspension of ACM within work area or discharge of asbestos fibers outside of work area.

D. Transportation: As required for loading, temporary storage, transit, and unloading of contaminated waste without exposure to persons or property.

E. Disposal Bags and Impermeable Containers: Provide six-mil thick leak-tight polyethylene bags. Provide containers suitable to receive and retain asbestos-containing or contaminated material until proper disposal. Use one of two types of impermeable containers: 1) six-mil polyethylene disposal bags 2) metal or fiber reinforced drums with tightly fitting lids.

Disposal bags and impermeable containers must be labeled with three labels, with text as follows:

First Label: Provide in accordance with 29 CFR 1910.1200(f) of OSHA's Hazard Communication standard:

DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS

Second Label: Provided in accordance with DOT regulations:

RQ HAZARDOUS SUBSTANCE SOLID,
N.O.S. (ASBESTOS) ORM/E,
NA - 2212

Third Label: Provided in accordance with 40 CFR Part 61 of NESHAP revision:

NAME OF WASTE GENERATOR:
(Name of Contractor and Owner)

LOCATION OF WASTE GENERATED:
(Name of Waste Disposal Facility)

F. Disposal Containers: Provide sealed and labeled leak tight containers for transportation and disposal of waste. Disposal containers must be correctly labeled as outlined in Section 1.03, E above.

G. Transportation: As required for loading, temporary storage, transit, and unloading of contaminated waste without exposure to persons or property.

1.04 PREPARATION:

GENERAL - WORK AREAS

A. Work Area: Is the location where asbestos abatement work occurs. It is a variable of the extent of Work of the contract. For this project a "Work Area" is defined as the area in which asbestos removal is being performed. A "Work Area" is considered contaminated during the Work and must be isolated from the rest of the building and decontaminated at the completion of the asbestos-abatement work.

B. Completely isolate the Work Area from the outside or from adjacent areas so as to prevent asbestos-containing dust or debris from passing beyond the isolated area. Should the area beyond the Work Area(s) become contaminated with asbestos-containing dust or debris as a consequence of the Work, immediately stop all abatement work and clean the contaminated, non-work areas to sufficiently satisfy EPA clearance criterion. Perform all such required cleaning or decontamination at no additional cost to the Architect or General Contractor.

C. Completely separate the Work Area from the outside by sheet plastic barriers (critical barriers) at least six-mil in thickness, or by sealing with duct tape.

D. Asbestos abatement work will not begin until:

1. Arrangements have been made for disposal of asbestos waste at an approved landfill and waste containers are onsite.

2. Work Areas and decontamination enclosure systems and parts of the building required to remain in use are effectively segregated.

3. Tools, equipment, and material waste receptacles are on hand.

4. Proper notification has been made to the appropriate regulatory agency.

5. All other preparatory steps have been taken and applicable notices posted and permits obtained.

6. All worker training has been completed and appropriate licenses acquired.

7. S&ME has inspected and accepted the Contractor's equipment, work area and decontamination units.

1.05 ASBESTOS REMOVAL (PREPARATION):

A. Work Area Preparation for Non-Friable Asbestos-Containing Chalkboard Mastic

1. Post warning signs and barrier tape in and around the Work Area as required by applicable regulatory requirements. Restrict access to the Work Area to authorized personnel.
2. The Contractor shall establish an equipment/decontamination area adjacent to the Work Area for decontamination of workers and equipment. The decontamination area shall be covered with impermeable polyethylene sheeting and shall be of sufficient size to allow cleaning of equipment and removal of personal protective equipment without spreading asbestos contamination outside the regulated Work Area.
3. Seal openings and penetrations to the Work Area with critical barriers, including, as applicable, heating and ventilation ducts, doorways, corridors, windows, and other openings through which asbestos-containing dust or debris could migrate. Entrances and exits from the Work Area shall be provided with overlapping polyethylene flap barriers or other suitable means of maintaining Work Area isolation.
4. All building ventilation systems serving or communicating with the Work Area shall be shut down and isolated as necessary. HVAC supply and return openings within the Work Area shall be sealed with critical barriers prior to disturbance of chalkboards or associated asbestos-containing mastic and shall remain sealed until the Work Area has passed final visual assessment and required final clearance air sampling.
5. Remove movable objects from the Work Area where practicable. Within each classroom where chalkboard mastic abatement is performed, fixed objects, floors, furnishings, equipment, and other surfaces designated to remain shall be cleaned as necessary and protected with six-mil polyethylene sheeting to prevent contamination or damage during abatement activities. Polyethylene protection shall remain in place through completion of asbestos removal and final cleaning activities within the classroom.
6. Install HEPA-filtered negative air filtration equipment within the Work Area. Negative pressure shall be maintained relative to adjacent non-work areas for the duration of asbestos abatement activities through completion of final cleaning and required clearance air sampling. Negative air equipment shall be positioned and operated to promote effective air movement through the Work Area and prevent migration of airborne fibers to adjacent areas.

7. Establish a designated waste load-out route and procedures for transferring asbestos-containing and asbestos-contaminated waste from the Work Area without contaminating adjacent areas.
8. The Contractor shall implement appropriate electrical safety procedures, including lockout/tagout and ground-fault circuit interrupter (GFCI) protection, as applicable. Electrically powered equipment and temporary wiring shall comply with applicable OSHA requirements, NFPA 70, and the National Electrical Code.
9. Maintain emergency and fire exits from the Work Area in accordance with applicable fire and life-safety requirements. Where existing exits are affected by the Work Area, establish appropriate alternative emergency egress.
10. Prior to disturbance or removal of existing chalkboards, the Contractor shall establish the regulated Work Area and required engineering controls. Chalkboards shall be removed within the regulated Work Area using methods that minimize disturbance of the underlying asbestos-containing mastic.
11. Where chalkboards have previously been removed and similar brown/black mastic is exposed on the wall substrate, the exposed mastic shall remain undisturbed until the regulated Work Area and required engineering controls have been established.
12. All similar brown/black mastic located behind or otherwise associated with chalkboards throughout Jefferson Elementary School shall be presumed asbestos-containing based on representative positive bulk sampling and shall be handled in accordance with these specifications.
13. The Contractor shall inspect critical barriers, Work Area isolation, and HEPA-filtered negative air equipment prior to commencement of abatement activities and as necessary throughout the Work. Deficiencies shall be corrected prior to commencement or continuation of asbestos abatement activities.

1.06 ASBESTOS REMOVAL (METHODS):

A. Method of Removal for Non-Friable Asbestos-Containing Chalkboard Mastic

1. Prior to commencement of asbestos removal activities, the Contractor's equipment, regulated Work Area, critical barriers, engineering controls, and decontamination facilities shall be inspected and determined acceptable by the contracted Asbestos Abatement Consultant, where such services are included in the Contract Documents.
2. Existing chalkboards, trim, fasteners, mounting components, and other materials shall be carefully removed as necessary to access the underlying asbestos-containing mastic. Removal shall be performed within the established regulated Work Area using methods that minimize breakage, abrasion, disturbance of the underlying mastic, and generation of dust or debris.
3. Chalkboards and associated components that can be adequately cleaned and decontaminated may be removed from the regulated Work Area following cleaning with HEPA-filtered vacuuming and/or wet wiping. Chalkboards or associated components that become contaminated with ACM and cannot be adequately decontaminated shall be handled and disposed of as asbestos-contaminated waste.
4. All similar brown/black mastic located behind or otherwise associated with chalkboards throughout Jefferson Elementary School shall be presumed to contain asbestos based on representative positive bulk sampling and shall be treated and removed as ACM regardless of whether the individual location was sampled.
5. Prior to and during removal, asbestos-containing mastic shall be adequately wetted with amended water or other approved wetting agent. The material shall be maintained in a wet condition during removal to minimize fiber release.
6. The Contractor shall remove the asbestos-containing mastic using hand methods and other appropriate methods designed to minimize breakage, abrasion, and fiber release. Dry sanding, dry grinding, dry mechanical abrasion, or other uncontrolled abrasive removal methods shall not be permitted.
7. Where practicable and approved by the Owner or Architect, portions of the underlying substrate may be removed with the asbestos-containing mastic intact rather than aggressively abrading the mastic from the substrate. Substrate removed with asbestos-

containing mastic remaining adhered shall be handled, packaged, and disposed of as asbestos-containing waste.

8. Mastic shall be removed in manageable sections and shall not be allowed to dry following removal. Removed ACM and asbestos-contaminated debris shall be promptly placed into leak-tight six-mil polyethylene disposal bags or other suitable leak-tight containers. Waste containers shall be sealed and appropriately labeled in accordance with applicable requirements.
9. Where chalkboards have previously been removed and similar brown/black mastic remains exposed on the wall or underlying substrate, the mastic shall be presumed ACM and removed using the same procedures specified herein.
10. Following gross removal, affected wall surfaces shall be thoroughly cleaned using wet methods and HEPA-filtered vacuuming as appropriate. No visible asbestos-containing mastic, mastic residue, dust, or asbestos-containing debris shall remain on the affected surfaces or within the regulated Work Area.
11. Dry sweeping, compressed air, or vacuuming using equipment not equipped with HEPA filtration shall not be permitted for cleaning asbestos-contaminated surfaces or Work Areas.
12. Polyethylene sheeting, disposable protective clothing, cleaning materials, filters, and other disposable materials contaminated with asbestos shall be placed in leak-tight disposal bags or containers and handled as asbestos-contaminated waste.
13. The exterior surfaces of waste bags, wrapped components, and other containers shall be cleaned prior to removal from the regulated Work Area. Waste shall be transferred through the designated waste load-out route in a manner that prevents contamination of adjacent areas.
14. Excess water generated during abatement activities shall be collected and managed in accordance with applicable regulatory requirements. Asbestos-contaminated water shall not be discharged to storm drains, exterior ground surfaces, ditches, streams, or other unauthorized locations.
15. Following completion of removal and cleaning, the Contractor shall notify the Asbestos Project Monitor that the Work Area is ready for final visual assessment. Final clearance air sampling shall not be performed until the Work Area has successfully passed the final visual assessment.

1.07 FINAL ASSESSMENTS AND CLEARANCE TESTING

A. If the Testing Laboratory observes visible accumulations of asbestos debris in the Work Area after the abatement, Contractor shall repeat wet cleaning until work area is in compliance, at Contractor's expense. All repeat visual assessments and air monitoring will be conducted only after all surfaces are dry. This shall be at the Contractor's expense.

B. When a visual assessment by the Testing Laboratory in the presence of Abatement Contractor's Representative determines that the area is free of accumulations of dust and visible debris, an encapsulant may be applied prior to final air testing.

C. Only critical barriers and negative air exhaust units shall remain in the Work Area prior to initiating final clearance air sampling. The Testing Laboratory will, for this project, test final air quality clearance utilizing aggressive methods coupled via TEM analysis. Sampling shall not begin until no visible water remains in work area. Clearance criteria for TEM analysis is less than 70 S/mm^2 per set of five samples. The Contractor shall be responsible for all costs and time delays associated with unacceptable clearance test results

D. Re-clean, at Contractor's expense, all areas which do not comply with the standard of cleaning for final air clearance. Continue cleaning until the specified final air quality clearance level is achieved. Contractor shall bear cost of all follow-up testing necessitated by the failure of the air tests to meet the specified final clearance level.

E. Following acceptance of clearance level test results and after the Testing Laboratory determines Work Area(s) to be visually decontaminated, the Contractor shall dismantle decontamination enclosure systems and thoroughly wet clean immediate areas. The Contractor shall dispose of debris, used cleaning materials, unsalvageable materials used for sturdy barriers, and any other remaining materials as asbestos waste.

1.08 SITE WORK COMPLETION

A. Asbestos abatement work is complete upon meeting the Work Area clearance criteria and fulfilling the following:

1. Remove all equipment, materials, debris from the Work site.

2. Remove all residue from adhesives used. Damage to furnishings or equipment during construction activities shall be restored to original condition or better at the expense of the Contractor.

3. Dispose of all asbestos-containing waste material in appropriately permitted landfill.

DISPOSAL OF ASBESTOS-CONTAINING MATERIALS

1.09 DISPOSAL:

A. Asbestos-containing waste material and debris which is packaged in accordance with the provisions of this specification may be disposed of at designated landfills. Include copy of Asbestos Waste Shipment Record (CN-1054) as required by the State of Tennessee in post-job submittals.

1.10 GENERAL:

A. Remove properly sealed and labeled containers of asbestos contaminated wastes and dispose of accordingly in approved landfill as follows:

1. Notify Testing Laboratory at least 48 hours prior to the proposed time of removing and delivery of contaminated waste to the landfill. The Testing Laboratory may elect to observe this operation and provide photo documentation.

2. All containers (bags, drums, wrapped components) are labeled so that labels have the appearance of or are designed in accordance with OSHA 29 CFR 1926.1101, August 10, 1994, as amended, and any subsequent amendments and editions, and EPA 40 CFR 61.150, November 20, 1990, as amended, and any subsequent amendments and editions.

3. Asbestos waste must be transported and disposed of in a manner that will not permit the release of asbestos fibers into the air.

4. The cargo area of the transport vehicle shall be free of debris and lined with six-mil polyethylene sheeting. Floor sheeting shall be installed first and shall extend up the side walls at least 12 inches and shall be taped securely into place. Wall sheeting shall overlap by at least six inches and be taped into place. Ceiling sheeting shall extend down the side of the walls at least six inches and be taped into place.

5. If asbestos waste is transported exclusively in leak-tight clean drums, then polyethylene sheeting is not required.

6. Drums, bags and wrapped components that have been removed from the work area shall be loaded into an appropriate vehicle for transportation.

7. Any debris or residue observed on containers or surfaces outside of the work area resulting from abatement activities shall immediately be cleaned using wet methods and vacuum equipment with a HEPA filter.

8. Containers shall be carefully placed and not thrown into the truck cargo area. Drums shall be placed on a level surface in the cargo area and packed tightly or blocked and braced to prevent shifting and tipping. Large structural components shall be secured to prevent shifting.

9. Asbestos waste shall be transported directly to an approved landfill and shall not be stored at a location other than the abatement site.

10. Metal dumpsters or containers in which asbestos waste is temporarily stored at the abatement site shall be lined with six-mil polyethylene sheeting to prevent contamination and shall have doors and tops. The doors and tops shall be closed and locked except during loading or unloading asbestos waste.

11. Metal dumpsters or containers used for waste storage shall be labeled in accordance with OSHA 29 CFR 1926.1101, August 10. 1994 as amended, and any subsequent amendments and additions.

12. Bags shall be free of splits, rips and tears, and shall be carefully placed, not thrown, into the transport vehicle.

13. The vehicle used to transport asbestos wastes shall be labeled in accordance with 40 CFR 61.149(d)(1)(i, ii, and iii) as amended, and any subsequent amendments and editions.

14. Upon reaching the landfill, vehicles shall approach the dump location as closely as possible to unload asbestos waste.

15. Following the removal of all containerized waste, polyethylene sheeting shall be removed and discarded in bags or drums along with contaminated cleaning materials and protective clothing.

16. After the asbestos waste has been unloaded, the truck cargo area, including the floor, walls, and ceiling, shall be decontaminated using wet methods or a vacuum equipped with a HEPA filter until no visible residue remains.

17. A waste shipment record shall be used and shall include the names of the facility owner, contractor and disposal site, the estimated quantity of asbestos waste, and the type and number of containers used. Each time the material changes custody, the record shall be signed by the persons receiving the waste. If a separate hauler is used, the hauler's name, address, telephone number and the driver's signature shall also appear on the record.

18. Commercial rental vehicles shall not be used to transport any asbestos or asbestos-containing waste.

END OF SECTION 02 82 33

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SECTION 03 10 00 – CONCRETE FORMWORK

PART 1 – GENERAL

1.1 RELATED SECTIONS

A. Section 032000 – Concrete Reinforcement.

B. Section 033000 – Cast-in-Place Concrete.

1.2 WORK INSTALLED BUT FURNISHED BY OTHERS

A. Build in anchors, inserts, bolts, hangers, sleeves, ferrules, waterstops and other accessories.

1.3 DESIGN REQUIREMENTS

A. Design, construct and erect formwork per ACI 347R-94, Guide to Formwork for Concrete.

1.4 ALLOWABLE TOLERANCES

A. In accordance with ACI-301-96 as listed in Table 4.3.1-Tolerances for Formed Surfaces.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Concealed concrete: No. 2 Common Southern Pine, S4S, or better.

B. Exposed Concrete: B-B Plyform, Class I or II, EXT-APA, Metal or Fiberglass forms may be used.

C. Construction joint forms for slabs-on-grade: Key-type steel formers, Vulcan Screed Joints, Burke Keyed Kold Joint Form, Dayton Sure-Grip G-20, or equal.

D. Expansion joint filler: Asphalt impregnated, premolded fiberboard by full thickness of slab or joint, ASTM D994-94.

E. Form-coating: Non-staining mineral oil.

F. Form ties: Snap-off type which will break off at least ½” below surface of concrete.

2.2 EARTH FORMS

A. Where soil is firm enough to permit cutting to true size, concrete may be placed without forms.

PART 3 – EXECUTION

3.1 ERECTING

A. Erect forms to obtain shapes, designs and dimensions indicated. Make forms sufficiently tight to prevent leakage. Brace, shore and tie forms together to maintain position without sagging or bulging.

B. Provide ¾" chamfering at corners (exposed or unexposed).

C. Prepare insides of forms so that concrete will have a smooth, uniform finish, free from fins, stone pockets, voids and other surface defects.

D. For slabs-on-grade, provide construction joint forms where concrete placement terminates at the end of a day or because of other reasons.

E. Where soil conditions are such that concrete cannot be placed without forms, and where other conditions cause trenches to be opened wider than footing or slab widths, erect forms for footing or slabs.

3.2 PREPARING

A. Prepare insides of forms so that concrete will have a smooth, uniform finish free of surface defects.

B. Coat forms before reinforcement steel is placed. Where mill-oiled forming material is used, follow manufacturer's instructions for recoating. Where forming material is not mill-oiled, coat forms before each use.

C. Before reusing forms, thoroughly clean them and remove projecting nails or similar devices.

3.3 FORM REMOVAL

A. Remove forms in such a manner and such time as to insure safety of structure and to avoid chipping and spalling of concrete. Refer to Section 6.2 of ACI 318-95, Section 6.2 of the Commentary to ACI 318-95, and Section 3.7 of ACI 347R-94 for form removal requirements.

END OF SECTION 03 10 00

SECTION 03 20 00 - CONCRETE REINFORCEMENT

PART 1 – GENERAL

1.1 RELATED SECTIONS

A. Section 03 10 00 – Concrete Formwork.

B. Section 03 30 00 – Cast-in-Place Concrete.

C. Section 04 20 00 – Unit Masonry.

1.2 QUALITY ASSURANCE

A. The placement of all concrete reinforcement shall be monitored.

1.3 SUBMITTALS

A. Submit warranty from mill or supplier stating that materials meet requirements of referenced ASTM and ACI Standards.

B. Submit electronic PDF's of shop drawings for review and mark-up. Detail reinforcing steel in accord with ACI MNL-66(20) "ACI Detailing Manual"SP-66 94. Shop drawings shall indicate bending and placement of reinforcement as well as sleeve and built-in work locations. Submit shop drawings for similar slabs and/or full column stacks at the same time.

C. Shop drawings shall include the following note completed and signed by the Contractor: The data submitted does not contain material deviation from requirements of contract documents except as follows:

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in bundles marked with metal tags for easy identification.

B. Handle and store materials to prevent contamination.

C. Deliver and store welding electrodes in accordance with American Welding Society D 1.4-92.

PART 2 – PRODUCTS

2.1 REINFORCEMENT STEEL

A. ASTM A615-20, Grade 60.

2.2 REINFORCEMENT WIRE

A. Welded steel wire fabric, ASTM A1064-24.

2.3 BAR SUPPORTS

A. Bar supports and spacing of same shall be as per recommendations set forth by Chapter 3 of the CRSI Manual of Standard Practice, 24th Edition, 1986.

2.4 OTHER SUPPORTS

A. Concrete brick may be used to support reinforcement to obtain proper clearance from earth and rigidity of reinforcement under concreting operations.

2.5 TIE WIRE

A. Wire shall be 16-1/2 gauge or heavier, black-annealed.

2.6 FABRICATING

A. In accordance with CRSI Manual of Standard Practice, 24th Edition, 1986.

PART 3 – EXECUTION

3.1 CONDITION OF SURFACES

A. Maintain reinforcement surfaces free of mud, oil or other coatings which might impair bond as described in Section 7.4 of ACI 318-95. Rust or mill scale is acceptable provided the minimum dimensions are not less than applicable ASTM Standards. Loose rust scale to be removed with wire brush.

3.2 INSTALLING REINFORCING STEEL

A. Handle, place and tie reinforcement steel in accordance with "Building Code Requirements for Reinforced Concrete," ACI 318-95 and CRSI publication "Placing Reinforcing Bars," 4th Edition, 1981.

B. All reinforcement bars shall be supported and secured as directed in ACI 315-94 and CRSI Manual of Standard Practice, 24th Edition, 1986.

C. For all splices, unless noted otherwise, provide the following lap splice length of reinforcement steel:

In concrete member:	Class B
In masonry member:	48 bar diameters

Do not splice reinforcement steel except as authorized by Architect.

D. Accomplish welding in accordance with American Welding Society publication "Recommended Practices for Welding Reinforcing Steel, Metal Inserts, and Connections in Reinforced Concrete Construction", AWS D1.4-92.

E. Bend bars cold. Do not field bend bars partially embedded in concrete except as specifically permitted by Architect. Do not heat or cut bars with a torch.

3.3 INSTALLING WELDED WIRE FABRIC

A. For Slabs-on-Grade:

1. Install welded wire fabric after vapor barrier (or under floor waterproofing, if applicable) has been placed.

2. Locate welded wire fabric in center third of slabs.

B. For Slabs on Metal Form:

1. Provide W.W.F. 6x6 – W1.4 x W1.4, unless noted otherwise.

2. Locate welded wire fabric at mid-depth of slab measured between top of slab and top of metal form.

C. Lap side one full mesh plus 2 inches. Lap end two full meshes. Offset end laps in adjacent width to prevent continuous laps.

3.4 CONCRETE PROTECTION FOR REINFORCEMENT

A. Protect reinforcing by thickness of concrete indicated on Contract Drawings.

B. Variation from clear cover shall conform to section 7.5 of ACI 318-19.

END OF SECTION

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SECTION 03 21 31 – CONCRETE CURBS AND WALKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

General provisions of the Contract, General and supplementary Conditions, and Division 1 specification sections, General Requirements, and the Civil Package apply to this section.

1.2 DESCRIPTION OF WORK

A. Labor, material equipment and services necessary to provide new concrete curbs and walks and refurbish existing concrete pavement.

1.3 QUALITY ASSURANCE

A. Comply with applicable requirements of Division 3 sections for concrete materials, testing, mixing, placing and curing, except as herein specified.

B. Lay section of concrete sidewalk, approximately 18 ft. in length, located in relatively obscure portion of the site, as a sample to be reviewed by Architect before continuation of sidewalk work. Provide sample consisting of same materials, construction, joint treatment, and finishing as specified for entire work. Work will be reviewed by the Architect for appearance only.

1.4 SUBMITTALS

Provide samples, manufacturer's data, test reports, mix designs, and materials' certifications as required in Reference Specifications.

1.5 JOB CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Provide flagmen, barricades, warning signs and warning lights as required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms: Either steel or wood, of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use forms that are straight and free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Coat forms with non-staining for release agent that will not discolor or deface the surface of the concrete. Fuel oil and kerosene will not be acceptable.

B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185. Furnish in flat sheets, not rolls, unless otherwise acceptable to the Architect.

C. Reinforcing Bars and Dowels: Deformed steel bars, ASTM A615, Grade 60, unless otherwise shown.

D. Concrete: Comply with applicable requirements of Division 3 sections for concrete materials, admixtures, bonding materials, curbing materials, and others as required.

E. Premolded Joint Filler: Provide resilient and non-extruding type premolded bituminous impregnated fiber board units complying with ASTM D 1751, FS HH-F-341, Type I, and AASHTO M 213. Manufacturers offering products complying with requirements include:

Celotex Corp. (Flexcell)
J & P Petroleum Prod. Inc. (Tex-Lite)
W. R. Meadows Inc. (Fiber)

2.2 CONCRETE MIX, DESIGN AND TESTING

A. Comply with applicable requirements of Division 3 sections for concrete mix design, sampling and testing, and quality control, and as herein specified.

B. Design the mix to produce standard-weight concrete consisting of Portland cement, aggregate, air-entraining admixture and water to produce the following properties:

1) Compressive Strength: 4000 psi, minimum at 28 Days.

2) Slump Range: 2: to 4”.

3) Air Content: 5% to 8%.

PART 3 - EXECUTION

3.1 INSPECTION

Examine the areas and conditions under which concrete curbs and walks are to be installed. Notify the Contractor, in writing, of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.2 SURFACE PREPARATION

Remove loose material from the compacted subbase surface immediately before placing concrete.

3.3 FORM CONSTRUCTION

A. Set forms to the required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of the work and so that forms can remain in place at least 24 hours after concrete placement.

B. Check completed formwork for grade and alignment to the following tolerances:

1) Top of form units: not more than 1/8” in 10’.

2) Vertical face: longitudinal axis, not more than ¼” in 10’.

C. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.

3.4 REINFORCEMENT

Locate, place, and support reinforcement as specified in Division 3.

3.5 CONCRETE PLACEMENT

A. Comply with the requirements of Division 3 for mixing and placing concrete, and as herein specified.

B. Do not place concrete until subgrade and forms have been checked for line and grade. Moisten subgrade as required to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they have been brought to the required grade and alignment.

C. Place concrete using methods which prevent segregation of the mix, and with as little re-handling as possible. Consolidate concrete along the face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from the joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.

D. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than ½ hour, place a construction joint. Sections less than 15' in length between transverse joints will not be permitted. Remove such sections if directed by the Architect.

3.6 JOINTS

A. General

1) Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of the concrete, unless otherwise shown. Construct transverse joints at right angles to the centerline, unless otherwise shown.

2) When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise shown.

B. Weakened-Plane (Contraction) Joints

1) Provide weakened-plane (contraction) joints, sectioning concrete into areas as shown on the drawings.

2) Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer. Construct tooled weakened-plane joints to a depth equal to at least ¼ concrete thickness. At Contractor's option joints may be sawn.

C. Construction Joints

1) Place construction joints at the end of all pours and at locations where placement operations are stopped for a period of more than 1/2 –hour. All pours shall terminate at expansion joints or weakened-plane joints.

2) Construct joints as shown, or if not shown, use standard metal keyway section forms.

D. Expansion Joints

1) Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks and other fixed objects.

2) Locate expansion joints at 25' o.c. for each sidewalk, unless otherwise shown.

3) Extend joint fillers full-width and depth of joint, and not less than ½ "or more than 1" below finished surface. Furnish joint fillers in one-piece lengths for the full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together. Form top edge of filler to conform to top profile of concrete.

4) Protect the top edge of the joint filler during concrete placement with a metal cap or other temporary material. Remove protection after both sides of joint are placed.

5) After placement of expansion joint filler, seal joint with sealant specified in Section 07 90 00+ "Sealants" for traffic joints.

3.7 CONCRETE FINISHING – NEW CONCRETE

A. After striking-off and consolidating concrete, smooth the surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust the floating to compact the surface and produce a uniform texture.

B. After floating, test surface for trueness with a 10' straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous, smooth finish.

C. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to ½" radius, unless otherwise shown.

D. After completion of floating and when excess moisture or surface sheen has disappeared, complete surface finishing.

E. Finish shall be light broom on walks.

F. Do not remove forms for 24 hours after concrete has been placed, unless otherwise acceptable to Architect. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Architect.

3.8 CONCRETE FINISHING – EXISTING CONCRETE

Lightly sandblast existing concrete pavement and seal joints and cracks.

3.9 CURING

Protect and cure finished concrete complying with applicable requirements of Division 3 sections. Use moist-curing methods for initial during whenever possible.

3.10 REPAIRS AND PROTECTIONS

A. Repair or replace broken or defective concrete, as directed by Architect.

B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

C. Sweep concrete pavement and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

END SECTION 03 21 31

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 RELATED SECTIONS

A. Section 03 10 00 – Concrete Formwork.

B. Section 03 20 00 – Concrete Reinforcement.

1.2 SUBMITTALS

A. Submit concrete mix designs with supporting data confirming compliance with ACO 318-19, Chapter 19 and this specification. The submittal shall include the following:
- Aggregate Analysis
- Certifications showing that the following conform to these specifications:
  - Fine & course aggregate
  - Cement
  - All admixtures (air entrainer, water reducer, etc.)
- Laboratory test reports concerning cast-in-place concrete:
  - Type of concrete furnished
  - Fresh unit weight
  - Compressive strength
  - Slump
  - Air content
  - Water added to concrete after batching will <u>not</u> be approved.
  - Water-cement ratio

B. Retain ready-mix delivery tickets at job site for inspection by Architect.

C. All submittals shall include the following note completed and signed by the Contractor:
- The data submitted does not contain material deviation from requirements of contract documents except as follows:

D. Submit laboratory reports verifying that all column base plates have been grouted with the specified non-shrink grout.

1.3 QUALITY ASSURANCE

A. Included in the responsibilities for concrete testing and inspection are the following:

1. Taking, handling, protecting and storing of test specimens.
2. Accurate reporting of compressive strength, weight of cylinders, temperature, slump, air content and location of concrete.
3. Verify the grouting of all column base plates.
4. Test floor slabs for flatness and levelness.
5. Monitor the concrete curing procedures.

B. If the concrete fails to meet any part of the specifications, immediately notify Architect to obtain instructions.

C. Laboratory will be required to obtain samples, in accordance with ASTM C31-26 and perform compression test per ASTM C39-26; air content tests per ASTM C138-24a (gravimetric method), ASTM C173-26 (Volumetric method) or ASTM C231-26 (pressure method); slump test per ASTM C143-26a.

D. Laboratory will test the number of cylinders specified below for each 50 cubic yards, or fraction thereof, or for each 5000 square feet of surface area for slabs or walls, whichever condition requires more frequent testing, of each class of concrete placed each day.

2 at 7 days for information.
2 at 28 days for acceptance.
2 at time directed by Architect if cylinders tested at 28 days do not indicate acceptable strength.

E. No additions or changes will be made to the concrete after test cylinders are made by Laboratory Field Personnel.

1.4 EVALUATION AND ACCEPTANCE OF CONCRETE

A. Concrete strength will be evaluated by the Architect according to the provisions of ACI 318-19, Section 26.12. Should evidence of low-strength concrete exist, or if test results indicate non-conformance with these specifications, additional investigation, as outlined in ACI 318-19, Section 26.12.4, may be directed by the Architect. All such investigation, including the cost of the Architect's time, shall be at the Contractor's expense.

B. If, after additional investigation, evidence of low-strength concrete still exists, load tests in accordance with Chapter 27 of ACI 318-19 may be ordered by the Architect. In the event the concrete is determined to be inadequate by the Architect, the Contractor will remove it from the Project and replace it with concrete conforming to these specifications, subject to all testing requirements herein. All such remedial work shall be at the Contractor's expense.

C. The Contractor shall be fully responsible for ensuring that all concrete and concrete placement are in accordance with the Project Specifications. Failure of Architect or Testing Laboratory to detect defective work, workmanship, or materials shall in no way prevent rejection and the Contractor taking approved corrective action when such defects are discovered. The Architect or the Testing Laboratory shall not, thereby, be obligated to make a final acceptance.

1.5 CONCRETE QUALITY DESIGN

A. All concrete mix designs shall be proportioned in accordance with Section 5.3 (field experience and/or trial mixtures) of ACI 318-95. Submit mix design for each class of concrete. If a standard deviation analysis is used, the concrete shall achieve an average strength in accordance with 5.3.2.1 of ACI 318-95. If trial mixtures are used, the proposed mix design shall achieve an average strength in accordance with Table 5.3.2.2 of ACI 318-95. Submittals made that do not conform to Section 5.3 of ACI 318-95 shall be rejected.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when temperature is below 40 degrees F (4.5 degrees C), or forecasted to go below 40 degrees F within 24 hours, unless adequate heating and protecting equipment is on hand to warm concrete. In these circumstances, use heating and protecting equipment continuously until concrete has set and for at least 72 hours after placing.

B. Perform cold weather concrete work in accordance with ACI 306R-16, "Guide to Cold Weather Concreting."

C. Perform hot weather concrete work in accordance with ACI 305R-91, "Guide to Hot Weather Concreting."

D. When high temperatures and/or placing or humidity conditions dictate, the mix may be initially retarded by use of the water reducing, retarding formulation (Type D) or the specified water reducing admixture (Type A).

1.7 REFERENCES

A. The following references shall be obtained by the Contractor and maintained at the job site in a readable condition at all times:

1. ACI 318-19, Building Code Requirements for Reinforced Concrete.
2. ACI 315R-18 Guide to Presenting Reinforcing Steel Design Details.
3. ACI 306R-16, Guide to Cold Weather Concreting.
4. ACI 305R-20, Guide to Hot Weather Concreting.
5. ACI 302.1-15, Guide to Concrete Floor and Slab Construction.
6. ACI 301-20, Specifications for Concrete Construction.
7. Manufacturer's Instructions of all products required for proper use or installation of the product.

PART 2 – PRODUCTS

2.1 PORTLAND CEMENT

A. ASTM C150-94a, Type 1. Use only one brand.

2.2 NORMAL WEIGHT AGGREGATE

A. Fine aggregate: Natural siliceous sand conforming to ASTM C33-93a.

B. Coarse Aggregate: Washed gravel or crushed stone, ASTM C33-93a. Size coarse aggregate in accordance with ACI 318-95, Chapter 3, subparagraph 3.3.2. Coarse aggregate for pan stairs shall not exceed ½ inch in maximum dimension.

2.3 WATER

A. Clean water, free from elements which might adversely affect concrete, and embedded items.

2.4 ADMIXTURES

A. Water Reducing Admixture: The admixture shall conform to ASTM C494-92, Type A, and not contain more than 0.05 percent chloride ions.

Manufacturer	Product
Euclid Chemical Company	Eucon WR-75 or WR-89
Master Builders	Pozzolith 322N
Sika Chemical Corporation	Plastocrete 160
W.R. GRACE & Co.	WRDA Series

B. Water Reducing/Retarding Admixture: The admixture shall conform to ASTM C494-92, Type D, and not contain more than 0.05 percent chloride ions.

Manufacturer	Product
Euclid Chemical Company	Eucon Retarder – 75
Master Builders	Pozzolith 100 XR
Sika Chemical Corporation	Plastiment
W.R. GRACE & Co.	Daratard – 17

C. High Range Water Reducing Admixture/(Superplasticizer): The admixture shall conform to ASTM C494-92, Type F or G, and not contain more than 0.05 percent chloride ions.

Manufacturer	Product
Euclid Chemical Company	Eucon 37
Master Builders	Rheobuild 1000
Sika Chemical Corporation	Sikament
W.R. GRACE & Co.	Daracem Series
W.R. GRACE & Co.	ADVA Flow

D. Non-Corrosive, Non-Chloride Accelerator: The admixture shall conform to ASTM C494-92, Type C or E, and not contain more chloride ions than are present in municipal drinking water. The admixture manufacturer must have long-term non-corrosive test data from an Independent Testing Laboratory (of at least a year's duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures.

Manufacturer	Product
Euclid Chemical Company	Accelguard 80
Master Builders	Pozzutec 20
W.R. GRACE & Co.	Polarset

E. Air Entraining Admixture: conforming to ASTM C260-95.

F. Prohibited Admixtures: Calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions are <u>not</u> permitted.

G. Certification: Written conformance to the above mentioned requirements and the chloride ion content of the content of the admixture will be required from the admixture manufacturer prior to mix design review by the Engineer.

2.5 FLY ASH

A. Use <u>NO</u> fly ash or any form in concrete. Any concrete provided with fly ash will be rejected.

B. Mix designs for industrial slab-on-grade shall not contain fly ash.

2.6 READYMIX CONCRETE

A. In accord with ASTM C94-92a, option A and the criteria given in these specifications and on the Structural Drawings.

B. Strength at 28 days: As specified on the Structural Drawings. For concrete to be post-tensioned, see Section 03230 for early strength criteria.

C. Air Content: Provide entrained air in accordance with ACI 302,1-15, Table 5.2.7a within tolerances specified and as noted in the Structural Drawings. Concrete subject to freezing and thawing and/or deicers shall be categorized as "severe exposure," except concrete with a specified strength of 6000 psi shall be categorized as "moderate exposure." All other concrete shall be categorized as "moderate exposure."

D. Water-Cement Ratio: All concrete exposed to freezing and thawing shall have a maximum water-cement ratio of 0.50. All concrete subjected to deicers and/or * required to be watertight shall have a maximum water-cement ratio of 0.45 (4500 psi or more at 28 days.) All reinforced concrete subjected to brackish water, salt spray or deicers shall have a maximum water/cement ratio of 0.40 (5000 psi or more at 28 days). Maximum water/cement ratio for industrial slab-on-grade shall be 0.50.

E. Slump: All concrete containing the high-range water-reducing admixture (superplasticizer) shall have a maximum slump of 9" unless otherwise approved by the Architect. The concrete shall arrive at the job site at a slump of 2" to 3", (3" to 4" for concrete receiving a "shake-on" hardener or lightweight concrete), which shall be verified, then the high-range water-reducing admixture added to increase the slump to the approved level. All other concrete shall have a maximum slump of 3 inches for slabs and 4 inches for other concrete.

F. Maximum water soluble chloride ion concentrations in hardened concrete at an age of 28 days contributed from the ingredients including water, aggregates, cementitious materials and admixtures shall not exceed the limits established in Table 4.3.1 of ACI 318-19.

G. Admixtures: All concrete shall contain the specified water-reducing admixture or high range water-reducing admixture (superplasticizer). At the Contractor's option, both water-reducing admixtures may be included in the concrete mix. All concrete slabs placed at air temperatures below 50 degrees Fahrenheit shall contain the specified Non-Chloride, Non-Corrosive accelerator. All concrete required to be air entrained shall contain the approved air entraining admixture. All pumped concrete and concrete with a water-cement ratio below 0.50 shall contain the specified high range water reducing admixture (superplasticizer).

2.7 VAPOR RETARDER

A. 10 mil minimum thickness polyolefin geomembrane manufactured from ISO certified virgin resins or equivalent. Vapor retarder shall meet or exceed ASTM E-1745 Class A requirements and shall have a maximum water vapor permeance of 0.04 perms.

2.8 BOND BREAKER

A. 30# and 90# asphalt saturated roofing felt.

2.9 CURING COMPOUND

A. Clear Curing and Sealing Compound (VOC compliant): The compound shall have 30 percent solids content minimum, and will not yellow under ultra violet light after 500 hours of test in accordance with ASTM C309-95 and will have a maximum moisture loss of 0.039 grams per sq. cm. when applied at a coverage rate of 250 sq. ft. per gallon in 72 hours. Product shall be "Super Aqua Cure VOX" or "Super Diamond Clear VOX" by The Euclid Chemical Company.

Manufacturer	Product
Euclid Chemical Company	Super Aqua Cure VOX or Super Diamond Clear VOX

2.10 SHEET MATERIAL FOR CURING CONCRETE

A. Waterproof paper or polyethylene film as per ASTM C171-95.

2.11 PENETRATING EPOXY SEALER

A. Sealer shall be applied to all concrete surfaces exposed to vehicular traffic. The compound shall be a two (2) component 100 percent reactive non-staining, penetrating epoxy with 30 percent solids minimum and applied in accordance with manufacturer's recommendations. The compound shall provide protection (rating=0, no scaling) to a minimum of 200 freeze/thaw cycles in accordance with ASTM C672-92.

Manufacturer	Product
Euclid Chemical Company	Eucopoxy 512
L and M Construction Chemical	Pentox
Master Builders	Master Seal GP

2.12 BONDING COMPOUND

A. Bonding compounds are for interior use only.

Manufacturer	Product
Euclid Chemical Company	Euco Weld
The Larsen Company	Weldcrete
L and M Construction Chemicals	Everbond
Master Builders	MB Primer

2.13 EPOXY ADHESIVE

A. The compound shall be a two (2) component, 100 percent solids, 100 percent reactive compound suitable for use on dry or damp surfaces.

Manufacturer	Product
Euclid Chemical Company	Euco Epoxy No. 452MV or Eucopoxy LPL
Sika Chemical Corporation	Sikadur Hi-Mod
Master Builders	Concresive

2.14 NON-SHRINK GROUT

A. The factory premixed non-metallic grout shall conform to ASTM C1107-86 (1991), "Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink)." In addition, the grout manufacturer shall furnish test data from an Independent Laboratory indicating that the grout when placed at a fluid consistency shall achieve 95 percent bearing under a 4'x4' base plate.

Manufacturer	Product
Euclid Chemical Company	Euco NS
Master Builders	Masterflow 928 Set Grout

B. Where high fluidity and/or increased placing time is required use the following products. In addition, the grout manufacturer shall furnish test data from an Independent Laboratory indicating that the grout when placed at a fluid consistency shall achieve 95 percent bearing under an 18" by 36" base plate.

Manufacturer	Product
Euclid Chemical Company	Euco Hi-Flow Grout
Master Builders	Masterflow 938

C. For grout used to fill pocket recess of post-tensioned tendon anchors, see Section 03230.

2.15 CONCRETE FLOOR TOPPING AND MORTAR

A. Underlayment: Free-flowing, self-leveling, pumpable cementitious base compound.

Manufacturer	Product
Euclid Chemical Company	Flo-Top
Master Builders	Master Top 110

B. Repair Topping: Self-leveling, polymer modified high strength topping.

Manufacturer	Product
Euclid Chemical Company	Thin Top SL
Master Builders	Master Top 112

C. Polymer Patching Mortar: The low shrinkage structural repair mortar shall be a polymer, high strength concrete repair mortar. This repair mortar only requires the addition of water at the job site.

Manufacturer	Product
Euclid Chemical Company	Euco Thin Coat, Concrete Coat (horizontal repairs) Verticoat LPL (Vertical and overhead repairs)
Sika Chemical Corporation	Sikatop 121 or 122 (horizontal repairs) Sika 123 (vertical and overhead repairs)
Master Builders	EMACOS Series or T Series

PART 3 – EXECUTION

3.1 FIELD QUALITY CONTROL

A. As concrete is delivered, the Testing Laboratory will make cylinders as specified in this specification. In addition, the Testing Laboratory will take small batches of the same concrete used for making cylinders for making slump tests and air entrainment tests. Assist the Laboratory in taking samples and furnish concrete required for making the test.

B. The Testing Laboratory shall observe baseplate grouting and curing procedures.

3.2 CONDITION OF SURFACES

A. Notify Testing Laboratory at least 48 hours before starting concrete placement. Placement may proceed provided no defective workmanship or materials are detected by inspecting personnel.

B. Place no concrete until reinforcement and other embedded items are positioned and secured.

C. Forms, surfaces, and trenches shall be free from water, mud, ice, frost and debris when concrete is placed.

3.3 VAPOR RETARDER

A. Install, protect and repair vapor retarder in accordance with ASTM E1643 and the manufacturer's written instructions. Where inconsistencies occur between ASTM E1643 and the manufacturer's

written instructions, conform to the manufacturer's instructions. Place vapor retarder under all interior slabs placed on earth or aggregate.

B. Installation:
   1. Level and compact granular fill. Choke off surface of stone with sand or finely crushed stone to create a smooth, level surface for the vapor retarder.
   2. Place vapor retarder sheeting with the longest dimension parallel with the direction of concrete placement.
   3. Lap vapor retarder over footings or seal to foundation wall, or both, and seal around penetrations such as utilities and columns in order to create a monolithic membrane between the surface of the slab and moisture sources below the slab and at the slab perimeter. Place smoothly, without wrinkles and trapped air. Turn vapor retarder up at least 4" (10 cm) at vertical surfaces and all penetrations.
   4. Lap side and end joints at least 6" (15 cm) or more if instructed by the manufacturer and weigh down sheeting to avoid blowing. Seal joints with the pressure sensitive tape or equivalent as specifically required or recommended by the vapor retarder manufacturer.

C. Protection:
   1. Take precautions to protect the vapor retarder from damage during installation of reinforcing steel and utilities and during concrete placement.
   2. Use only concrete brick type reinforcing bar supports or provide 6 inch by 6 inch protective pads of asphaltic hardboard or other material recommended by the vapor retarder manufacturer to protect the vapor retarder from puncture.
   3. Avoid use of stakes driven through the vapor retarder.
   4. Keep unnecessary traffic off of vapor retarder.

D. Repair:
   1. Repair vapor retarder damaged during the placement of reinforcing steel or concrete using the same vapor retarder material or as instructed by the manufacturer.
   2. Lap beyond damaged areas a minimum of 6 inches and seal as prescribed for sheet joints.

3.4 BOND BREAKERS

A. Where separation from a vertical surface is desired, place 12" wide strips of 30# felt, creased at a right angle in the long direction, at all vertical surfaces, except where fiberboard is to be installed. Turn up on vertical surfaces for full thickness of concrete.

B. Where floor slabs bear on tops of foundations, place a 90# strip of felt, full width of bearing surfaces, on all bearing surfaces.

3.5 PRODUCTION OF CONCRETE

A. Produce concrete in accordance with Chapter 7 of ACI 301-96 for ready-mixed concrete.

3.6 PLACING CONCRETE

A. Prepare place of deposit and equipment. Convey and place concrete in accordance with ACI 301-20, Chapter 5. Certain parts of those paragraphs are modified below, and where modifications conflict with those paragraphs or additional instructions they should take precedence over the printed paragraphs of ACI 301-96.

B. Variation from clear cover and depth of members shall conform to section 20.6.1.3 of ACI 318-19.

C. Deposit concrete within 1-1/2 hours after water is added to dry batching, or use retarding admixture.

D. Convey concrete promptly to point of use in manner which will prevent separation of ingredients and loss of water. Deposit concrete near its final position to avoid rehandling.

E. Consolidate concrete, including floor slabs, in accordance with ACI 309-05, "Recommended Practice for Consolidation of Concrete". All concrete shall be vibrated. Maintain at least one vibrator as a stand-by. Lower frequency vibrators may be used with "flowing" concrete.

F. Do not use vibrators to cause concrete to flow.

G. Concrete column placements shall not extend more than ¾ inch into the concrete slab, beam or shear cap. Chip off any concrete that exceeds this dimension.

H. Do not add water to the concrete at the Project site. Concrete shall arrive at the site and be discharged at the specified requirements and conforming to the approved design mix. Adding water in the field and changing concrete's chemistry to unknown and indeterminated characteristics will not be accepted or approved.

3.7 CONSTRUCTION JOINTS AND EMBEDDED ITEMS

A. Construction joints and embedded items shall conform to ACI 301-96 and Chapter 6 of ACI 318-95. Location of all construction joints shall be approved by the Architect.

B. Do not place contraction joints in framed floors, composite slabs, or shear walls.

C. Place contraction joints in slabs-on-grade with spacing as shown on plans. If not shown otherwise, maximum spacing of contraction/control joints shall be approximately 15'-0" to form a regular grid. The long dimension of the grid shall not exceed 1.5 times the short dimension of the grid. Saw joints shall be a depth equal to one-fourth the slab thickness by one-eighth inch wide. Alternately, in areas to receive carpeting or wood flooring contraction joints may be provided by performed plastic strip inserts.

D. Provide contraction joints in concrete foundation or retaining walls at a maximum spacing of 20-foot but not more than 1.5 or less than 0.7 times the wall height. Space contraction joints equally between column interruptions in the wall surface such as pedestals, corners, or construction joints. Coordinate location with Architect. Contraction joints shall be formed as a V-groove on both faces of the wall, 3/4-inch minimum depth.

E. Obtain Design Professional's written approval prior to cutting concrete for installation of other work.

F. Construction, contraction and control joints shall be key-cold, hand tooled or saw cut with a "soft-cut" saw. Sawn joints shall be installed in less than 24 hours after placement of concrete.

3.8 FINISHING

A. After placing concrete, screed to levels and slopes indicated. Do not use tamping tools to force aggregate away from surface.

B. When the water sheen has disappeared, use a wood float as indicated.

C. Where troweled finish is required, the surface shall initially receive a float finish. The surface shall then be troweled, at least twice, to a smooth dense finish. Remove small imperfections left by troweling machine and bring to a smooth, dense, polished finish.

D. Broomed finish: The surface shall be given a coarse transverse scored texture by drawing a broom or burlap belt across the surface. This operation shall follow immediately after floating. Texture shall be as approved by the Architect from sample panels.

E. Do not use dry materials, such as sand and cement, on surfaces during finishing.

F. Do not use any procedures, such as the addition of water to the concrete surface that produces a layer of weak material with an increased water-cement ratio at the slab surface.

G. Grinding or the specified underlayment or repair topping shall be used where surfaces do not achieve their specified tolerances.

H. Where floors are to be covered with thin set tile, trowel as specified above and then broom surfaces to form a "tooth".

I. Floor Finish Tolerances

1. General: Prior to commencing work, see Table 1 and ACI 302 for construction methods suggested to achieve specified flatness and levelness requirements.

2. Floor Tolerance Measurements: Floor flatness and levelness tests shall be conducted in accordance with the provisions set forth in ASTM E1155. Floor tolerance measurements shall be made by the Testing Laboratory within 16 hours after completion of the final troweling operation and in all cases before forms and/or shores have been removed. FL values shall not apply to unshored elevated slabs or slabs on grade sloped to floor drains. Results of all floor tolerance tests – including a formal notice of acceptance or rejection of the work – shall be provided to the Contractor within 24 hours after data collection. Weekends and holidays shall be ignored when computing the testing and reporting deadlines specified above.

4. Flatness/Levelness Tolerances:

All Float Finish Areas:	Specified overall value: FF-25/FL-20
All areas that receive a trowel finish:	Specified overall value: FF-30/FL-20
	Minimum local value: FF-20/FL-13

3.9 CURING

A. As finished work is completed, begin curing. Curing may be accomplished by either of the methods described below, except for items specifically designated for a particular method.

B. Waterproof paper or plastic film curing: Cover damp surfaces with film or paper and lap at edges at least 4 inches. Apply weights to prevent displacement. Repair tears and punctures as they occur.

C. All exposed interior slabs and troweled slabs receiving mastic applied adhesives or metallic or mineral aggregate hardeners shall be cured with curing and sealing compounds compatible with the adhesives or hardeners. Exterior slabs, sidewalks, curbs, architectural concrete and any concrete where total resistance to yellowing from ultra-violet light and water exposure is required shall be cured with the specified clear, non-yellowing curing and sealing compound. Use waterproof paper or plastic film where any topping or applied material is not compatible with curing and sealing compounds.

D. Do not use curing and sealing compounds on surfaces receiving applied finishes other than resilient tile or carpet.

E. Where forms are left in place, keep forms damp by spraying at frequent intervals for at least 8 days. Do not allow forms to dry out.

3.10 PROTECTION

A. Protect concrete for at least 48 hours after finishing is complete. Erect barriers as necessary to protect uncured areas. Provide wood covers to protect uncured areas. Provide wood covers to protect concrete step-ups.

B. Protect concrete from paint and other stains, and from abrasive traffic.

C. Protect all future exposed concrete from construction dirt, damage and staining.

3.11 PATCHING

A. After forms are removed do not patch or repair, except that fins may be removed back to formed surfaces, until Architect has examined the work. After inspection by Architect, patch voids, honeycombs, spalls, chips, as directed.

B. Cut out honeycomb, rock pockets, voids over ¼" in any dimension, and holes left by tie rods and bolts, down to solid concrete, but in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Before placing cement mortar, thoroughly clean, dampen with water and apply the specified bonding compound. The cement mortar shall be placed after the bonding compound has dried. In areas subjected to moisture, the specified epoxy adhesive shall be used. The patching mortar shall be placed while the epoxy adhesive is still tacky.

C. Rub exposed interior finished concrete as specified above. Where form marks and fins detract from appearance or are otherwise objectionable remove them by rubbing.

D. The specified patching mortar may be used in lieu of the bonding compound and patching mortar with prior approval of the Engineer, when color match of the adjacent concrete is not required.

E. All overhead and vertical surface repairs shall be made with the specified polymer repair mortar (gel consistency).

F. All structural repairs shall be made with prior approval of the Engineer, as to the method and procedure, using the specified epoxy adhesive and/or epoxy mortar or the polymer repair mortar gel formulation. Where epoxy injection procedures must be used, an approved low viscosity epoxy made by the manufacturers previously specified shall be used.

3.12 FLOOR TOPPING PLACEMENT

A. Clean substrate of oil, grease or other contaminants and broom clean. Apply primer to the substrate as recommended by the manufacturer. Place topping over primed substrate continuously in a thickness of approximately one inch or as required to concrete level surface. Protect completed topping from damage during remainder of construction with wood planking or similar material.

B. The underlayment topping shall be used for interior surfaces receiving applied finishes. The repair topping shall be used in all other areas.

3.13 GROUTING

A. All column base plates, equipment bases, and other locations noted on the Contract Drawings, shall be grouted with the specified non-shrink, non-metallic grout.

B. After steel columns have been erected and shimmed to proper height, grout under column base plates with specified grout.

C. Where high fluidity and/or increased placing time is required use the specified high flow grout. This grout shall be used for all base plates larger than 10 sq. ft.

3.14 CLEAN-UP

A. Clean up and leave concrete work free from any loose material. Remove any mortar spills from floors other materials. Leave areas free from any debris.

B. Remove excess material and equipment from site when work is completed.

END OF SECTION 03 30 00

SECTION 03 62 00 - NON-SHRINK GROUT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section includes non-shrink grout under base plates, bearing plates, handrail pockets, and where specified in Contract Documents.

1.2 REFERENCES

A. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).

B. ASTM C1107 – Standard Specification For Packaged Dry, Hydraulic-Cement Grout (Non-Shrink)

1.3 QUALITY ASSURANCE

A. Structural Testing/Inspection Agency shall perform the following quality related items:

1. Perform compressive strength tests in accordance with ASTM C109 with 2-inch x 2-inch cubes. Test one cube at three days, two cubes at seven days and three cubes at 28 days. Perform one compressive strength test for each ten bags of grout used and/or perform one test minimum for each day of grouting, whichever is more frequent.

1.4 SUBMITTALS

A. Submit product data sheets for review.

PART 2 – PRODUCTS

2.1 GROUT

A. Provide a non-shrink, non-metallic grout that complies with ASTM C1107.

B. Grout shall have a minimum compressive strength of 7500 psi at 28 days.

C. Grout placed in exterior exposed conditions or areas subject to moisture shall be free of gypsum. Grout shall be SikaGrout 212 by Sika, General-Purpose by Symons Dayton Superior, or approved equal.

2.2 WATER

A. Provide clean, potable water.

PART 3 - EXECUTION

3.1 HANDLING

A. Store and protect non-shrink grout from moisture and contamination.

3.2 PREPARATION

A. Remove mud, dirt and other foreign materials from areas to be grouted.

B. Apply grout to rough concrete surface; roughen concrete as necessary prior to placing grout.

3.3 MIXING

A. Mix grout to its fluid, self-leveling consistency in accordance with manufacturer’s recommendations. Do not retemper grout. Do not exceed manufacturer's maximum limit on water content or use at a consistency which produces free bleeding. Mix grout in a paddle-type mortar mixer. Do not mix by hand.

3.4 PLACEMENT

A. Consolidate grout to provide uniformity. Do not vibrate grout.

B. Use forms to contain grout.

3.5 PROTECTION

A. Protect grout and areas to be grouted from excessive heat and cold in accordance with manufacturer's specifications. Protect grout from excessive drying shrinkage resulting from wind or direct sunlight. Protect areas grouted from excessive vibrations for three days.

END OF SECTION 03 62 00

SECTION 04 20 00 - UNIT MASONRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Concrete masonry units.
2. Decorative concrete masonry units.
3. Face brick.
4. Mortar and grout.
5. Steel reinforcing bars.
6. Masonry joint reinforcement.
7. Ties and anchors.
8. Embedded flashing.
9. Miscellaneous masonry accessories.
10. Cavity-wall insulation.

B. Related Sections:
1. Section 05 12 00 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
2. Section 05 50 00 "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.
3. Section 07 62 00 "Sheet Metal Flashing and Trim" for sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.02 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.03 PERFORMANCE REQUIREMENTS

A. All unit masonry work shall comply with Building Code Requirements for Masonry Structures and Specification for Masonry Structures.

B. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:
1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: For the following:
   1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
   2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
   3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

D. Samples for Initial Selection:
   1. CMUs, in the form of small-scale units.
   2. Weep holes/vents.

1.05 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
   1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

C. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

E. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 01 40 00 "Quality Requirements" for mockups.
   1. Build sample panels for each type of exposed unit masonry construction 48 inches long by 36 inches high by full thickness.
   2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
   3. Clean exposed faces of panels with masonry cleaner indicated.
   4. Protect approved sample panels from the elements with weather-resistant membrane.
   5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.

a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination."

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.08 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.01 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.02 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
   2. Provide bullnose units for outside corners unless otherwise indicated.

B. CMUs: ASTM C 90.
   1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi.
   2. Density Classification: Normal weight.
   3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
   4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

2.03 CONCRETE AND MASONRY LINTELS

A. General: Provide one of the following:

B. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section 03 30 00 "Cast-in-Place Concrete," and with reinforcing bars indicated.

C. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.04 BRICK

A. Regional Materials: Brick shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

B. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
   1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
   2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

C. Building (Common) Brick: ASTM C 62, Grade SW.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1700 psi (11.72 MPa.
2. Size: Match size of face brick.

D. Basic of Design: As indicated on drawings.

2.05 MORTAR AND GROUT MATERIALS

A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

C. Hydrated Lime: ASTM C 207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. Davis Colors; True Tone Mortar Colors.
   b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
   c. Solomon Colors, Inc.; SGS Mortar Colors.

F. Aggregate for Mortar: ASTM C 144.
1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

G. Aggregate for Grout: ASTM C 404.

H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. Euclid Chemical Company (The); Accelguard 80.
   b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
   c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.

I. Water: Potable.

2.06 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
1. Interior Walls: Hot-dip galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized, carbon steel.
3. Wire Size for Side Rods: 0.148-inch diameter.

4. Wire Size for Cross Rods: 0.148-inch diameter.
5. Wire Size for Veneer Ties: 0.148-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet , with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

D. Masonry Joint Reinforcement for Multiwythe Masonry:
1. Adjustable (two-piece) type, ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.

2.07 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
2. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.
1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units.
2. Where wythes are of different materials, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
3. Wire: Fabricate from 3/16-inch-diameter, hot-dip galvanized steel wire.

D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch-diameter, hot-dip galvanized steel wire.

E. Partition Top anchors: 0.105-inch- thick metal plate with 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

F. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

2.08 MISCELLANEOUS ANCHORS

A. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

B. Postinstalled Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Load Capacity: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 unless otherwise indicated.
3. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.09 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
3. Metal Drip Edge: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.

B. Flexible Flashing: Use one of the following unless otherwise indicated:
1. Copper-Laminated Flashing: 3-oz./sq. ft. copper sheet bonded between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
   a. Products: Subject to compliance with requirements, provide one of the following:
      1) Advanced Building Products Inc.; Copper Fabric Flashing.
      2) Dayton Superior Corporation, Dur-O-Wal Division; Copper Fabric Thru-Wall Flashing.
      3) Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
      4) Phoenix Building Products; Type FCC-Fabric Covered Copper.
      5) Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
      6) York Manufacturing, Inc.; Multi-Flash 500.
2. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.
   a. Products: Subject to compliance with requirements, provide one of the following:
      1) DuPont; Thru-Wall Flashing.
      2) Hohmann & Barnard, Inc.; Flex-Flash.
      3) Hyload, Inc.; Hyload Cloaked Flashing System.
      4) Mortar Net USA, Ltd.; Total Flash.
   b. Monolithic Sheet: Elastomeric thermoplastic flashing, 0.040 inch thick.
   c. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

C. Application: Unless otherwise indicated, use the following:
1. Where flashing is indicated to receive counterflashing, use metal flashing.
2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing, flexible flashing with a metal drip edge, or elastomeric thermoplastic flashing with drip edge.
4. Where flashing is fully concealed, use metal flashing or flexible flashing.

D. Solder and Sealants for Sheet Metal Flashings:
1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
2. Elastomeric Sealant: ASTM C 920, chemically curing urethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

F. Metal Termination Bars: Stainless steel or aluminum bars, approximately 1 by 1/8 inch thick, predrilled at 9-inch centers.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Use the following unless otherwise indicated:
1. Wicking Material for Window Sills: Absorbent rope, made from cotton or UV-resistant synthetic fiber, 1/4 to 3/8 inch in diameter, in length required to produce 2-inch exposure on exterior and 18 inches in cavity. Use only for weeps.
2. Cellular Plastic Weep/Vent for all other Weep Locations: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
   a. Products: Subject to compliance with requirements, provide one of the following:
      1) Advanced Building Products Inc.; Mortar Maze weep vent.
      2) Blok-Lok Limited; Cell-Vent.
      3) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
      4) Heckmann Building Products Inc.; No. 85 Cell Vent.
      5) Hohmann & Barnard, Inc.; Quadro-Vent.
      6) Wire-Bond; Cell Vent.

E. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
   b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
   c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
   d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.11 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
1. Manufacturers: Subject to compliance with requirements, provide one of the following:
   a. Diedrich Technologies, Inc.
   b. EaCo Chem, Inc.
   c. ProSoCo, Inc.

2.12 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Use portland cement-lime mortar.
   3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
   1. For masonry below grade or in contact with earth, use Type M.
   2. For reinforced masonry, use Type S.
   3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type S.

D. Grout for Unit Masonry: Comply with ASTM C 476.
   1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
   2. Proportion grout in accordance with ASTM C 476, Table 1.
   3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
   2. Verify that foundations are within tolerances specified.
   3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges.

Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
   1. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.03 TOLERANCES

A. Dimensions and Locations of Elements:
   1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
   2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
   3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:
   1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
   2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
   3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
   4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
   5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
   6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
   7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:
   1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
   2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
   3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
   4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.
   5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.04 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
   1. Install compressible filler in joint between top of partition and underside of structure above.
   2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
   3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
   4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07 84 46 "Fire-Resistive Joint Systems."

3.05 MORTAR BEDDING AND JOINTING

A. Lay hollow masonry units as follows:
   1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
   2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
   3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
   4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.06 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
   1. Space reinforcement not more than 16 inches o.c.
   2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
   3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.07 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
   1. Provide an open space not less than 1 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
   2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
   3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.08 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:
   1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
   2. Install preformed control-joint gaskets designed to fit standard sash block.
   3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.

C. Form expansion joints in brick as follows:
   1. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 07 92 00 "Joint Sealants."

D. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 07 92 00 "Joint Sealants," but not less than 3/8 inch.
   1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.09 LINTELS

A. Install steel lintels where indicated.

B. Provide concrete or masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.10 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:
   1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
   2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches and secure to face of inter wythe with termination bar and fasteners spaced 16 inches on center.
   3. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches; secure flashing through sheathing to metal studs with termination bar and fasteners spaced 16 inches on center.
   4. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
   5. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing even with outside face of wall and adhere flexible flashing to top of metal drip edge.
   6. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
   1. Use specified weep/vent products to form weep holes.
   2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
   3. Space weep holes 24 inches o.c. unless otherwise indicated.
   4. Space weep holes formed from wicking material 16 inches o.c.
   5. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
   6. Trim wicking material flush with outside face of wall after mortar has set.

E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

3.11 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
   1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
   2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.12 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Reference Special Inspections information on structural drawings, if provided.

C. Inspections: Level B special inspections according to the "International Building Code."
1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

D. Testing Prior to Construction: One set of tests.

E. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

F. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.13 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

3.14 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
   1. Crush masonry waste to less than 4 inches in each dimension.
   2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 31 20 00 "Earth Moving."
   3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 20 00

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SECTION 05 12 00 - STRUCTURAL STEEL

PART 1 – GENERAL

1.1 RELATED SECTIONS

A. Grouting under base and bearing plates: Section 033000 – Cast-in-Place Concrete.

B. Section 05 21 00 – Steel Joists.

C. Section 05 30 00 – Steel Decking.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Anchor bolts and setting templates:

1. Section 03 30 00 – Cast-in-Place Concrete.
2. Section 03 10 00 – Concrete Formwork.

1.3 SCOPE

This is a Performance specification. Work under this section includes, but is not limited to, a complete resolution of the geometry of the Structural Steel members and their joints, producing shop drawings which accurately reflect the geometry of the members and joints fabricating and erecting of the structural steel to achieve a finished structural frame. The fabricator and erector shall include in their bid the expense of making any field corrections required to achieve a workable structure.

1.4 SUBMITTALS

A. Steel fabricator and erector to supply a list of five previous projects similar in size and complexity to this project to establish that they are capable to perform the work for this project. List shall include the name and location of each project with the name and phone number of the Contractor and Architect for which the previous projects were performed. Architect may reject any steel fabricator or erector that, in his opinion, fails to appear capable of performing the required work. Steel fabricator shall be approved by the Architect prior to the production of shop drawings.

B. Shop drawings prepared by the fabricator. Submit electronic PDF's of shop drawings for review and mark-up. Connections not detailed on the design drawings shall be designed by the fabricator. Structural design drawings are for design intent only. It is the responsibility of the fabricator to ensure that the shop drawings reflect all necessary information required for fabrication and erection. Reproduction of structural design drawings for the shop drawing submittal will not be permitted nor will they be reviewed.

C. Submit mill certification that steel supplied meets requirements of specifications.

D. Submit electrode manufacturer's certification that the electrode and flux combination the requirements of the particular classification or grade of electrodes.

E. Submit a minimum of three copies of each report from the Testing Laboratory to the Architect. See Field Quality Control section this specification for inspections and test required of the Testing Laboratory.

F. Submittals shall include the following note completed and signed by the Contractor: The data submitted does not contain material deviation from requirements of contract documents except as follows:

1.5 QUALITY ASSURANCE

A. Structural steel: Meet requirements of Manual of Steel Construction, Ninth Edition, Allowable Stress Design and Plastic Design for types of steel specified.

B. Fabrication and erection: Meet requirements of Specification for the Design Fabrication and Erection of Structural Steel for Buildings, June 1, 1989, and all subsequent modifications or addendums (referred to below as Structural Steel for Buildings) as indicated.

C. Welding: In accordance with requirements of American Welding Society "Structural Welding Code," AWS D1.1-85.

D. Testing Agency – Personnel performing tests and inspection will be certified by American Society for Non-Destructive Testing, for Level II.

E. Included in the responsibilities for structural steel testing and inspection are the following:

1. Observe the AWS qualifications of all welders.
2. Inspect and test a representative sampling of a minimum of 10% of the high strength bolts for proper installation and tensioning.
3. Verify that electrodes are compatible with the base metals joined.
4. Ultrasonically test complete penetration welds and visually inspect all fillet welds.

1.6 QUALIFICATIONS

A. Steel Fabricator: Fabricator shall be approved by the Architect. See Submittal section this specification for requirements.

B. Welders, tackers, and welding operators: Qualified in accordance with Code for Welding in Building Construction, AWS D1.1-96 to perform the type of work required.

1.7 PRODUCT HANDLING

A. Deliver materials, such as anchor bolts and other anchor devices to be embedded in concrete and masonry construction, to project site in time to be installed in proper sequence with concrete and masonry work. Provide setting drawings, templates and directions for installation of anchor bolts and other devices.

B. Deliver steel to project site and stack in designated area.

C. Stack and store steel above ground on platforms, studs or other supports. Protect steel from corrosion and damage. Keep materials clean.

D. Store other materials in a weathertight, dry place until ready for use.

E. Store packaged materials in their original, unbroken package or container.

PART 2 – PRODUCTS

2.1 STRUCTURAL STEEL

A. Channels, Angles: ASTM A 36/A 36M
B. W-Shapes: ASTM A992/A992M
C. Plate and Bar: ASTM A 36/A 36M
D. Steel Castings: ASTM A 216/A 216M, Grade WCB with supplementary requirement S11.

E. Steel Forgings: ASTM A 668/A 668M.
F. Welding Electrodes: Comply with AWS requirements W/ 70 ksi electrodes.

2.2 STEEL PIPE

A. ASTM A53-96, Grade B, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

2.3 STEEL TUBING

A. ASTM A500-93, Grade B, Standard Specification for Cold-Formed Welded and Seamless Carbon Structural Tubing.

2.5 WELDING ELECTRODES

A. Electrodes having low hydrogen covering shall be purchased in hermetically-sealed containers.

B. For fabricating plant use: E70 electrodes, AWS A5.1-91, A5.5-96, A5.17-89 or A5.20-95.

2.6 BOLTS

A. High strength bolts, nuts and washer: Type 1 or 2, ASTM A325-96, Standard Specification for High-Strength Bolts for Structural Joints, Including Suitable Nuts and Plain Hardened Washers. Provide ¾" diameter bolts unless noted otherwise.

B. High strength bolts shall be load-indicator bolts. Provide load-indicator bolts as manufactured by Bethlehem, Le Juene, or approved substitute. Load-indicator bolts shall be installed using equipment specifically manufactured for this use. Load-indicator bolts in tension shall have rounded heads that cannot accept the application of a wrench.

C. Unfinished bolts: ASTM A307-94, Standard Specification for Carbon Steel and Externally Threaded Standard Fasteners

D. Expansion (wedge) anchors: See Structural Drawings

E. Adhesive anchors: See Structural Drawings

2.7 SHOP COATING

A. A high grade rust-inhibiting primer.

B. Paint shall be VOC compliant, lead and chromate free and shall be compatible with products specified in Division 9 specifications.

2.8 GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time. (Minimum Compressive Strength = 5,000 psi.)
B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time. (Minimum Compressive Strength = 5,000 psi.)

PART 3 – EXECUTION

3.1 FABRICATING

A. Fabricate in accordance with applicable requirements of M2 of "Specification For Structural Steel Building" by AISC.

B. Design all connections, except for those fully detailed on the Structural Drawings.

3.2 SHOP COATING

A. Before steel leaves fabricator's shop, remove loose mill scale, rust, weld slag and flux deposit, dirt, foreign matter and oil and grease. Prepare surface as recommended by paint manufacturer for the intended exposure. Do not sandblast, flame clean, or pickle material.

B. Thoroughly and evenly apply one coat of shop paint to cleaned surfaces. Thickness of shop paint coat shall be applied to a minimum dry film thickness of 1 mil or as required by surface preparation.

C. Do not paint steel to be encased in concrete, plaster and sprayed-on-fireproofing.

3.3 ERECTING

A. Before commencing erecting work, notify Architect in writing at 48 hours in advance.

B. Erect steel in accordance with requirements of Section M4 of "Specification For Structural Steel Buildings" by AISC, except paragraph M4.6 is hereby modified to make field painting a part of the work on this section.

C. Use specified high-strength bolts for bolted connections, except where unfinished bolts and welded connections are allowed below. Use a minimum of 2 bolts at each bolted connection. Use hardened washers under bolt or nut, whichever is the element turned in tightening. Prior to tightening the bolts of a connection to final tension, there shall first be enough bolts brought to a "snug tight" condition to insure that the parts of the joint are brought into good contact with each other.

D. Bolts in bearing type conditions which are not subject to fatigue or load fluctuations need only to be tightened to a snug-tight condition. Bolts in tension shall be tightened to full tension values. Refer to Drawings for location of bolts required to be fully tightened.

E. Use unfinished bolts in places indicated.

F. Install expansion anchors per manufacturer's instructions.

G. Weld connections where indicated. Do not peen welds unless authorized in writing by Architect. Any shop paint on surfaces adjacent to joints to be field welded shall be wire brushed to reduce the paint film to a minimum.

H. Field Painting: For shop coated steel, touch up welds and scarred and damaged shop coat.

I. Protect all structural steel below grade by encasing in concrete or painting with bitumastic paint.

J. Do not field cut or alter structural members without approval of Architect/Engineer.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs[where indicated], back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

A. Shop and field welding will be tested and inspected in accordance with AWS Structural Welding Code. Welds will be visually or ultrasonically tested, depending on types of welded joints. All penetration welds shall be ultrasonically tested and inspected. A minimum representative sampling of 10 percent of all other welds shall be inspected by the Testing Laboratory for compliance with the design drawings and shop drawings. Additional inspections and testing shall be directed by the Architect. Additional testing as a result of non-conformances will be at the expense of the Contractor.

B. The Testing Laboratory shall inspect and test a minimum representative sampling of 10 percent of all bolted connections. Additional inspections and testing of bolted connections shall be performed by the Testing Laboratory as directed by the Architect. Additional testing as a result of non-conformances will be at the expense of the Contractor.

C. The steel fabricator shall be fully responsible for insuring that all steel fabrication and erection is in accordance with the Contract Documents. Failure of Architect or Testing Laboratory to detect defective work, workmanship, materials, or erection shall in no way prevent rejection of the work and the steel fabricator taking approved corrective action when such defects are discovered. The Architect or the Testing Laboratory shall not, thereby, be obligated to make a final acceptance.

3.6 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections

END OF SECTION 05 12 00

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SECTION 05 21 00 - STEEL JOISTS

PART 1 – GENERAL

1.1 RELATED SECTIONS

A. Section 05 12 00 – Structural Steel.

B. Section 05 30 00 – Steel Decking.

1.2 REFERENCES

A. SJI Specifications as adopted by the Steel Joist Institute as of the first day when the Project Documents may be picked up by bidders.

1. Standard Specifications for Open Web Steel Joist, K-Series.

B. AWS D1.1 – Structural Welding Code.

1.3 SUBMITTALS

A. Submit under the provisions of Section 01 30 00.

B. Submit electronic pdf's of the shop drawings. Steel joist shop drawings shall bear the seal and signature of an Engineer registered in the State of Tennessee, who shall be responsible for the design, materials, and fabrication of the steel joists and bridging. In lieu of stamped shop drawings, joist designer may submit delegated engineer component certification letter appended to this section.

1. Indicate standard designations, configurations, sizes, spacing, and locations.
2. Indicate connections and attachments.
3. Indicate bridging type and method of attachment to joists and at ends.
4. Submit PDF's of shop drawings. Obtain Architect's approval before fabricating.
5. Submittals shall include the following note completed and signed by the Contractor: The data submitted does not contain material deviation from requirements of contract documents except as follows:

1.4 QUALITY ASSURANCE

A. Perform work in accordance with SJI Specifications and Load Tables.

B. Included in the responsibilities for joist inspection are the following:

1. Inspect the welding of joists to supports.
2. Observe the AWS qualifications of all welders.

1.5 QUALIFICATIONS

A. Fabricator: Company specializing in performing the work of this Section and approved by SJI for the type of joists specified.

B. Erector: Company specializing in performing the work of this Section with three years minimum experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver joists and accessories to project and stack in designated areas. Keep material clean. Inspect joists and reject any that are damaged unless written approval is obtained from the Engineer of the joist.

B. Stack and store joists above ground on platforms, skids, or other supports. Protect from corrosion and damage.

C. Store other materials in a weathertight, dry place until ready for use.

D. Store packaged materials in their original, unbroken package or container.

1.7 COORDINATION

The Contractor is responsible to coordinate the construction and erection of masonry walls, steel joists, and steel decking to ensure compatibility of roof systems and wall systems when considering pitch and camber of steel joists.

PART 2 – PRODUCTS

2.1 STEEL JOISTS

Design and fabricate in accordance with SJI Specifications for the designated Series and with SJI Load Tables or for the superimposed uniform and concentrated loads specified on the Structural Drawings. Uplift conditions must be considered by the designer.

2.2 BRIDGING

Design in accordance with SJI Specifications.

2.3 CAMBER

Camber joists to be compatible with structural system, other materials, and required slope.

2.4 FINISH

A. Shop prime joists in accordance with SJI Specifications. Apply to clean surfaces in one even coat. Do not prime surfaces that will be field welded, fireproofed, or in contact with concrete.

B. Coordinate primer color with that specified for structural steel in Section 05 12 00.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of installation means Erector accepts existing conditions.

3.2 ERECTION

A. Erect joists in accordance with the SJI Standard Specifications and approved Shop Drawings.

B. Weld each end of each joist to steel supports as specified on the Structural Drawings, but in no case less than that required by the SJI Specifications. Unless noted otherwise, welds for joists required to resist lateral forces shall be designed to resist the forces indicated on the Structural Drawings. Wire brush any shop paint on surfaces adjacent to field welds to reduce the paint film to a minimum.

C. Install bridging and permanently fasten in place as soon as joists are erected, and before application of construction loads are placed on them. Bolted bridging shall be installed before slacking of hoisting lines for all joists longer than 40 feet.

D. Anchor ends of top and bottom chord bridging terminating at walls and beams. Provide ‘X’ bridging between perimeter beams and first interior joists.

E. No attachment shall be made to a steel joist that produces torsion in the joist member.

F. Provide means for adequate distribution of excessive concentrated loads so that the carrying capacity of any joist is not exceeded.

3.3 FIELD QUALITY CONTROL

A. Upon completion, examine work for defects and correct defects found. Do not cover up joists until permission is received from Architect.

B. Assist Testing Agency who will inspect the work. Provide ladders and scaffolds required to gain access for close inspection. Correct defects found.

C. Joists welded in place shall be subject to inspection. Remove and replace work found to be unacceptable. Contractor shall pay for tests conducted for his convenience.

3.4 CLEAN-UP AND TOUCH-UP

A. Clean up weld slag and other foreign matter resulting from this work.

B. Touch up damaged shop coat and welds with paint closely matching shop coat.

END OF SECTION 05 21 00

DELEGATED ENGINEER COMPONENT CERTIFICATION

Specification Section 05 21 00

Project Name_____

Project Location _____

CWE Project # _____

I certify that as delegated engineer for the above referenced project that I have reviewed and coordinated the joist design with the contract documents, erection drawings, all applicable building codes and SJI design specifications.

Seal and signature of Delegated Engineer

SECTION 05 30 00 - STEEL DECKING

PART 1 – GENERAL

1.1 RELATED REQUIREMENTS

A. Section 05 12 00 – Structural Steel.

B. Section 05 21 00 – Steel Joists.

1.2 SUBMITTALS

A. Submit electronic PDF's of steel deck shop drawings prepared by the fabricator or deck supplier.

B. Metal roof deck supplier shall submit section properties and load tables for the supplied product. This information shall be submitted with deck or form layout shop drawings.

C. Indicate sizes and location of deck units. Indicate welding and screw patterns.

D. Indicate sizes and location of holes to be cut in shop.

E. Submittals shall include the following note completed and signed by the Contractor: The data submitted does not contain material deviation from requirements of contract documents except as follows:

1.3 COORDINATION

Coordinate with other trades to preclude delays and interferences.

1.4 QUALIFICATIONS

Welders, tackers, and welding operation: Qualified in accordance with Code for Welding in Building Construction, AWS D1.3 to perform type of work required.

1.5 PRODUCT HANDLING

A. Deliver materials, in manufacturer's bundles, to project site and store in designated areas.

B. Store decking above ground on platforms or other supports. Protect from corrosion. Keep materials clean.

C. Store other materials in a weathertight, dry place until ready for use.

1.6 QUALITY ASSURANCE

A. Included in the responsibilities for steel decking inspection are the following:

1. Inspect the welding of metal deck to supports.
2. Inspect deck sidelap fasteners.
3. Observe the AWS qualifications of all welders.

PART 2 – PRODUCTS

2.1 GENERAL

A. Section properties shall conform to all applicable provisions of the latest edition of the Specification for the Design of Cold-Formed Steel Structural Members as published by the American Iron and Steel Institute.

B. Galvanized deck shall be roll-formed from steel sheet (hot dip galvanized) conforming to ASTM Designation A653, and ASTM A924 or Fed, Spec. QQ-S-775e.

C. For galvanized and painted deck, the steel shall be galvanized by the hot dip method followed by an organic chromate finish, then further treated with a clear vinyl epoxy preparation. A light gray

thermosetting, rust inhibiting prime paint shall then be roller coated and cured in a catenary oven at temperatures in excess of 400 degrees Fahrenheit before forming.

D. Accessories such as ridge and valley plates, cant strips, sump pans and other accessories which must be attached directly to the steel deck in order to provide a finished surface for the application of insulation and roofing, shall be supplied where shown on the contract drawings.

E. Placement drawings shall be prepared and submitted for approval. The drawings shall show deck type, finish, decimal thickness of steel, the location and length of the sheets, field cutting, the method of fastening and other information as required for a thorough review and installation.

F. The deck manufacturer shall certify that all materials will be in full compliance with this specification. The Letter of Certification shall accompany the design computations when submitting placement drawings for approval. When completed, 3 copies of certified mill reports shall be furnished to the Architect.

G. For the gage of deck as shown or referenced to on the drawings, the minimum uncoated steel thickness as delivered to the job site shall not at any location be less than the following decimal thicknesses:

GAGE	**Thickness (Inches)**
22	0.0295

1. All decking shall have nested side laps. Button punchable side laps will not be accepted.

H. Metal roof deck:

1. Steel deck shall be manufactured to conform to the following provision:

a. The Steel shall be ASTM designation A611, Grade C cold-rolled structural quality steel sheet (for painted deck) or A653, Grade A (hot-dip galvanized deck and accessories).

2. The minimum section properties per foot of width shall be as follows:

a. 1½ inch deck

GAGE	I (in^4)	SP(in^3)	SN(in^3)
22	0.158	0.186	0.192

b. The sheet width of 1½ inch deck shall be 30 inches.

c. Metal deck having a sheet width of 36 inches may be approved if all section properties listed above are satisfied.

d. 1½ inch deck shall be Type ‘B’.

2.2 METHODS OF ATTACHMENT

A. Metal roof deck: See deck attachment details on the drawings.

2.3 FABRICATING

A. Do not use a cutting torch for cutting deck or holes in deck. Cutting torch may be used for cutting holes in sump pans provided that cuts are cleaned and painted with a zinc base paint.

B. Cut holes for openings in deck indicated on Structural Drawings. Location of other holes will be furnished by trades requiring them.

2.4 SUMP PLATES

14 gage galvanized steel approximately 30 inches square. Refer to Architectural Drawings for specific size and shape.

2.5 RIDGE AND VALLEY PLATES

16 gage galvanized steel 8” plate on each side of ridge or valley, bent to conform to slopes.

PART 3 – EXECUTION

3.1 GENERAL

A. All deck is to be installed in accordance with manufacturer’s recommendations and this specification.

B. Deck with thickness less than 22 gage shall be attached by means of welding through 16 gage welding washers.

C. Place sump pans for roof drains and weld or bolt them to deck to reinforce openings.

D. Fasten ridge and valley plates to each roof rafter with two 1/4-14 self drilling screws. Overlap plates over two rafters on each side.

3.2 CUTTING

A. Cut required openings or lengths neatly with sheet metal tools. No cutting with welding equipment will be allowed.

B. Where the deck warps up at edges, and cutting is the only way to correct the warping, the underside of the deck may be cut to facilitate bending. Cutting should be centered over supports and should not extend up to the bottom of the top part of the flute. If necessary to maintain structural integrity, the Contractor shall provide for additional strength where deck is cut. Weld to support along each side of cut and paint over cut area.

3.3 FIELD QUALITY CONTROL

After installation is completed, carefully inspect it for loose fasteners or broken welds and re-fasten deck to supports where attachments are not tight. Where burn-through of deck or form occurs, 16 ga. welding washers shall be placed over openings and rewelded. If burn-through damages the supporting structural member, notify Engineer for repair instructions.

3.4 CLEAN-UP AND TOUCH-UP

A. After inspection, remove debris, welding spelter, and other foreign matter.

B. Use zinc base paint for touching up welds and damage to galvanized coating. Use rust-inhibiting paint to touch up wherever painted metal is scratched, scarred, abraded or welded.

C. Leave surfaces clean and ready for application of surfacing material.

END OF SECTION 05 30 00

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SECTION **05 40 00 - COLD-FORMED METAL FRAMING**

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Exterior non-load-bearing wall framing.

B. Related Requirements:
1. Section 05 50 00 "Metal Fabrications" for masonry shelf angles and connections.
2. Section 09 22 16 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.02 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of cold-formed steel framing product and accessory.

B. Shop Drawings:
1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Delegated-Design Submittal: For cold-formed steel framing.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

D. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. ClarkWestern Building Systems, Inc.
   2. Dietrich Metal Framing; a Worthington Industries Company.
   3. MarinoWARE.
   4. Odom Construction Services, Knoxville,Tenessee.
   5. Southeastern Stud & Components, Inc.

2.02 PERFORMANCE REQUIREMENTS

A. Cold-Formed Steel Framing Design Standards:
   1. Wall Studs: AISI S211.
   2. Headers: AISI S212.
   3. Lateral Design: AISI S213.

B. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.

C. Refer to structural drawings for all requirements no listed in this specification.

2.03 COLD-FORMED STEEL FRAMING, GENERAL

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
   1. Grade: ST33H, minimum.
   2. Coating: G90 or equivalent.

C. Steel Sheet for Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
   1. Grade: 33.
   2. Coating: G90.

2.04 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch.
   2. Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch.
   2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. AllSteel & Gypsum Products, Inc.
      b. ClarkWestern Building Systems, Inc.
      c. Dietrich Metal Framing; a Worthington Industries company.

d. MarinoWARE.
e. SCAFCO Corporation.
f. Steel Network, Inc. (The).
g. Steeler, Inc.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
1. Minimum Base-Metal Thickness: 0.0538 inch.
2. Flange Width: 1 inch plus twice the design gap for other applications.

E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.05 SOFFIT FRAMING

A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches, minimum.

2.06 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.07 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 55, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater

than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
   1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.08 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: [SSPC-Paint 20 or MIL-P-21035B] [ASTM A 780].

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.

C. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.09 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
   1. Fabricate framing assemblies using jigs or templates.
   2. Cut framing members by sawing or shearing; do not torch cut.
   3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
   4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
   2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.03 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
   1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
   1. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Section 07 21 00 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.04 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
   1. Stud Spacing: As indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
   1. Install single deep-leg deflection tracks and anchor to building structure.
   2. Install double deep-leg deflection tracks and anchor outer track to building structure.
   3. Connect vertical deflection clips to studs and anchor to building structure.
   4. Connect drift clips to cold-formed metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
   1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
      a. Install solid blocking at centers indicated.
   2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
   3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
   4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.05 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.06 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

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SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Steel framing and supports for countertops.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Aluminum roof access ladders.

B. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.
2. Division 05 Section "Structural Steel".

1.3 PERFORMANCE REQUIREMENTS

A. Thermal Movements:

1. Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
2. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Paint products.
3. Grout.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Provide templates for anchors and bolts specified for installation under other Sections.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel".
2. AWS D1.3, "Structural Welding Code--Sheet Steel".

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

C. Provide allowance for trimming and fitting at site.

1.7 COORDINATION

Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36.

B. Steel Tubing: ASTM A 500, cold-formed steel tubing.

C. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

D. Cast Iron: ASTM A 48, Class 30, unless another class is indicated or required by structural loads.

2.3 FASTENERS

General: Select fasteners for type, grade, and class required.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Concrete Materials and Properties: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

G. Aluminum shapes (6005-T5)

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items. Furnish inserts if units are installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.8 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning".
2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning".

C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
2. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 50 00

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SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Wood blocking and nailers.
2. Plywood backing panels.

B. Related Sections include the following:

1. Division 06 Section "Interior Architectural Woodwork" for nonstructural carpentry items exposed to view and not specified in another Section.

1.3 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.
2. NLGA - National Lumber Grades Authority.
3. SPIB - Southern Pine Inspection Bureau.
4. WCLIB - West Coast Lumber Inspection Bureau.
5. WWPA - Western Wood Products Association.

1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.

C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Expansion anchors.

1.5 QUALITY ASSURANCE

Source Limitations for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product through one source from a single producer.

1.6 DELIVERY, STORAGE, AND HANDLING

Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.
5. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

B. Plywood Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inches thick.

2.2 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, provide materials that comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 5664, for lumber and ASTM D 5516, for plywood.
2. Use treatment that does not promote corrosion of metal fasteners.
3. Use Interior Type A High Temperature (HT), unless otherwise indicated. Use Exterior type for exterior locations and where indicated.

B. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

C. Application: Treat all rough carpentry, including the following, unless otherwise indicated:

1. Concealed blocking.
2. Plywood backing panels.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA C2 (lumber) and AWPA C9 (plywood), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction, containing no arsenic or chromium, and one of the following:

a. Ammoniacal, or amine, copper quat (ACQ).

b. Copper bis (dimethyldithiocarbamate) (CDDC).

c. Ammoniacal copper citrate (CC).

d. Copper azole, Type A (CBA-A).

e. Oxine copper (copper-8-quinolinolate) in a light petroleum solvent.

2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry material after treatment to maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

D. Application: Treat items indicated on Drawings, and wood cants, nailers, blocking, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2.4 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Cants.
3. Nailers.

B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 19 percent maximum moisture content and any of the following species:

1. Mixed southern pine; SPIB.
2. Hem-fir or Hem-fir (north); NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.
2. Hem-fir or Hem-fir (north), Construction or 2 Common grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or Spruce-pine-fir, Construction or 2 Common grade; NELMA, NLGA, WCLIB, or WWPA.

2.5 PLYWOOD BACKING PANELS

Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inches thick.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Lag Bolts: ASME B18.2.1.

G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.

3.3 PLYWOOD BACKING PANELS

Fastening Methods: Screw to cold-formed metal framing or concrete masonry unit walls.

3.4 PROTECTION

Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00

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SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Plastic-laminate or wood cabinets and countertops.
2. Solid-surfacing-material countertops and integral sink bowls and window sills.
3. Shop finishing woodwork.
4. Closet and Utility Shelving.
5. Base boards.
6. Wood wall paneling.

B. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips unless concealed within other construction before woodwork installation.

1.2 SUBMITTALS

A. Product Data: For solid-surfacing material, cabinet hardware and accessories, handrail brackets and finishing materials and processes.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

C. Samples:

1. Lumber and panel products for transparent finish, for each species and cut, finished on one side and one edge.
2. Lumber and panel products with shop-applied opaque finish, for each finish system and color, with exposed surface finished.
3. Plastic-laminates, for each type, color, pattern, and surface finish.
4. Thermoset decorative panels, for each type, color, pattern, and surface finish.
5. Solid-surfacing materials.

D. Woodwork Quality Standard Compliance Certificates: WI-certified compliance certificates.

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop the employed skilled worker who custom fabricate products similar to those required for this Project and whose products have a record of successful in –service performance

B. Installer Qualifications: Fabricator of woodwork.

C. Source limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork.

D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards.", WI's "Manual of Millwork."

E. Fire-Test Response Characteristics: Where Fire Retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or other testing and inspecting agency acceptable to authorities having jurisdiction. Identify appropriate markings of applicable testing and inspecting agency in the form of separate paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

F. Mock-ups: build mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approved mockups may become part of the completed work if undisturbed.

G. Preinstallation Conference: conduct conference at Project site to comply with requirements in Section 01 31 00 Project Meetings.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 WOODWORK FABRICATORS

A. Fabricators: Subject to compliance with requirements, provide interior architectural woodwork by one of the following:

2.2 MATERIALS

A. Wood Species for Opaque Finish: Any closed-grain hardwood

B. Wood Products:
1. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
2. Particleboard: ANSI A208.1, Grade M-2
3. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

C. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Formica Corporation.
b. Nevamar Company, LLC; Decorative Products Div.
c. Wilsonart International; Div. of Premark International, Inc.

D. Solid Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.

1. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
   a. ABA Industries.
   b. Avonite, Inc.
   c. E.I. du Pont de Nemours and Company.
   d. Formica Corporation.
   e. LG Chemical, Ltd.
   f. Meganite Inc.; a division of the Pyrochem Group.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with performance requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Use Exterior Type or Interior Type A. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Kiln-dry material after treatment.

B. Fire-Retardant Particleboard: Panels made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture with flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.

C. Fire-Retardant Fiberboard: ANSI A208.2 medium-density fiberboard panels made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture with flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

2.4 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural woodwork, except for items specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)."

B. Butt Hinges: 2-3/4-inch 5-knuckle steel hinges made from 0.095-inch- thick metal, and as follows:

1. Semiconcealed Hinges for Flush Doors: BHMA A156.9, B01361.
2. Semiconcealed Hinges for Overlay Doors: BHMA A156.9, B01521.

C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, **135** degrees of opening**, self-closing**.

D. Back-Mounted Pulls: BHMA A156.9, B02011.

E. Wire Pulls: Back mounted, solid metal 5 inches (127 mm) long, 2-1/2 inches (63.5 mm) deep, and 5/16 inch (8 mm) in diameter.

F. Catches: Magnetic catches, BHMA A156.9, B03141

G. Drawer Slides: BHMA A156.9, B05091.

1. Standard Duty (Grade 1, Grade 2, and Grade 3): Side mounted and extending under bottom edge of drawer; full-extension partial-extension type; zinc-plated steel with polymer rollers.
2. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
3. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.

4. File Drawer Slides: Grade 1HD-200; for drawers more than 6 inches high or 24 inches wide.
5. Pencil Drawer Slides: Grade 2; for drawers not more than 3 inches (75 mm) high and 24 inches wide.

H. Aluminum Slides for Sliding Glass Doors: BHMA A156.9, B07063.

I. Door Locks: BHMA A156.11, E07121.

J. Drawer Locks: BHMA A156.11, E07041.

K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Stainless Steel: BHMA 630.

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, fire-retardant-treated, kiln-dried to less than 15 percent moisture content.

B. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

2.6 FABRICATION

A. General: Complete fabrication to maximum extent possible before shipment to Project site. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.

B. Plastic-Laminate Cabinets:

1. AWI Type of Cabinet Construction: Flush overlay
2. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate as follows:

   a. Horizontal Surfaces Other Than Tops: Grade HGS.
   b. Postformed Surfaces: Grade HGP.
   c. Vertical Surfaces: Grade HGS.
   d. Edges: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.

3. Materials for Semiexposed Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
4. Drawer Sides and Backs: Thermoset decorative panels.
5. Drawer Bottoms: Thermoset decorative panels.
6. Colors, Patterns, and Finishes: Match sample
7. Colors, Patterns, and Finishes: As selected by Architect from laminate manufacturer's full range of solid colors, wood grains, patterns, gloss matte finish.
8. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

C. Plastic-Laminate Countertops:

1. High-Pressure Decorative Laminate Grade: HGS or HGP.
2. Edge Treatment: Same as laminate cladding on horizontal surfaces
3. Core Material at Sinks: exterior-grade plywood

D. Solid-Surfacing-Material Countertops:

1. Fabricate tops in one piece with shop-applied backsplashes. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
2. Install integral sink bowls in countertops in shop.

2.7 SHOP FINISHING

A. Finish architectural woodwork at fabrication shop. Defer only final touchup, cleaning, and polishing until after installation.

B. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling.

C. Transparent Finish:

1. Grade: Premium
2. AWI Finish System: Catalyzed polyurethine
3. Staining: Match sample
4. Wash Coat for Stained Finish: Apply a wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
5. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

2.8 SHELVING AND CLOTHES ROD INSTALLATION

A. Cut shelf cleats at ends of shelves about 1/2 inch (13 mm) less than width of shelves and sand exposed ends smooth.

B. Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face and filled. Space fasteners not more than 16 inches (400 mm) o.c.

C. Install shelf brackets according to manufacturer's written instructions, spaced not more than 36 inches (900 mm) o.c. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.

D. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled. Install shelves, fully seated on cleats, brackets, and supports.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas. Examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

B. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

C. Install woodwork level, plumb, true, and straight to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm). Shim as required with concealed shims.

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation.

1. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish

G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."

3.2 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed upon completion of installation.

B. Clean shop-finished woodwork, touch-up finish as required, and remove and refinish damaged or soiled areas of finish.

C. Protection: Advise Contractor of procedures and precautions for protection of materials and installed woodwork from damage by the work of other trades until acceptance of the work by the Owner. Advise Contractor of the required temperature/humidity conditions which must be maintained during the remainder of the construction period in areas of architectural woodwork installations.

END OF SECTION 06 40 23

SECTION 071300 – SHEET MEMBRANE WATERPROOFING
PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

B. Related Sections include the following:

1. Division 7 Section "Thermal Insulation" for insulation installed as part of waterproofing for perimeter insulation under slabs-on-grade.

1.2 SUMMARY

A. This Section includes sheet membrane waterproofing systems.

B. Types of sheet waterproofing specified in this section consist of rubberized asphalt sheet waterproofing.

C. Furnish all labor, materials and equipment, and perform all work to install premolded membrane waterproofing in the following locations:

1. As shown and noted in the drawings and any required penetrations of retaining wall.

1.3 SYSTEM PERFORMANCE

A. General: Provide sheet waterproofing products that have been produced and installed to establish and maintain watertight continuous seals.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specifications Sections.

B. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

C. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

D. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

E. Qualification Data: For Installer and manufacturer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for waterproofing.

G. Warranties: Special warranties specified under this section.

1.5 QUALITY ASSURANCE

A. Manufacturer: Obtain primary waterproofing materials of each type required from a single manufacturer, to greatest extent possible. Provide secondary materials only as recommended by manufacturer of primary materials. Must have minimum of twenty years in the production of sheet membrane waterproofing.

B. Installer: A firm that is approved or licensed by waterproofing manufacturer for installation of waterproofing required for this Project and with not less than five waterproofing projects similar to requirements for this project with satisfactory in service performance.

C. Pre-Installation Conference: Prior to installation of waterproofing and associated work, meet at project site with Installer of each component of associated work, inspection and testing agency representatives (if any), and installers of work requiring coordination with waterproofing work. Review material selections and procedures to be followed in performing work including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs. Notify Architect at least 48 hours before conducting meeting.

D. Mockups: Before beginning installation, install waterproofing to 100 sq. ft. of wall to demonstrate surface preparation, crack and joint treatment, corner treatment, and execution quality.

1. If Architect determines mockups do not comply with requirements, reapply waterproofing until mockups are approved.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Store rolls according to manufacturer's written instructions.

E. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

A. Substrate: Proceed with work after substrate construction, openings, and penetrating work have been completed. The exterior face of retaining walls and top of the concrete footings adjacent to the exterior wall surfaces shall be carefully cleaned free of mud and dirt so that the premolded membrane

waterproofing can be secured in place on these surfaces as specified. Power driven sanders using open coat abrasive paper or fabric, or similar mechanical abrasion methods shall be used if necessary to remove the mud or dirt.

B. Weather: Proceed with waterproofing and associated work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturers' recommendations and warranty requirements. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Do not apply waterproofing in snow, rain, fog, or mist.

C. Coordinate work with other trades. The applicator shall have sole right of access to the specified areas for the time needed to complete the installation.

D. Warn personnel against breathing of vapors and contact of material with skin or eyes. Wear applicable protective clothing and respiratory protection gear.

E. Keep flammable products away from spark or flame. Do not allow the use of spark producing equipment during application until all vapors have dissipated. Post “NO SMOKING “ signs.

F. Maintain work area in a neat and orderly condition, removing empty containers, rags, and rubbish daily from the site.

1.8 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to replace waterproofing material that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch in width.
2. Warranty Period: Five years from date of Substantial Completion.

B. Special Installer's Warranty: Specified form, on warranty form at end of this Section, signed by Installer, covering Work of this Section, for warranty period of two years.

1. Warranty includes removing and reinstalling protection board and drainage panels.

PART 2 – PRODUCTS

2.1 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: Not less than 60-mil- thick, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated to a 4-mil- thick, cross-laminated polyethylene film with release liner on adhesive side.

1. Basis-of-Design Product: Grace Construction Products; Bituthene System 3000. Subject to compliance with requirements, provide the specified product or a comparable product by one of the following:

   a. Carlisle Coatings & Waterproofing Inc.; CCW MiraDRI 860/861.
   b. W. R. Grace & Co. ; Bituthene
   c. Meadows, W. R., Inc.; SealTight Mel-Rol.
   2. Physical Properties:
   a. Tensile Strength: 325 psi minimum; ASTM D 412, Die C, mod ified.
   b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
   c. Low-Temperature Flexibility: Pass at minus 25 deg F; ASTM D 1970.
   d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.
   e. Puncture Resistance: 50 lbf minimum; ASTM E 154.
   f. Hydrostatic-Head Resistance: 200 feet minimum; ASTM D 5385.
   g. Water Absorption: 0.10 percent weight-gain maximum after 72-hour immersion at 70 deg F; ASTM D 570.
   h. Vapor Permeance: 0.05 perms; ASTM E 96, Water Method.

2.2 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

B. Primer: Liquid, rubber-based primer formulated to promote adhesion of waterproofing membrane to green or damp concrete surfaces that have cured for less than seven day cure for normal structural concrete..

   1. Basis-of-Design Product: Grace Construction Products; Bituthene Primer B2 .

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by manufacturer of sheet waterproofing material.

D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, trowel grade or low viscosity.

   1. Basis-of-Design Product: Grace Construction Products; Bituthene Liquid Membrane.

E. Sheet Strips: Self-adhering, rubberized-asphalt sheet strips of same material and thickness as sheet waterproofing.

F. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch thick, predrilled at 9-inch centers.

G. Substrate Patching Membrane: Low-viscosity, two-component, asphalt-modified coating.

H. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

   1. Detail Tape: Two-sided, pressure-sensitive, self-adhering reinforced tape, 4-1/2 inches wide, with a tack-free protective adhesive coating on one side and release film on self-adhering side.
   2. Detail Strips: 62.5-mil- thick, felt-reinforced self-adhesive strip, 9 inches wide, with release film on adhesive side.

I. Horizontal Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:

1. Thickness: 1/8 inch, nominal.
2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for type of protection course.

J. Drainage Composite: Shall be CCW MiraDrain as recommended by the manufacturer for each condition.

2.3 WATERPROOFING PROTECTION BOARD

A. Waterproofing Protection Board: Extruded polystyrene board to rigid, closed cell type, with integral high density skins.

1. Board Size: 1220 mm wide, 15.24 metres long, 6 mm thick.
2. Compressive Strength: minimum 55kPa.
3. Edges: Square, fan folded panels at 610 mm o.c.
4. Water Vapor Permeance: to ASTM E96, 51 ng/Pa.s.m2 per 25.4 mm thickness.
5. Manufacturer and Product Name: Dow Protection Board III Extruded Polystyrene Insulation.

B. Adhesive: To CGSB 71-GP-24M, Type 1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
2. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
3. Verify that compacted subgrade or concrete mud-slab is dry, smooth, and sound; and ready to receive adhesive-coated HDPE sheet.
4. Verify that concrete substrates are smooth, float finished and monolithic.
5. Verify that vertical soil retention systems are prepared using drainage composite, plywood, shotcrete or other approved means to achieve a uniform, sound and continuous substrate ready to receive the adhesive-coated HDPE Sheet.
6. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Install sheet strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.

F. Bridge and cover isolation joints and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips.

1. Invert and loosely lay first 9 inch sheet strip over center of prepared and sealed joint. Firmly adhere second 18 inch sheet strip to first and overlap to substrate.

G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install 12 inch membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:

a. At footing-to-wall intersections, extend liquid membrane 6 inches (152 mm) in each direction from corner or install 12 inch membrane strip centered over corner.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.3 MODIFIED BITUMINOUS SHEET WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and according to recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.

D. Two-Ply Application: Install sheets to form a membrane with lap widths not less than 50 percent of sheet widths to provide a minimum of 2 thicknesses of sheet membrane over areas to receive waterproofing.

E. Horizontal Application: Apply sheets from low point to high point of decks to ensure that side laps shed water.

F. Apply continuous sheets over sheet strips bridging substrate cracks, construction, and contraction joints.

G. Seal exposed edges of sheets at terminations not concealed by metal counterflashings or ending in reglets with mastic.

H. Install sheet waterproofing and auxiliary materials to tie into adjacent waterproofing.

I. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.

J. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

3.4 PROTECTION COURSE

A. Vertical Application: Install perimeter drainage system as the first course of drainage composite immediately after membrane has been installed on vertical surfaces. Install drainage composite (consult manufacturer for recommendation), protection course. Stop drainage composite 6 inches below final grade level.

B. Horizontal Application: Install drainage composite (consult manufacturer for recommendation) or protection course immediately after flood testing on horizontal surfaces. If flood testing is delayed, install a temporary covering to protect the membrane from damage by other trades.

C. Flood Testing: Flood test each deck area for leaks, according to recommendations in ASTM D 5957, after completing waterproofing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.

1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of sheet flashings.
2. Flood each area for 24 hours.
3. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.

3.5 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives, tapes, or mechanical fasteners that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

1. For vertical applications, install board insulation before installing drainage panels.

3.6 INSULATION INSTALLATION

A. Install one or more layers of board insulation to achieve required thickness and insulation drainage panels over waterproofed surfaces. Cut and fit to within 3/4 inch of projections and penetrations.

B. On vertical surfaces, set insulation units in adhesive or tape applied according to manufacturer's written instructions.

3.7 PROTECTION AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Protect installed board insulation and drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction. Add Special Installer's Warranty Form here if required.

END OF SECTION 07 13 00

SECTION 07 21 00 – THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Sound attenuation insulation.
2. Concealed building insulation.

B. Related Sections include the following:

1. Division 07 Section "Fire-Resistive Joint Systems" for insulation installed as part of a perimeter fire-resistive joint system.
2. Division 21 Section "Fire-Suppression Systems Insulation."
3. Division 22 Section "Plumbing Insulation."
4. Division 23 Section "HVAC Insulation."

1.3 DEFINITIONS

Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.

C. Research/Evaluation Reports: For foam-plastic insulation.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.
2. Fire-Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Glass-Fiber Insulation:
   a. CertainTeed Corporation.
   b. Johns Manville Corporation.
   c. Knauf Fiber Glass.
   d. Owens Corning.

2.2 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.

B. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 1.60 lb/cu. ft., with maximum flame-spread and smoke-developed indices of 75 and 450, respectively:

C. Sound Attenuation Insulation (Unfaced Mineral-Fiber Blanket Insulation): ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from glass; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

D. Concealed Building Insulation (Foil-Faced Mineral-Fiber Blanket Insulation): ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame spread of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on one face; consisting of fibers manufactured from glass.

2.3 AUXILIARY INSULATING MATERIALS

Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF EXTUDED-POLYSTYRENE BOARD INSULATION

A. On vertical surfaces, set units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer. Extend insulation a minimum of 24 inches blow exterior grade line, unless otherwise indicated.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly about insulation units.

3.5 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Seal joints between foam-plastic insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

D. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:

1. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.

2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.

3.6 PROTECTION

Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

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SECTION 072120 -BOARD INSULATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the Conditions of the Contract and Division 01 Specification Sections apply to this section.

1.2 SUMMARY

A. Section includes roof insulation over the properly prepared deck substrate.

1.3 REFERENCE

A. American Society for Testing and materials (ASTM):
B. ASTM C1289 — Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
C. ASTM-D412 Standard Test Method for Vulcanized Rubber and Thermoplastic Elastomers Tension
D. ASTM D523 Standard Test Method for Specular Gloss
E. ASTM D-816 Standard Test Methods for Rubber Cements
F. ASTM D903 Standard Test Method for Peel Or Stripping Strength Of Adhesive Bonds
G. ASTM-D1875 › Standard Test Method for Density of Adhesives in Fluid Form
H. Standard Test Method For Peel Or Stripping Strength Of Adhesive Bonds
I. ASTM D2556-Standard Test Method for Apparent Viscosity Of Adhesives Having Shear-Rate-Dependent Flow Properties Using Rotational Viscometry
J. ASTM E108-Standard Test Methods for Fire Tests Of Roof Coverings
K. ASTM C165 Standard Test Method for Measuring Compressive Properties of Thermal Insulation.
L. ASTM C1396 Standard Specification for Gypsum Wallboard.

1.4 SUBMITTALS

A. Product Data: Provide manufacturer's specification data sheets for each product in accordance with Submittal Procedures 01330.

B. Provide approval letters from insulation manufacturer for use of their insulation within this particular roofing system type.

C. Provide a sample of each insulation type.

D. Shop Drawings
   1. Submit manufacturer's shop drawings indicating complete installation details of tapered insulation system, including identification of each insulation block, sequence of installation, layout, drain locations, roof slopes, thicknesses, crickets and saddles.
   2. Shop drawing shall include: Outline of roof, location of drains, complete board layout of tapered insulation components, thickness and the average "R" value for the completed insulation system.

E. Certification

1. Submit roof manufacturer's certification that insulation fasteners furnished are acceptable to roof manufacturer.
2. Submit roof manufacturer's certification that insulation furnished is acceptable to roofing manufacturer as a component of roofing system and is eligible for roof manufacturer's system warranty.

1.5 QUALITY ASSURANCE

A. Fire Classification, ASTM E-108.

B. Manufacturer's Certificate: Certify that roof system furnished is approved by Factory Mutual, Underwriters Laboratories, Warnock Hersey or approved third party testing facility in accordance with ASTM E108, Class A for external fire and meets local or nationally recognized building codes.

C. Manufacturer's Certificate: Certify that the roof system is adhered properly to meet or exceed the requirements of FM 1-90.

D. Pre-installation meeting: Refer to Division 07 roofing specifications for pre-installation meeting requirements.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and undamaged.

B. Store all insulation materials in a manner to protect them from the wind, sun and moisture damage prior to and during installation. Any insulation that has been exposed to any moisture shall be removed from the project site.

C. Keep materials enclosed in a watertight, ventilated enclosure (i.e. tarpaulins).

D. Store materials off the ground. Any warped, broken or wet insulation boards shall be removed from the site.

PART 2 – PRODUCTS

2.1 PRODUCTS, GENERAL

A. Refer to Division 01 Section "Common Product Requirements."

B. Basis of Design: Materials, manufacturer's product designations, and/or manufacturer's names specified in this section shall be provided by The Garland Company, Inc or Approved equal. The products listed herein shall be regarded as the minimum standard of quality required for work of this Section. Comply with all manufacturer and contractor/fabricator quality and performance criteria specified in Part 1.

C. Substitutions: Products proposed as equal to the products specified in this Section shall be submitted in accordance with Division 0 Bidding and Division 1 Section 01340 Substitution Procedures.

1. Proposals shall be accompanied by a copy of the manufacturer's standard specification section. That specification section shall be signed and sealed by a professional engineer licensed in the state in which the installation is to take place. Substitution requests containing specifications without licensed engineer certification shall be rejected for non-conformance
2. Include a list of three (3) projects of similar type and extent, located within a one hundred mile radius from the location of the project. In addition, the three projects must be at least five (5)

years old and be available for inspection by the Design Professional, Owner or Owner's Representative.

3. Equivalency of performance criteria, warranty terms, submittal procedures, and contractual terms will constitute the basis of acceptance.
4. The Owner's decision regarding substitutions will be considered final. Unauthorized substitutions will be rejected.

2.2 INSULATION MATERIALS

A. Tapered insulation on the roofing project as follows:
   1. Part A:
      a. All slope to the exterior gutters shall be a minimum of 1/4" per foot.

B. Thermal Insulation Properties and Approved Insulation Boards.
   1. Rigid Polyisocyanurate Roof Insulation; ASTM C1289:
      a. Qualities: Rigid, closed cell polyisocyanurate foam core bonded to heavy duty glass fiber mat facers.
      b. Thickness: Minimum Two layer of 2.5"
      c. Attachment: Mechanically
      d. R-Value: Minimum R-30.
      e. Compliances: UL, WH or FM listed under Roofing Systems
         Federal Specification HH-I-1972, Class 1.
      f. Acceptable Products:
         1) ENRGY-3; Johns Manville
         2) EnergyGuard; GAF
         3) Bitec, Inc.
         4) Hunter Panels
         5) Approved Equivalent
   2. High Density Wood Fiber Board (Installed over rigid insulation)
      a. Qualities: Nonstructural glass mat faced, noncombustible, water-resistant treated gypsum core panel.
      b. Board Size: Four feet by four feet (4'x4').
      c. Attachment: Type IV Hot Asphalt
      d. Thickness: One half (1/2) inch.
      e. R-Value: .56
      f. Compliances: UL, WH or FM listed under Roofing Systems.

2.3 RELATED MATERIALS

A. Fiber Cant and Tapered Edge Strips: Performed rigid insulation units of sizes/shapes indicated, matching insulation board or of perlite or organic fiberboard.

B. Protection Board: Pre-molded semi-rigid asphalt composition board one half (1/2) inch.

C. Roof Deck Insulation Adhesive: Dual-component, high rise foam adhesive as recommended by insulation manufacturer and approved by FM indicated ratings.
   1. Tensile Strength (ASTM D412)……250 psi
   2. Density (ASTM D1875)……..8.5 lbs./gal.
   3. Viscosity (ASTM D2556)……22,000 to 60,000 cP.
   4. 2 `Peel Strength (ASTM D903)…..17 lb/in.
   5. 3 `Flexibility (ASTM D816)……Pass @ -70°F

PART 3 – EXECUTION

3.1 EXECUTION, GENERAL

A. Comply with requirements of Division 01, Spec Section 01690 Execution Requirements.

3.2 INSPECTOR OF SURFACES

A. Roofing contractor shall be responsible for preparing an adequate substrate to receive insulation.
   1. Verify that work which penetrates roof deck has been completed.
   2. Verify that wood nailers are properly and securely installed.
   3. Examine surfaces for defects, rough spots, ridges, depressions, foreign material, moisture, and unevenness.
   4. Do not proceed until defects are corrected.
   5. Do not apply insulation until substrate is sufficiently dry.
   6. Broom clean substrate immediately prior to application.
   7. Use additional insulation to fill depressions and low spots that would otherwise cause ponding water.
   8. Verify that temporary roof has been completed.

3.3 INSTALLATION

A. Roofing contractor is responsible for installation of all insulation materials.
   1. Follow insulation system component product data sheets, published general requirements and, approvals.
   2. Install all insulation system components on clean, dry, uniform, and properly prepared substrates.
   3. All insulation system boards shall be carefully installed and fitted against adjoining boards to form tight joints.
   4. Insulation system boards that must be cut to fit shall be saw-cut or knife -cut in straight line, not broken. Chalk lines shall be used to ensure straight cut of insulation components. Uneven or broken edges shall not be accepted. Remove dust and debris that develops during cutting operations.
   5. Stagger successive layers of insulation 12 in vertically and laterally to ensure board joints do not coincide with joints from the layers above and below.
   6. Crickets, saddles, and tapered edge strips shall be installed before installing Cover-boards
   7. Install tapered insulation, saddles and crickets as required to ensure positive slope for complete roof drainage
   8. Cover-boards shall be installed to fit tights against adjacent boards.
   9. The finished insulation system surface shall be tight to, and flush with, adjacent substrates to form a satisfactory substrate to install specified roof membrane and flashings
   10. Install specified cants where required for membrane flashing transitions

3.4 CLEANING

A. Remove debris and cartons from roof deck. Leave insulation clean and dry, ready to receive roofing membrane.

3.5 CONSTRUCTION WASTE MANAGEMENT

A. Remove and properly dispose of waste products generated during installation. Comply with requirements of authorities having jurisdiction.

END OF SECTION 07 21 20

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SECTION 07 24 00 - EXTERIOR INSULATION AND FINISH SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior insulation and finish system (EIFS), air/water resistive barrier and continuous insulation (CI) wall assemblies with cementitious coating and finish applied over concrete, masonry, and cement board substrate.

1.2 REFERENCES

A. ANSI

1. ANSI/EIMA 99A-2001 American National Standard for Exterior Insulation and Finish Systems (EIFS)

B. ASTM International:

1. ASTM C 578 – Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
2. ASTM C 1063 – Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.
3. ASTM C 1193 - Standard Guide for Joint Sealants
4. ASTM C 1382 - Test Method for Determining Tensile Adhesion Properties of Sealants When Used in Exterior Insulation and Finish Systems (EIFS) Joints.
5. ASTM C 1481 - Standard Guide for Use of Joint Sealants with Exterior Insulation and Finish Systems (EIFS).
6. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
7. ASTM E 119 – Standard Test Methods for Fire Tests of Building Construction and Materials.
8. ASTM E 2110 - Standard Terminology for Exterior Insulation and Finish Systems (EIFS)
9. ASTM E 2134 - Standard Test Method for Evaluating the Tensile-Adhesion Performance of an Exterior Insulation and Finish System (EIFS)
10. ASTM E 2273 - Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Walls
11. ASTM E 2321 - Standard Practice of Use for Test Methods E 96 for Determining the Water Vapor Transmission (WVT) of Exterior Insulation and Finish Systems (EIFS)
12. ASTM E 2359 - Standard Test Method for Field Pull Testing of an In-Place Exterior Insulation and Finish System Clad Wall Assembly
13. ASTM E 2430 - Standard Specification for Expanded Polystyrene (“EPS”) thermal Insulation Boards for Use in Exterior Insulation and Finish System (EIFS)
14. ASTM E 2485 - Standard Test Method for Freeze/Thaw Resistance of Exterior Insulation and Finish Systems (EIFS) and Water Resistive Barrier Coatings.
15. ASTM E 2511 - Standard Guide for Detailing of EIFS-Clad Wall Assemblies
16. ASTM E 2568 - Standard Specification for PB Exterior Insulation and Finish Systems
17. ASTM E 2570 - New Standard Test Methods for Evaluating Water-Resistive Barrier (WRB) Coatings Used Under Exterior Insulation and Finish Systems (EIFS) or EIFS with Drainage

C. ICC ES:
   1. Acceptance AC24 Interim Criteria for Exterior Insulation and Finish Systems (EIFS)
   2. AC212 Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers Over Exterior Sheathing
   3. AC219 Acceptance Criteria for Exterior Insulation and Finish Systems
   4. AC235e Acceptance Criteria for EIFS Clad Drainage Wall Assemblies

D. Exterior Insulation Manufacturers Association:
   1. EIMA- Guideline Specification for Exterior Insulation and Finish Systems, Class PB and Class PM.

E. National Fire Protection Association:
   1. NFPA 259 – Standard Test Method for Potential Heat of Building Materials.
   2. NFPA 268 – Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source.
   3. NFPA 285 – Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus.

F. UL 723 (Underwriters Laboratories, Inc.) – Tests for Surface Burning Characteristics of Building Materials.
G. EPA (Environmental Protection Agency) CPG (Comprehensive Procurement Guidelines), http://www.epa.gov/cpg. Or http://www.epa.gov/epawaste/conserve/tools/cpg/index.htm
H. FM (Factory Mutual) – Research Specification Tested Products Guide
I. UL's Product Directories, Volume 1 – Building Materials, Roofing Materials and Systems, Fire Protection Equipment, Fire Resistance.
J. International Code Council – International Building Code

1.3 SYSTEM DESCRIPTION

A. Exterior Insulation and Finish System: EIMA Class PM system. Consisting of an air/water-resistive barrier coating, an adhesive, extruded polystyrene insulation board, mechanical fasteners, fiber reinforced polymer modified base coat with reinforcing mesh(es) and finish.

1.4 DEFINITIONS

A. Exterior Insulation and Finish System (EIFS): Exterior Assemblies Composed of Air Barrier, Assembled (adhesive or mechanical), insulation board, reinforcing mesh, reinforcing trim, base coat and finish coat, with approved accessories sealants, backer rods, etc.
B. Air Barrier Assembly: The collection of air barrier materials, accessory and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.
C. Continuous Insulation (CI): Insulation that is continuous across all structural members without thermal bridges other than fasteners and service openings installed on the exterior of the building envelope.

1.5 ACTION SUBMITTALS

A. Product Data: Manufacturer's technical data for each component of exterior insulation and finish system.
B. Installation Instructions: Manufacturer's literature indicating installation specifications and procedures.

C. Shop Drawing(s): Provide details of all elements illustrating integration of the exterior wall systems with other adjacent and/or applicable building systems. Indicate all exposed joints, surface patterns and decorative detailing elements. Graphically illustrate vapor barriers, flashing and sealant locations.
D. Samples: 24-inch square panels for each type of finish-coat color and texture indicated, prepared using same tools and techniques intended for actual work including custom trim, each profile, and an aesthetic reveal.
   1. Include exposed trim and accessory samples to verify color selected.
   2. Include a typical control joint filled with sealant of color selected, as specified in Section 07 9200 Joint Sealants.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.
B. Manufacturer Certificates: Signed by EIFS manufacturer certifying the following:
   1. EIFS substrate is acceptable to EIFS manufacturer.
   2. Accessory products installed with EIFS, including joint sealants, flashing, water resistant barriers, and trim, whether or not furnished by EIFS manufacturer and whether or not specified in this section, are acceptable to EIFS manufacturer.

C. Product Certificates: For cementitious materials and aggregates and for insulation.
D. Product Test Reports: For each EIFS assembly and component, for tests performed by a qualified testing agency.
E. Field quality control reports and special inspection reports.
F. Evaluation Reports: For EIFS, including insulation fasteners, flexible membrane flashing, from ICC-ES.
G. Sample Warranty: For manufacturer's special warranty.

1.7 SUSTAINABLE DESIGN SUBMITTALS

A. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
   1. Materials Resources Certificates:
      a. Certify recycled material content for recycled content products.
      b. Certify source for regional materials and distance from Project site.

B. Product Data: For solvent cements and adhesive primers, documentation including printed statement of VOC content.
C. Laboratory Test Reports: For solvent cements and adhesive primers, documentation indicating that products comply with testing and product requirements of 40 CFR 59, Subpart D (EPA Method 24), National Volatile Organic Chemical Emission Standards for Architectural Coatings.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: Include maintenance data for EIFS in maintenance manuals.
B. Warranty: Executed copy of Manufacturer's Special Warranty in accordance with Article 1.15.
C. Extra Materials: Furnish materials in accordance with Article 1.16.

1.9 QUALITY ASSURANCE

A. Fire Rated Wall Construction: Rating as indicated on Drawings.

1. Tested Rating: Determined in accordance with ASTM E 119.

B. Fire Performance:
   1. Potential Heat of Foam Insulation: Determined in accordance with NFPA 259.
   2. Potential Heat of Foam Insulation with Wall assembly: Maximum not to exceed potential heat of foam insulation with assembly when tested in accordance with NFPA 285.
   3. Ignition: No sustained flaming when tested in accordance with NFPA 268.

C. Surface Burning Characteristics:
   1. Foam Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E 84.

D. Apply label from approved agency showing the manufacturer's name, product listing, product identification and information sufficient to determine that the end use will comply with the code requirements.

1.10 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' documented experience.
B. Applicator: Company specializing in performing Work of this section with minimum three years' documented experience approved by manufacturer.

1.12 MOCKUP

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, to set quality standards for materials and execution, and to set quality standards for fabrication and installation.
   1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.13 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened packages with manufacturer's labels intact and clearly identifying products.
B. Store materials inside and under cover; keep them dry and protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.
   1. Stack insulation board flat and off the ground with supports at two feet on center minimum.
   2. Protect plastic insulation against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
   3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.14 FIELD CONDITIONS

A. Weather Limitations: Maintain ambient temperatures above 40 degrees F for a minimum of 24 hours before, during, and after adhesives or coatings are applied. Do not apply EIFS adhesives or coatings during rainfall. Proceed with installation only when existing and forecasted weather conditions and ambient

outdoor air, humidity, and substrate temperatures permit EIFS to be applied, dried, and cured according to manufacturer's written instructions and warranty requirements.

1.15 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace EIFS that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Bond integrity and weather tightness.
      b. Deterioration of EIFS finishes and other EIFS materials beyond normal weathering.

   2. Warranty coverage includes the following EIFS components.
      a. EIFS finish, including base and finish coats and reinforcing mesh.
      b. Insulation installed as part of EIFS.
      c. Insulation adhesive and mechanical fasteners.
      d. EIFS accessories, including trim components and flashing.

   3. Warranty Period: Ten years from date of Substantial Completion.

1.16 EXTRA MATERIALS

A. Furnish the following materials to the Owner, with maintenance instructions and repair procedures:
   1. One gallon of base coat.
   2. One gallon of primer coat.
   3. One gallon of each color of finish coat.
   4. Ten-foot length of each type of mesh.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one the following:
   1. BASF Wall Systems
   2. Dryvit System, Inc.
   3. Sto Corp

B. Source Limitations: Obtain EIFS from single source from single EIFS manufacturer and from sources approved by EIFS manufacturer as tested and compatible with EIFS components.

2.2 SUSTAINABILITY CHARACTERISTICS

A. Primer: VOC content of 250 g/L or less.
B. Insulation Adhesive: VOC content of 50 g/L or less.
C. Waterproof Adhesive/Base Coat Materials: VOC content of 50 g/L or less.
D. Air Barrier: VOC content of 10 g/L or less.
E. Insulation: Minimum of 20% pre-consumer recycled content.
F. Base Coat: VOC content of 10 g/L or less.
G. Finish Coat: VOC content of 25 g/L or less.

2.3 PERFORMANCE REQUIREMENTS

A. Air/Water- Resistive Barrier Coating
   1. Tensile Bonding: ASTM C 297, Minimum 15 PSI.
   2. Freeze-thaw: ASTM E 2485, Method B. no deleterious effects after 10 cycles.
   3. Water Resistance: ASTM D 2247, no deleterious effects from 14 days of exposure to water.
   4. Water Vapor Transmission: ASTM E 96, Procedure B: Class III vapor barrier.
   5. Air Permeance: ASTM E 2178, less than 0.003 ft3/min-ft2 at 1.56 psf.
   6. Air Barrier Assembly: ASTM E 2357, not greater than 0.003 ft3/min-ft2 tested in both directions.
   7. Air Leakage: ASTM E 283, less than 0.003 ft3/min-ft2 at 1.56 psf.
   8. Fastener Stability: ASTM D 1970, no water penetration at fastener penetration under 5 inches head or water after 3 days at 40 deg. F.
   9. Surface Burning Characteristics: ASTM E 84
      a. Flame spread: Less than 25.
      b. Smoke developed: Less than 450.

B. EIFS Performance: Comply with ASTM E 2568 and ICC-ES AC219 and with the following:
   1. Weather tightness: Resistant to water penetration from exterior.
   2. System Fire Performance: Fire-resistance rating of wall assembly.
   3. Structural Performance: EIFS assembly and components shall comply with ICC-ES AC219 when tested according to ASTM E 2568.
   4. Impact Performance: ASTM E 2568, High impact resistance.
   5. Bond Integrity: Free from bond failure within EIFS components or between EIFS and substrates, resulting from exposure to fire, wind loads, weather, or other in-service conditions.
   6. Abrasion Resistance of Finish Coat: Sample consisting of 1-inch thick EIFS mounted on ½-inch thick gypsum board; cured for a minimum of 28 days and shows no cracking, checking, or loss of film integrity after exposure to 528 quarts of sand when tested according to ASTM D 968, Method A.
   7. Mildew Resistance of Finish Coat: Sample applied to 2-by-2-inch clean glass substrate; cured for 28 days and shows no growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274.

2.4 AIR/WATER RESISTIVE BARRIER MATERIALS

A. Provide manufacturers' recommended air/water resistive barrier coatings, accessory materials, joint reinforcement and flashing materials compatible with EIFS.
B. Air/water resistive barrier system to comply with ASHRAE 90.1 or 189.1 and ICC code requirements.
C. Air/water resistive barrier to be evaluated to ASTM E 2357.

2.5 EIFS MATERIALS

A. Insulation Adhesive: EIFS manufacturer's standard formulation designed for indicated use; compatible with substrate complying with one of the following:
   1. Job-mixed formulation of Portland cement complying with ASTM C 150/C 150M, Type I, and polymer-based adhesive specified for base coat.

2. Factory-blended dry formulation of Portland cement, dry polymer admixture, and fillers specified for base coat.
3. Factory-mixed noncementitious formulation designed for adhesive attachment of insulation to substrates of type indicated, as recommended by EIFS manufacturer.

B. Molded, (expanded) Rigid Cellular Polystyrene Board Insulation (EPS): Comply with ASTM C 578, Type I; and with EIFS manufacturer's requirements for most stringent requirements for material performance and qualities of insulation, including dimensions and permissible variations, and the following:
1. Aging: Before cutting and shipping, age insulation in block form by air-drying for not less than six weeks.
2. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, according to ASTM E 84.
3. Dimensions: Provide insulation boards of not more than 24 by 48 inches thick or in other thickness indicated, but not more than 4 inches thick or less than the thickness allowed by ASTM C 1397.

C. Reinforcing Mesh: Balanced, alkali-resistant, open-weave, glass-fiber mesh treated for compatibility with other EIFS materials, made from continuous multi-end strands with retained mesh tensile strength of not less than 120 lbf/in. according to ASTM E 2098 and the following:
1. Reinforcing Mesh for EIFS, General: Not less than weight required to meet impact-performance level specified in "Performance Requirements" Article.
2. Strip Reinforcing Mesh: Not less than 3.75 oz/sq. yd. or recommended by EIFS manufacturer.
3. Detail Reinforcing Mesh: Not less than 4.0 oz/sq. yd. or as recommended by EIFS manufacturer.
4. Corner Reinforcing Mesh: Not less than 7.2 oz/sq. yd. or as recommended by EIFS manufacturer.

D. Base-Coat Materials: EIFS manufacturer's standard mixture complying with one of the following:
1. Job-mixed formulation of Portland cement complying with ASTM C 150, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use with Portland cement.
2. Job-combined formulation of manufacturer's standard polymer-emulsion adhesive and manufacturer's standard dry mix containing Portland cement.
3. Factory-blended dry formulation of Portland cement, dry polymer admixture, and inert fillers to which only water is added at Project site.

E. Waterproof Adhesive/Base-Coat Materials: EIFS manufacturer's standard waterproof formulation complying with one of the following:
1. Job-mixed formulation of Portland cement complying with ASTM C 150, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use with Portland cement.
2. Job-combined formulation of manufacturer's standard polymer-emulsion adhesive and manufacturer's standard dry mix containing Portland cement.

F. Mechanical Fasteners: EIFS manufacturer's standard corrosion-resistant fasteners consisting of thermal cap, standard washer and shaft attachments, and fastener indicated below; designed to resist Project's design loads; capable of pulling fastener head below surface of insulation board; and complying with the following:
1. For attachment to steel studs from 0.033 to 0.112 inch in thickness, provide steel drill screws complying with ASTM C 954.
2. For attachment to light-gage steel framing members not less than 0.0179 inch in thickness, provide steel drill screws complying with ASTM C 1002.

3. For attachment to wood framing members and plywood sheathing, provide steel drill screws complying with ASTM C 1002, Type W.
4. For attachment to masonry and concrete substrates, provide sheathing dowel in form of a plastic wing-tipped fastener with thermal cap, sized to fit insulation thickness indicated and to penetrate substrate to depth required to secure anchorage.

G. Primer: EIFS manufacturer's standard factory-mixed, elastomeric-polymer primer for preparing base-coat surface for application of finish coat.
H. Finish-Coat Materials: EIFS manufacturer's standard cementitious coating complying with the following:
   1. Factory-mixed formulation of Portland cement, hydrated lime, aggregates and additives.
   2. Colors: As selected from manufacturer's full standard range.
   3. Textures: As selected by A/E of Record from manufacturer's full range.

I. Sealer: Manufacturer's waterproof, clear acrylic-based sealer for protecting finish coat.
J. Water: Potable.
K. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with EIFS manufacturer's written instructions; manufactured from UV-stabilized PVC; and complying with ASTM D 1784 and ASTM C 1063.
   1. Casing Bead: Prefabricated, one-piece type for attachment behind insulation, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
   2. Drip Screed/Track: Prefabricated, one-piece type for attachment behind insulation with face leg extended to form a drip, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
   3. Expansion Joint: Prefabricated, one-piece V profile; designed to relieve stress of movement.
   4. Windowsill Flashing: Prefabricated type for both flashing and sloping sill over framing beneath windows; with end and back dams; designed to direct water to exterior.
   5. Parapet Cap Flashing: Type for both flashing and covering parapet top with design complying with ASTM C 1397.

2.6 MIXING

A. Comply with EIFS manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as recommended by EIFS manufacturer. Mix materials in clean containers. Use materials within time period specified by EIFS manufacturer or discard.

2.7 SOURCE QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform shop tests and inspections indicated below and to prepare test reports:
   1. Shop welds are subject to testing and inspection.
   2. Testing and inspecting agency shall interpret tests and report whether tested work complies with or deviates from requirements.
   3. Correct deficiencies in or replace EIFS prefabricated panels that test reports and inspections indicate do not comply with requirements.
   4. Additional testing and inspection, at Subcontractor's expense, shall be performed to determine compliance of corrected work with requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the work.
B. Examine roof edges, wall framing, flashings, openings, substrates, and junctures at other construction for suitable conditions where EIFS will be installed.
C. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Begin coating application only after surfaces are dry.
   2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Protect contiguous work from moisture deterioration and soiling caused by application of EIFS. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.
B. Protect EIFS, substrates and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind EIFS and deterioration of substrates.
C. Prepare and clean substrates to comply with EIFS manufacturer's written instructions to obtain optimum bond between substrate and adhesive for insulation.
   1. Concrete Substrates: Provide clean, dry, neutral-pH substrate for insulation installation. Verify suitability of substrate by performing bond and moisture tests recommended by EIFS manufacturer.

3.3 EIFS INSTALLATION, GENERAL

A. Comply with ASTM C 1397, ASTM E 2511, and EIFS manufacturer's written instructions for installation of EIFS as applicable to each type of substrate.

3.4 AIR BARRIER INSTALLATION

A. Coordinate work with other trades to ensure air barrier continuity with connections at foundation, floor lines, flashings, lintels and shelf angles, openings and penetrations such as pipes, vents, windows and doors, masonry anchors, rafters or beams, joints in construction, projections such as decks and balconies, and roof line.
B. Rough opening protection
   1. Install transition membrane into and around rough opening in accordance with the manufacturer's recommendations.

C. Sheathing joints
   1. Install joint treatment material with applicable reinforcement over sheathing joints in accordance with manufacturer's recommendations.
D. Transitions
   1. Install air barrier accessory materials (with reinforcement where applicable), or auxiliary material at transition areas: foundation, floor lines, flashings, lintels and shelf angles, openings and penetrations such as pipes, vents, windows and doors, masonry anchors, rafters or beams, joints in construction, projections such as decks and balconies, and roof line in accordance with manufacturer's recommendations.

E. Air barrier membrane
   1. Concrete: Install air barrier membrane by spray or roller in a uniform, continuous film to the prepared concrete substrate in accordance with the manufacturer's recommended installation instructions. Do not install over working or moving joint sealants.
   2. Concrete Masonry: Install air barrier membrane by spray or roller in a uniform, continuous film to the prepared concrete masonry substrate. Back roll spray applications. Allow to dry. Install a second coat of the air barrier membrane in a uniform, continuous film, and back roll spray applications, to achieve a void and pinhole free surface. Depending on the condition of the surface a minimum of 10 wet mils up to maximum of 30 wet mils per coat is required. Apply additional coats if required to achieve a void and pinhole free surface. Do not install over working or moving joint sealants.
   3. Sheathing
      a. Spot fasteners with knife grade coating or joint treatment material.
      i. Glass mat faced gypsum sheathing: Apply one coat of air barrier membrane by spray or roller in a uniform, continuous film to the prepared glass mat gypsum substrate in accordance with the manufacturer's recommended installation instructions to achieve a void and pinhole free surface. Do no install over working or moving joint sealants.
      ii. Plywood sheathing: Apply one coat of air barrier membrane by spray or roller in a uniform, continuous film to the prepared substrate in accordance with the manufacturer's recommended installation instructions to achieve a void and pinhole free surface. Do not install over working or moving joint sealants.
      iii. OSB sheathing: Apply one coat of air barrier membrane by spray or roller in a uniform, continuous film to the prepared substrate in accordance with the manufacturer's recommended installation instructions to achieve a void and pinhole free surface. Inspect surface and touch-up with a second coat at raised wood strands. Do no install over working or moving joint sealants.

3.5 CONTINUOUS INSULATION

A. Board insulation: Adhesively and mechanically attach insulation to substrate in compliance with ASTM C 1397 and the following:
   1. Sheathing: Apply adhesive to insulation by notched-trowel method in a manner that results in coating the entire surface of sheathing with adhesive once insulation is adhered to substrate. Apply adhesive to a thickness of not less than ¼ inch for factory mixed and not less than 3/8 inch for field mixed, measured from surface of insulation before placement.
   2. Concrete or Masonry: Apply adhesive by ribbon-and-dab method.
   3. Press and slide insulation into place. Apply pressure over the entire surface of insulation to accomplish uniform contact, high initial grab, and overall level surface.
   4. Allow adhered insulation to remain undisturbed for not less than 24 hours, before installing mechanical fasteners, beginning rasping and sanding insulation or before applying base coat and reinforcing mesh.
   5. Mechanically attach insulation to substrate. Install top surface of fastener heads flush with plane of insulation. Install fasteners into or through substrates with the following minimum penetration.
      a. Steel framing: 5/16 inch.
      b. Wood framing: 1 inch.
      c. Concrete and masonry: 1 inch.

   6. Apply insulation over dry substrates in courses with long edges of boards oriented horizontally.
   7. Begin first course of insulation from a level base line and work upward.
   8. Begin first course of insulation from screed/track and work upward. Work from perimeter casing beads toward interior of panels if possible.

9. Stagger vertical joints of insulation boards in successive courses to produce running bond pattern. Locate joints so no piece of insulation is less than 12 inches wide or 6 inches high. Offset joints not less than 6 inches from corners of window and door openings and not less than 4 inches from aesthetic reveals.
    a. Adhesive attachment: Offset joints of insulation not less than 6 inches from horizontal and 4 inches from vertical joints in sheathing.
    b. Mechanical attachment: Offset joints of insulation from horizontal joints in sheathing.

10. Interlock ends at internal and external corners.
11. Abut insulation tightly at joints within and between each course to produce flush, continuously even surfaces without gaps or raised edges between boards. If gaps greater than 1/16 inch occur, fill with insulation cut to fit gaps exactly; insert insulation without using adhesive or other material.
12. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes complying with details indicated.
13. Rasp or sand flush entire surface of insulation to remove irregularities projecting more than 1/32 inch from surface of insulation and to remove yellowed areas due to sun exposure; do not create depressions deeper than 1/16 inch. Prevent airborne dispersal and immediately collect insulation waste.
14. Cut aesthetic reveals in outside face of insulation with high-speed router and bit configured to produce grooves, rabbets, and other features that comply with profiles and locations indicated. Do not reduce insulation thickness at aesthetic reveals to less than ¾ inch. Prevent airborne dispersal and immediately collect insulation raspings or sandings.
15. Install foam build-outs and attach to structure.
16. Interrupt insulation for expansion joints where indicated.
17. Form joints for sealant application by leaving gaps between adjoining insulation edges and between insulation edges and dissimilar adjoining surfaces. Make gaps wide enough to produce joint widths indicated after encapsulating joint substrates with base coat and reinforcing mesh.
18. Form joints for sealant application with back-to-back casing beads for joints within EIFS and with perimeter casing beads at dissimilar adjoining surfaces. Make gaps between casing beads and between perimeter casing beads and adjoining surfaces of width indicated.
19. Fully wrap board edges with strip reinforcing mesh.
20. Treat exposed edges of insulation as follows:
    a. Except for edges forming substrates of sealant joints, encapsulate with base coat, reinforcing mesh, and finish coat.
    b. Encapsulate edges forming substrates of sealant joints within EIFS or between EIFS and other work with base coat and reinforcing mesh.
    c. At edges trimmed by accessories, extend base coat, reinforcing mesh, and finish coat over face leg of accessories.
21. Coordinate installation of flashing and insulation to produce wall assembly that does not allow water to penetrate behind flashing and EIFS lamina.

B. Expansion Joints: Install at locations indicated, where required by EIFS manufacturer, and as follows:
1. At expansion joints in substrates behind EIFS.
2. Where EIFS adjoin dissimilar substrates, materials, and construction, including other EIFS.
3. At floor lines in multilevel wood-framed construction.
4. Where wall height or building shape changes.
5. Where EIFS manufacturer requires joint in long continuous elevations.
6. Where panels abut one another.

3.6 BASE-COAT INSTALLATION

A. Waterproof Adhesive/Base Coat: To exposed surfaces of insulation, apply a minimum thickness recommended in writing by EIFS manufacturer where indicated on Drawings.
B. Base Coat: Apply to exposed surfaces of insulation and foam build-outs in minimum thickness recommended in writing by EIFS manufacturer, but not less than 1/16-inch dry-coat thickness.
C. Reinforcing Mesh: Embed reinforcing mesh in wet base coat to produce wrinkle-free installation with mesh continuous at corners, overlapped not less than 2-1/2 inches or otherwise treated at joints to comply with ASTM C 1397 and EIFS manufacturer's written instructions. Do not lap reinforcing mesh within 8 inches or corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are invisible.
D. Double-Layer Reinforcing-Mesh Application: Where indicated or required, apply second base coat and second layer of reinforcing mesh, overlapped not less than 2-1/2 inches or otherwise treated at joints to comply with ASTM C 1397 and EIFS manufacturer's written instructions in same manner as first application. Do not apply until first base coat has cured.
E. Additional Reinforcing Mesh: Apply strip reinforcing mesh around openings, extending 4 inches beyond perimeter. Apply additional 9-by-12-inch strip reinforcing mesh diagonally at corners of openings (re-entrant corners). Apply 8-inch wide, strip reinforcing mesh at both inside and outside corners unless base layer of mesh is lapped not less than 4 inches on each side of corners.
   1. At aesthetic reveals, apply strip reinforcing mesh not less than 8 inches wide.
   2. Embed strip enforcing mesh in base coat before applying first layer or reinforcing mesh.
F. Foam Build-Outs: Fully embed reinforcing mesh in base coat.
G. Double Base-Coat Application: Where indicated, apply second base coat in same manner and thickness as first application, except without reinforcing mesh. Do not apply until first base coat has cured.

3.7 FINISH-COAT INSTALLATION

A. Primer: Apply over dry base coat according to EIFS manufacturer's written instructions.
B. Finish Coat: Apply over dry primed base coat, maintaining a wet edge at all times for uniform appearance, in thickness required by EIFS manufacturer to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.
   1. Embed aggregate in finish coat according to EIFS manufacturer's written instructions to produce a uniform applied-aggregate finish of color and texture matching approved sample.
C. Sealer Coat: Apply over dry finish coat, in number of coats and thickness required by EIFS manufacturer.

3.8 FIELD QUALITY CONTROL

A. Special Inspections: Owner will perform the following special inspections:
   1. As stipulated in Chapter 17 of the IBC.
   2. According to ICC-ES AC24.

B. Testing Agency: Owner will perform tests and inspections.
C. EIFS Tests and Inspections: According to ICC-ES AC24.
D. EIFS will be considered defective if it does not pass tests and inspections.
E. Prepare test and inspection reports.

3.9 CLEANING AND PROTECTION

A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive EIFS coatings.
B. Do not permit finish surface to become soiled or damaged.
C. Repair or replace damaged or disfigured surfaces caused by work of this section.

END OF SECTION

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SECTION 07 27 00 – AIR/VAPOR BARRIER MEMBRANE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of contract, including all sections of Division 1 of the specification, apply to work of this section.

1.2 SUMMARY

A. This Section includes air/vapor barrier membrane used at exterior wall locations where indicated on drawings.

B. Related Sections include the following:

1. Division 6 Section "Sheathing" for substrate materials.
2. Division 7 Section "Bituminous Dampproofing" for dampproofing applied to the exterior face of inner wythe of exterior masonry cavity walls.
3. Division 7 Section "Building Insulation" for insulation materials.

1.3 SUBMITTALS

A. Product Data: For each type of product. Indicate material information and construction and application details.

B. Research/Evaluation Reports: Showing compliance with building code in effect for Project.

1.4 DELIVERY, STORAGE, AND HANDLING

Protect membrane materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 AIR/VAPOR RETARDER MEMBRANE

A. Building Wrap: ASTM E 1677, Type I air retarder; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.

1. Basis-of-Design: The design for building wrap is based on “Tyvek CommercailWrap” manufactured by DuPont (E. I. du Pont de Nemours and Company). Subject to compliance with requirements, provide either the named product or a comparable product by one of the following manufacturers.
   a. Dow Chemical Company (The);
   b. Ludlow Coated Products;
2. Thickness: Not less than 3 mils.
3. Allowable Exposure Time: Not less than three months.
4. Water-Vapor Permeance: Not less than 200 g through 1 sq. m of surface in 24 hours per ASTM E 96, Desiccant Method (Procedure A).
5. Allowable UV Exposure Time: Not less than three months.

2.2 TAPE

Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

PART 3 - EXECUTION

3.1 AIR/VAPOR BARRIER MEMBRANE INSTALLATION

A. Cover wall sheathing with air/vapor barrier membrane as indicated.

B. Comply with manufacturer's written instructions.

C. Cover upstanding flashing with 4-inch overlap.

D. Seal seams, edges, and penetrations with tape.

E. Extend into jambs of openings and seal corners with tape.

END OF SECTION 07 27 00

SECTION 07550 - MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hot Applied 2-Ply Asphalt Roofing

1.2 REFERENCES

A. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

B. ASTM D 312 - Standard Specification for Asphalt used in Roofing.

C. ASTM D 451 - Standard Test Method for Sieve Analysis of Granular Mineral Surfacing for Asphalt Roofing Products.

D. ASTM D 1079 Standard Terminology Relating to Roofing, Waterproofing and Bituminous Materials.

E. ASTM D 4586 Standard Specification for Asphalt Roof Cement, Asbestos-Free.

F. ASTM D 5147 Standard Test Method for Sampling and Testing Modified Bituminous Sheet Materials.

G. ASTM D 6162 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.

H. ASTM D 6163 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.

I. ASTM D 6164 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.

J. ASTM E 108 - Standard Test Methods for Fire Test of Roof Coverings

K. Factory Mutual Research (FM): Roof Assembly Classifications.

L. National Roofing Contractors Association (NRCA): Roofing and Waterproofing Manual.

M. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.

N. Underwriters Laboratories, Inc. (UL): Fire Hazard Classifications.

O. Warnock Hersey (WH): Fire Hazard Classifications.

P. ANSI-SPRI ES-1 Wind Design Standard for Edge Systems used with Low Slope Roofing Systems.

Q. ASCE 7, Minimum Design Loads for Buildings and Other Structures

R. UL - Fire Resistance Directory.

S. FM Approvals - Roof Coverings and/or RoofNav assembly database

1.3 DESIGN / PERFORMANCE REQUIREMENTS

A. Perform work in accordance with all federal, state and local codes.

B. Design Requirements:
1. Uniform Wind Uplift Load Capacity
   a. Installed roof system shall withstand negative (uplift) design wind loading pressures complying with the following criteria.
      1) Design Code: ASCE 7, Method 2 for Components and Cladding.
      2) Importance Category:
         a) IV.
      3) Importance Factor of:
         a) 1
      4) Wind Speed: 117 mph
      5) Ultimate Pullout Value: 585 pounds per each of the fastener
      6) Exposure Category:
         a) C.
      7) Design Roof Height: 18 feet.
      8) Minimum Building Width: 76 feet.
      9) Roof Pitch: 1/4”:12.
      10) Roof Area Design Uplift Pressure:
         a) Zone 1 - Field of roof 38.8 psf
         b) Zone 2 - Eaves, ridges, hips and rakes 49.2psf
         c) Zone 3 - Corners 64.7 psf
2. Live Load: 20 psf, or not to exceed original building design.
3. Dead Load:
   a. Installation of new roofing materials shall not exceed the dead load capacity of the existing roof structure.

C. Energy Star: Roof System shall comply with the initial and aged reflectivity required by the U.S. Federal Government's Energy Star program.

D. Roof System membranes containing recycled or bio-based materials shall be third party certified through UL Environment.

1.4 SUBMITTALS

A. All substitution submittals are due to the architect/owner within 48 hours of the mandatory pre-bid meeting.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation instructions.

C. Shop Drawings: Submit shop drawings including installation details of roofing, flashing, fastening, insulation and vapor barrier, including notation of roof slopes and fastening patterns of insulation and base modified bitumen membrane, prior to job start.

D. Design Pressure Calculations: Submit design pressure calculations for the roof area in accordance with ASCE 7 and local Building Code requirements. Include a roof system attachment analysis report, certifying the system's compliance with applicable wind load requirements before Work begins. Report shall be signed and sealed by a Professional Engineer registered in the State of the Project who has provided roof system attachment analysis for not less than 5 consecutive years.

E. Recycled or Bio-Based Materials: Provide third party certification through UL Environment of roof System membranes containing recycled or bio based materials

F. Verification Samples: For each modified bituminous membrane ply product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

G. Manufacturer's Certificates: Provide to certify products meet or exceed specified requirements.

H. Test Reports: Submit test reports, prepared by an independent testing agency, for all modified bituminous sheet roofing, indicating compliance with ASTM D5147. Testing must be performed at 77 deg. F. Tests at 0 deg. F will not be considered.

I. Manufacturer's Fire Compliance Certificate: Certify that the roof system furnished is approved by Factory Mutual (FM), Underwritters Laboratories (UL), Warnock Hersey (WH) or approved third party testing facility in accordance with ASTM E108, Class A for external fire and meets local or nationally recognized building codes.

J. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic inspection and maintenance of all completed roofing work. Provide product warranty executed by the manufacturer. Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

K. Substitutions

1. Substitutions will not be accepted from a roofing contractor whom did not attend the mandatory pre-bid meeting. The materials outlined herein are the type of materials that should be used in this project. When a particular make or trade name is specified, it shall be indicative of the minimum standard required. The bidder must disclose in his/her bid package the manufacturer that is intended to be used on this Project if other than the listed manufacturers. If no manufacturer is listed, the bidder's bid is accepted only with the use of the Basis of Design manufacturer and the bidder must use the Basis of Design manufacturer.

2. Bidder will not be allowed to change materials after the bid opening date.

3. If an alternate material is bid, the material must be equal or exceed the specifications, and submitted by the bidding Roofing Contractor to the Owner for approval within 48 hours of the pre-bid meeting and include the following:

a. Written Application with explanation of why it should be considered

b. Material Product Data sheet

c. A certificate from an accredited testing laboratory comparing the physical and performance attributes of the proposed material with those materials denoted as pre-approved systems or the characteristics noted in the material specification section. Private-label manufacturer substitutions are not allowed.

d. A list of at least five (5) jobs where the proposed alternate material was used under similar conditions. These jobs shall be located within fifty (50) miles of the current project. Each job must be at least five (5) years old, and each must be available for inspection by the Owner.

e. The manufacturer must have a current ratio of 5:1 (current assets to current liabilities) and demonstrate such with an audited financial statement supported by an affidavit from a third party. Manufacturer must not have been in Chapter 11 bankruptcy during the last five (5) years or settled litigation or paid fines to a public agency in excess of $20 million dollars. The manufacturer must also have current ISO 9001:2000 certification for the manufacturing of the products to be utilized on this project.

f. The Roofing manufacturer's inspector must have a minimum of 7-year experience with said roofing manufacturer and be an employee of the manufacturer warranting the roof system. A signed affidavit should be submitted as to the hire date of said employee of roofing manufacturer in submittals from contractor.

g. A sample warranty by the manufacturer of the roofing system. The manufacturer must be the organization that physically manufacturers and guarantees the roofing system. Bidding contractor, if making a request for substitution, represents that he/she personally investigated the proposed product or method and determined that it is equal or superior in all respects to that specified. He/she will provide the same guarantee for substitution as the products specified, waives all claims for additional cost related to substitution, and will reimburse the owner for all redesign cost for accommodation of the substitute

L. The Owner reserves the right to be the final authority on the acceptance or rejection of any or all bids, proposed alternate roofing systems or materials that has met ALL specified requirement criteria.

M. Alternate material submissions shall be sent to the Architect/Owner by the bidding Roofing Contractor within 48 hours of the mandatory pre-bid meeting. Only substitutes approved in writing by the Owner will be considered.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Roofing and Waterproofing Manual.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified with documented ISO 9001 certification and minimum of twelve years of documented experience and must not have been in Chapter 11 bankruptcy during the last five years.

C. Installer Qualifications: Note: All items must be provided at the time of bid.

1. Contractor specializing in performing work of this section with minimum five years documented experience. Contractor to provide the name, address, and materials used on a job that was over 5 years old.
2. Contractor to provide 5 job references, showing the type of work in this section, that includes customer names, address, and materials used.
3. Contractor must carry an Umbrella Insurance Policy in excess of $5 Million.
4. Contractor to provide a bid bond in the sum of 5% of the amount of the bid
5. Contractor must be pre-approved by the manufacturer and must include a letter of "good standing" from that manufacturer.
6. Contractor must have a Dun & Bradstreet (DNB) rating of 3 or higher.

D. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of roofing work while roofing work is in progress.

E. Product Certification: Provide manufacturer's certification that materials are manufactured in the United States and conform to requirements specified herein, are chemically and physically compatible with each other, and are suitable for inclusion within the total roof system specified herein.

F. Source Limitations: Obtain all components of roof system from a single manufacturer. Secondary products that are required shall be recommended and approved in writing by the roofing system Manufacturer. Upon request of the Architect or Owner, submit Manufacturer's written approval of secondary components in list form, signed by an authorized agent of the Manufacturer.

G. Immediately correct roof leakage during construction. If the Contractor does not respond within

twenty four (24) hours, the Owner has the right to hire a qualified contractor and back charge the original contractor.

1.6 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to commencing Work of this section.

B. Review installation procedures and coordination required with related Work.

C. Inspect and make notes of job conditions prior to installation:
1. Record minutes of the conference and provide copies to all parties present.
2. Identify all outstanding issues in writing designating the responsible party for follow-up action and the timetable for completion.
3. Installation of roofing system shall not begin until all outstanding issues are resolved to the satisfaction of the Architect.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging with labels intact until ready for installation.

B. Store all roofing materials in a dry place, on pallets or raised platforms, out of direct exposure to the elements until time of application. Store materials at least 4 inches above ground level and covered with "breathable" tarpaulins.

C. Stored in accordance with the instructions of the manufacturer prior to their application or installation. Store roll goods on end on a clean flat surface except store KEE-Stone FB 60 rolls flat on a clean flat surface. No wet or damaged materials will be used in the application.

D. Store at room temperature wherever possible, until immediately prior to installing the roll. During winter, store materials in a heated location with a 50 degree F (10 degree C) minimum temperature, removed only as needed for immediate use. Keep materials away from open flame or welding sparks.

E. Avoid stockpiling of materials on roofs without first obtaining acceptance from the Architect/Engineer.

F. Adhesive storage shall be between the range of above 40 degree F (4 degree C) and below 80 degree F (27 degree C). Area of storage shall be constructed for flammable storage.

1.8 COORDINATION

A. Coordinate Work with installing associated metal flashings as work of this section proceeds.

1.9 PROJECT CONDITIONS AND MANUFACTURER'S INSPECTIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. When the project is in progress, the roofing system manufacturer will provide the following:
1. Keep the Architect/Owner informed as to the progress and quality of the work as observed.
2. Provide daily job site inspections a minimum of day (3) days a week with reports to the Architect/Owner. The reports will include pictures of the days progress made by the contractor and a detailed written report as to the work performed that day.
3. Roofing manufacturer's inspector must have a minimum of 7-year experience with said roofing manufacturer and be an employee of the manufacturer warranting the roof system. A signed affidavit should be submitted as to the hire date of said employee of roofing

manufacturer.

4. Report to the Architect/Owner in writing any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.
5. Confirm after completion that manufacturer has observed no application procedures in conflict with the specifications other than those that may have been previously reported and corrected.

1.10 WARRANTY

A. Upon completion of the work, provide the Manufacturer's written and signed Edge-To-Edge NDL System Warranty, warranting that, if a leak develops in the roof during the term of this warranty, due either to defective material or defective workmanship by the installer, the manufacturer shall provide the Owner, at the Manufacturer's expense, with the labor and material necessary to return the defective area to a watertight condition including Garland Metal Components.
   1. Warranty Period:
      a. 30 years from date of acceptance.
      b. Warranty at no additional cost to the owner
      c. Manufacturer warranty terms require approval from the owner before award.

B. Installer is to guarantee all work against defects in materials and workmanship for a period indicated following final acceptance of the Work.
   1. Warranty Period:
      a. 5 years from date of acceptance.

C. The material manufacturer will provide an annual inspection for the duration of the warranty at the request of the owner at no additional charge.

D. The warranty shall cover all roof related components installed under this specification and shall not be limited to only those materials supplied by the material supplier issuing the warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design System: The Garland Company, Inc. 3800 E. 91st St., Cleveland, OH 44105. ASD. Toll Free: 800-321-9336. Phone: 216-641-7500. Fax: 216-641-0633. Web Site: www.garlandco.com.

B. Acceptable Alternate Manufacturers if the specification requirements are met
   1. Ecology
   2. Polyglass

C. The Products specified are intended and the Standard of Quality for the products required for this project. If other products are proposed the bidder must disclose in the bid the manufacturer and the products that they intend to use on the Project. If no manufacturer and products are listed, the bid may be accepted only with the use of products specified.
   1. Bidder will not be allowed to change materials after the pre-bid date.
   2. If alternate products are included in the bid, the products must be equal to or exceed the products specified. Supporting technical data shall be submitted to the Owner for approval prior to acceptance.
   3. In making a request for substitution, the Bidder/Roofing Contractor represents that it has:
      a. Personally investigated the proposed product or method, and determined that it is equal or superior in all respects to that specified.
      b. Will provide the same guarantee for substitution as for the product and method specified.
      c. Will coordinate installation of accepted substitution in work, making such changes as

may be required for work to be completed in all respects.

d. Will waive all claims for additional cost related to substitution, which consequently become apparent.

e. Cost data is complete and includes all related cost under his/her contract or other contracts, which may be affected by the substitution.

f. Will reimburse the Owner for all redesign cost by the Architect for accommodation of the substitution.

4. Owner reserves the right to be the final authority on the acceptance or rejection of any or all bids, proposed alternate roofing systems or materials that has met ALL specified requirement criteria.

5. Failure to submit substitution package, or any portion thereof requested, will result in immediate disqualification and consideration for that particular contractors request for manufacturer substitution.

2.2 HOT APPLIED 2-PLY ROOF SYSTEM

A. Base (Ply) Sheet: One ply bonded to the prepared substrate with Interply Adhesive:

B. Modified Cap (Ply) Sheet: One ply bonded to the prepared substrate with Interply Adhesive:

C. Interply Adhesive: (1 and 2)
   1. Generic Type IV asphalt

D. Flashing Base Ply: One ply bonded to the prepared substrate with Interply Adhesive:

E. Flashing Cap (Ply) Sheet: One ply bonded to the prepared substrate with Interply Adhesive:

F. Flashing Ply Adhesive:

G. Surfacing: Requires 30 day wait before applying.
   1. Surface Coatings:

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Inspect and approve the deck condition, slopes and fastener backing if applicable, parapet walls, expansion joints, roof drains, stack vents, vent outlets, nailers and surfaces and elements.

C. Verify that work penetrating the roof deck, or which may otherwise affect the roofing, has been properly completed.

D. If substrate preparation and other conditions are the responsibility of another installer, notify Owner of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. General: Clean surfaces thoroughly prior to installation.
   1. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
   2. Fill substrate surface voids that are greater than 1/4 inch wide with an acceptable fill material.
   3. Roof surface to receive roofing system shall be smooth, clean, free from loose gravel, dirt and debris, dry and structurally sound.
   4. Wherever necessary, all surfaces to receive roofing materials shall be power broom and

vacuumed to remove debris and loose matter prior to starting work.

5. Do not apply roofing during inclement weather. Do not apply roofing membrane to damp, frozen, dirty, or dusty surfaces.
6. Fasteners and plates for fastening components mechanically to the substrate shall provide a minimum pull-out capacity of 300 lbs. (136 k) per fastener. Base or ply sheets attached with cap nails require a minimum pullout capacity of 40 lb. per nail.
7. Prime decks where required, in accordance with requirements and recommendations of the primer and deck manufacturer.

3.3 INSTALLATION - GENERAL

A. Install modified bitumen membranes and flashings in accordance with manufacturer's instructions and with the recommendations provided by the National Roofing Contractors Association's Roofing & Waterproofing Manual, the Asphalt Roofing Manufacturers Association, and applicable codes.

B. General: Avoid installation of modified bitumen membranes at temperatures lower than 40-45 degrees F. When work at such temperatures unavoidable use the following precautions:
1. Take extra care during cold weather installation and when ambient temperatures are affected by wind or humidity, to ensure adequate bonding is achieved between the surfaces to be joined. Use extra care at material seam welds and where adhesion of the applied product to the appropriately prepared substrate as the substrate can be affected by such temperature constraints as well.
2. Unrolling of cold materials, under low ambient conditions must be avoided to prevent the likelihood of unnecessary stress cracking. Rolls must be at least 40 degrees F at the time of application. If the membrane roll becomes stiff or difficult to install, it must be replaced with roll from a heated storage area.

C. Commence installation of the roofing system at the lowest point of the roof (or roof area), working up the slope toward the highest point. Lap sheets shingle fashion so as to constantly shed water

D. All slopes greater than 2:12 require back-nailing to prevent slippage of the ply sheets. Use ring or spiral-shank 1 inch cap nails, or screws and plates at a rate of 1 fastener per ply (including the membrane) at each insulation stop. Place insulation stops at 16 ft o.c. for slopes less than 3:12 and 4 feet o.c. for slopes greater than 3:12. On non-insulated systems, nail each ply directly into the deck at the rate specified above. When slope exceeds 2:12, install all plies parallel to the slope (strapping) to facilitate backnailing. Install 4 additional fasteners at the upper edge of the membrane when strapping the plies.

3.4 INSTALLATION HOT APPLIED ROOF SYSTEM

A. Modified Base Ply: Install base sheet in twenty five (25) lbs (11.3kg) per square of bitumen shingled uniformly to achieve one or more plies over the entire prepared substrate. Shingle in direction of slope of roof to shed water on each area of roof. Do not step on base rolls until asphalt has cooled, fish mouths should be cut and patched.
1. Lap ply sheet ends 8 inches (203 mm). Stagger end laps 4 inches (304mm) side laps minimum.
2. Install base flashing ply to all perimeter and projection details after membrane application.
3. Extend plies 2 inches beyond top edges of cants at wall and projection bases.
4. Install base flashing ply to all perimeter and projection details.
5. Allow the one ply of base sheet to cure at least 30 minutes before installing the modified membrane.

B. Modified Cap Ply(s): Solidly bond the modified membrane to the base layer with specified material at the rate of 25 to thirty 30 lbs. (11-13kg) per 100 square feet.
1. Roll must push a puddle of hot material in front of it with material slightly visible at all side laps. Use care to eliminate air entrapment under the membrane. Exercise care during application to eliminate air entrapment under the membrane.

2. Apply pressure to all seams to ensure that the laps are solidly bonded to substrate.
3. Install subsequent rolls of modified membrane as above with a minimum of 4 inch (101 mm) side laps and 8 inch (203 mm) end laps. Stagger end laps. Apply membrane in the same direction as the previous layers but stagger the laps so they do not coincide with the laps of the base layers.
4. Apply hot material no more than 5 feet (1.5 m) ahead of each roll being embedded.
5. Extend membrane 2 inches (50 mm) beyond top edge of all cants in full moppings of the specified hot material.

C. Fibrous Cant Strips: Provide non-combustible perlite or glass fiber cant strips at all wall/curb detail treatments where angle changes are greater than 45 degrees. Cant may be set in approved cold adhesives, hot asphalt or mechanically attached with approved plates and fasteners.

D. Wood Blocking, Nailers and Cant Strips: Provide wood blocking, nailers and cant strips as specified in Section 06114.
1. Provide nailers at all roof perimeters and penetrations for fastening membrane flashings and sheet metal components.
2. Wood nailers should match the height of any insulation, providing a smooth and even transition between flashing and insulation areas.
3. Nailer lengths should be spaced with a minimum 1/8 inch gap for expansion and contraction between each length or change of direction.
4. Nailers and flashings should be fastened in accordance with Factory Mutual "Loss Prevention Data Sheet 1- 49, Perimeter Flashing" and be designed to be capable of resisting a minimum force of 200 lbs/lineal foot in any direction.

E. Metal Work: Provide metal flashings, counter flashings, parapet coping caps and thru-wall flashings as specified in Section 07620 or Section 07710. Install in accordance with the SMACNA "Architectural Sheet Metal Manual" or the NRCA Roofing Waterproofing manual.

F. Termination Bar: Provide a metal termination bar or approved top edge securement at the terminus of all flashing sheets at walls and curbs. Fasten the bar a minimum of 8 inches (203 mm) o/c to achieve constant compression. Provide suitable, sealant at the top edge if required.

G. Flashing Base Ply: Install flashing sheets by the same application method used for the base ply.
1. Seal curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
2. Prepare all walls, penetrations, expansion joints and surfaces to be flashed with required primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
3. Adhere to the underlying base flashing ply with specified hot material unless otherwise noted in these specifications. Nail off at a minimum of 8 inches (203 mm) o.c. from the finished roof at all vertical surfaces.
4. Solidly adhere the entire sheet of flashing membrane to the substrate.
5. Seal all vertical laps of flashing membrane with a three-course application of trowel-grade mastic and mesh.
6. Coordinate counter flashing, cap flashings, expansion joints, and similar work with modified bitumen roofing work as specified.
7. Coordinate roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices with the roofing system work.

H. Flashing Cap Ply: Install flashing cap sheets by the same application method used for the cap ply.
1. Seal curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
2. Prepare all walls, penetrations, expansion joints and where shown on the Drawings to be flashed with required primer at the rate of 100 square feet per gallon. Allow primer to dry tack

free.

3. Adhere to the underlying base flashing ply with specified flashing ply adhesive unless otherwise specified. Nail off at a minimum of 8 inches (203 mm) o.c. from the finished roof at all vertical surfaces.
4. Coordinate counter flashing, cap flashings, expansion joints and similar work with modified bitumen roofing work as specified.
5. Coordinate roof accessories, miscellaneous sheet metal accessory items with the roofing system work.
6. All stripping shall be installed prior to flashing cap sheet installation.
7. Heat and scrape granules when welding or adhering at cut areas and seams to granular surfaces at all flashings.
8. Secure the top edge of the flashing sheet using a termination bar only when the wall surface above is waterproofed, or nailed 4 inches on center and covered with an acceptable counter flashing.

I. Surface Coatings: Apply roof coatings in strict conformance with the manufacturer's recommended procedures.

J. Roof Walkways: Provide walkways in areas indicated on the Drawings.

3.5 INSTALLATION EDGE TREATMENT AND ROOF PENETRATION FLASHING

A. Fabricated Flashings: Fabricated flashings and trim are provided as specified in Section 07620.
1. Fabricated flashings and trim shall conform to the detail requirements of SMACNA "Architectural Sheet Metal Manual" and/or the Copper Development Association "Copper in Architecture - Handbook" as applicable.

B. Coping Cap:
1. Minimum flashing height is 8 inches (203 mm) above finished roof height. Maximum flashing height is 24 inches (609 mm). Prime vertical wall at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
3. Attach tapered board to top of wall.
4. Install base flashing ply covering entire wall and wrapped over top of wall and down face with 6 inches (152 mm) on to field of roof and set in cold asphalt. Nail membrane at 8 inches (203 mm) o.c.
5. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Apply a three-course application of mastic and mesh at all seams and allow to cure and aluminize.
6. Install continuous cleat and fasten at 6 inches (152 mm) o.c. to outside wall.
7. Install new metal coping cap hooked to continuous cleat.
8. Fasten inside cap 24 inches (609 mm) o.c. with approved fasteners and neoprene washers through slotted holes, which allow for expansion and contraction.

C. Surface Mounted Counterflashing:
1. Minimum flashing height is 8 inches (203 mm) above finished roof height. Maximum flashing height is 24 inches (609 mm). Prime vertical wall at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
3. Install base flashing ply covering wall set in bitumen with 6 inches (152 mm) on to field of the roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Apply butyl tape to wall behind flashing. Secure termination bar through flashing, butyl tape and into wall. Alternatively use caulk to replace the butyl tape.

6. Secure counterflashing set on butyl tape above flashing at 8 inches (203 mm) o.c. and caulk top of counterflashing.

D. Equipment Support:
1. Minimum curb height is 8 inches (203 mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
3. Install base flashing ply covering curb set in bitumen with 6 inches (152 mm) on to field of the roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Attach top of membrane to top of curb and nail at 8 inches (203 mm) o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Install pre-manufactured cover. Fasten sides at 24 inches (609 mm) o.c. with fasteners and neoprene washers. Furnish all joint cover laps with butyl tape between metal covers.
6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.

E. Curb Detail/Air Handling Station:
1. Minimum curb height is 8 inches (203 mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
3. Install base flashing ply covering curb set in bitumen with 6 inches (152 mm) on to field of the roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Install pre-manufactured counterflashing with fasteners and neoprene washers or per manufacturer's recommendations.
6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.

F. Exhaust Fan:
1. Minimum curb height is 8 inches (203 mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all plies over cant a minimum of 2 inches (50 mm).
3. Install base flashing ply covering curb with 6 inches (152 mm) on to field of the roof.
4. Install a second ply of modified flashing ply installed over the base flashing ply, 9 inches (228 mm) on to field of the roof. Attach top of membrane to top of wood curb and nail at 8 inches (203 mm) o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Install metal exhaust fan over the wood nailers and flashing to act as counterflashing. Fasten per manufacturer's recommendation.

G. Plumbing Stack:
1. Minimum stack height is 12 inches (609 mm).
2. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric sealant.
3. Prime flange of new sleeve. Install properly sized sleeves set in 1/4 inch (6 mm) bed of roof cement.
4. Install base flashing ply in bitumen.
5. Install membrane in bitumen.
6. Caulk the intersection of the membrane with elastomeric sealant.
7. Turn sleeve a minimum of 1 inch (25 mm) down inside of stack.

H. Heat Stack:
1. Minimum stack height is 12 inches (609 mm).
2. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric

sealant.
3. Prime flange of new sleeve. Install properly sized sleeves set in 1/4 inch (6 mm) bed of roof cement.
4. Install base flashing ply in bitumen.
5. Install modified membrane in bitumen.
6. Caulk the intersection of the membrane with elastomeric sealant.
7. Install new collar over cape. Weld collar or install stainless steel draw brand.

I. Pitch Pocket:
1. Run all plies up to the penetration.
2. Place the pitch pocket over the penetration and prime all flanges.
3. Strip in flange of pitch pocket with one ply of base flashing ply. Extend 6 inches (152 mm) onto field of roof.
4. Install second layer of modified membrane extending 9 inches (228 mm) onto field of the roof.
5. Fill pitch pocket half full with non-shrink grout. Let this cure and top off with pourable sealant.
6. Caulk joint between roof system and pitch pocket with roof cement.

J. Liquid Flashing:
1. Mask target area on roof membrane with tape.
2. Clean all non-porous areas with isopropyl alcohol.
3. Apply 32 wet mil base coat of liquid flashing over masked area.
4. Embed polyester reinforcement fabric into the base coat of the liquid flashing.
5. Apply 48-64 wet mil top coat of the liquid flashing material over the fabric extending 2 inches (51 mm) past the scrim in all directions.
6. Apply minerals immediately or allow the liquid flashing material to cure 15-30 days and then install reflective coating.

3.6 CLEANING

A. Clean-up and remove daily from the site all wrappings, empty containers, paper, loose particles and other debris resulting from these operations.

B. Remove asphalt markings from finished surfaces.

C. Repair or replace defaced or disfigured finishes caused by Work of this section.

3.7 PROTECTION

A. Provide traffic ways, erect barriers, fences, guards, rails, enclosures, chutes and the like to protect personnel, roofs and structures, vehicles and utilities.

B. Protect exposed surfaces of finished walls with tarps to prevent damage.

C. Plywood for traffic ways required for material movement over existing roofs shall be not less than 5/8 inch (16 mm) thick.

D. In addition to the plywood listed above, an underlayment of minimum 1/2 inch (13 mm) recover board is required on new roofing.

E. Special permission shall be obtained from the Manufacturer before any traffic shall be permitted over new roofing.

3.8 SCHEDULES

A. Base (Ply) Sheet:
1. 80 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing base sheet reinforced with a fiberglass scrim, performance requirements according to ASTM D 5147.

a. Tensile Strength, ASTM D 5147
1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 225 lbf/in XD 225 lbf/in
2) .08mm/min. @ 0 +/- 3.6 deg. C MD 240 kN/m XD 220 kN/m
b. Tear Strength, ASTM D 5147
1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 300 lbf XD 300 lbf
c. Elongation at Maximum Tensile, ASTM D 5147
1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 7 % XD 7 %
d. Low Temperature Flexibility, ASTM D 5147, Passes -30 deg. F (-34.4 deg. C)

B. Modified Cap (Ply) Sheet:
1. 155 mil SBS (Styrene-Butadiene-Styrene) rubber modified membrane incorporating post consumer recycled rubber and reinforced with a fiberglass and polyester composite scrim. ASTM D 6162, Type III Grade S
a. Tensile Strength, ASTM D 5147(a) 2 in/min. @ 73.4 +/- 3.6 deg. F
1) MD 325 lbf/in
2) XD 325 /lbf/in
b. Tear Strength, ASTM D 5147
1) MD 500 lbf.
2) XD 500 lbf
c. Elongation at Maximum Tensile, ASTM D 5147
1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 8% XD 8%
d. Low Temperature Flexibility, ASTM D 5147, Passes -30 deg. F (-34.4 deg. C)
e. Pre-Consumer 11% recycled content
f. Post-Consumer .3% recycled content

C. Interply Adhesive:
1. Generic Type IV Asphalt: Hot Bitumen, ASTM D 312, Type IV special steep asphalt having the following characteristics:
a. Softening Point 210 deg. F - 225 deg. F
b. Flash Point 500 deg. F
c. Penetration @ 77 deg. F 15-25 units
d. Ductility @ 77 deg. F 1.5 cm

D. Flashing Base Ply:
1. 80 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing base sheet reinforced with a fiberglass scrim, performance requirements according to ASTM D 5147.
a. Tensile Strength, ASTM D 5147
1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 225 lbf/in XD 225 lbf/in
2) .08mm/min. @ 0 +/- 3.6 deg. C MD 240 kN/m XD 220 kN/m
b. Tear Strength, ASTM D 5147
1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 300 lbf XD 300 lbf
c. Elongation at Maximum Tensile, ASTM D 5147
1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 7 % XD 7 %
d. Low Temperature Flexibility, ASTM D 5147, Passes -30 deg. F (-34.4 deg. C)

E. Flashing Ply Adhesive:
1. Asphalt roofing mastic V.O.C. compliant, ASTM D 4586, Type II trowel grade flashing adhesive.
a. Non-Volatile Content ASTM D 4479 70 min.
b. Density ASTM D 1475 8.3 lbs./gal. (1kg/l)
c. Flash Point ASTM D 93 103 deg. F (39 deg. C)

F. Surfacing:
1. Surface Coatings:
a. Surfacing:
1) ASTM D 2824 aluminum coating non-fibered aluminum roof coating non-

fibered aluminum roof coating having the following characteristics:

a) Flash Point 103 deg. F (39 deg. C) min.

b) Weight/Gallon 7.9 lbs./gal. (1.0 g/cm3)

END OF SECTION 07 71 00

SECTION 07 62 00 – SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Aluminum flashing associated with aluminum framing systems.

B. Related Sections:

1. Division 6 Section "Rough Carpentry" for wood nailers, curbs, and blocking.

1.3 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:

1. Identification of material, thickness, weight, and finish for each item and location in Project.

2. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.

3. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.

4. Details of connections to adjoining work.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.

2. Accessories and Miscellaneous Materials: Full-size Sample.

D. Meeting Records: Minutes of pre-installation conference.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

C. Do not proceed with the installation of flashing and sheet metal work until curb and substrate construction, cant strips, blocking, reglets and construction to receive the work is completed.

D. Pre-Installation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.

2. Review methods and procedures related to sheet metal flashing and trim.

3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.

4. Review special details and condition of other construction that will affect sheet metal flashing.

5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.7 COORDINATION

Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.

1. Application: Provide at flashing associated with aluminum framing systems and louvers. When not indicated of higher gage, provide sheet metal of minimum gage as recommended in the SMACNA Manual.

2. Exposed Clear Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

3. a. Surface: Smooth, flat.

b. Exposed Coil-Coated Finishes:

c. Color: Match Architect’s samples.

d. Concealed Finish: Pretreat with manufacturer’s standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.040 inch (1.0 mm).

2.2 UNDERLAYMENT MATERIALS

Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.

b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

2. Obtain field measurements for accurate fit before shop fabrication.

3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

E. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.

2.5 WALL SHEET METAL FABRICATIONS

Flashings: Fabricate discontinuous lintel, sill, and similar flashings to extend 8 inches beyond each side of wall openings. Form with 2-inch- high, end dams where flashing is discontinuous.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
4. Install sealant tape where indicated.
5. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

1. Coat back side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

D. Fasteners:

1. Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
2. Aluminum: Use aluminum or stainless-steel fasteners.

E. Seal joints as shown and as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

3.4 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings: Install continuous head, sill, and similar flashings to extend 6 inches beyond wall openings.

3.5 ERECTION TOLERANCES

Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 CLEANING AND PROTECTION

A. Clean and neutralize flux materials. Clean off excess solder.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

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SECTION 07 71 00 – ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following manufactured roof specialties:
   1. Copings.
   2. Roof Edge Flashings.
   3. Counterflashings and Reglets.

B. Related Sections include the following:
   1. Division 4 Section "Unit Masonry Assemblies" for installing reglets.
   2. Division 6 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
   3. Division 7 Section "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing" for coordination with roofing membrane warranty.
   4. Division 7 Section "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
   5. Division 7 Section "Roof Accessories" for set-on-type curbs, roof hatches, vents, and other manufactured roof accessory units.
   6. Division 7 Section "Joint Sealants" for field-applied sealants.

1.3 PERFORMANCE REQUIREMENTS

A. General: Manufacture and install manufactured roof specialties to resist thermally induced movement and exposure to weather without failing, rattling, leaking, and fastener disengagement.
B. FMG Listing: Manufacture and install copings that are listed in FMG's "Approval Guide" and approved for Windstorm Classification indicated on Structural Drawings. Identify materials with FMG markings.
C. Manufacture and install copings tested according to SPRI ES-1 and capable of resisting the following design pressures: Design Pressure: As indicated on Structural Drawings.
D. Thermal Movements:

   1. Provide manufactured roof specialties that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   2. Temperature Change (Range): Minus 20 to plus 180 deg F, ambient; 180 deg F, material surfaces.

E. Water Infiltration: Provide manufactured roof specialties that do not allow water infiltration to building interior.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
B. Shop Drawings: Show layouts of manufactured roof specialties, including plans and elevations. Identify factory- vs. field-assembled work. Include the following:

   1. Details for fastening, joining, supporting, and anchoring manufactured roof specialties including fasteners, clips, cleats, and attachments to adjoining work.

2. Details for expansion and contraction.

C. Fabrication Samples: For copings, counterflashings, and reglets made from 12-inch lengths of full-size components including fasteners, cover joints, accessories, and attachments.
D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, verifying compliance of copings with performance requirements.
E. Warranty: Special warranty specified in this Section.

1.5 COORDINATION

Coordinate installation of manufactured roof specialties with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

1.6 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace manufactured roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXPOSED METALS

A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for use and finish indicated, finished as follows:

1. Surface: Smooth, flat finish.
2. Anodic Finish: Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611

B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:

1. Anodic Finish: Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611

2.2 CONCEALED METALS

A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for use and structural performance indicated, mill finished.
B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items required by manufacturer for a complete installation.
B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.
C. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
D. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.
F. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
G. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.
H. Polyethylene Sheet: 6-mil- thick polyethylene sheet complying with ASTM D 4397.

2.4 COPINGS

A. Copings: Manufactured coping system consisting of formed-metal coping cap in section lengths not exceeding 12 feet, concealed anchorage, concealed splice plates with same finish as coping caps, mitered corner units, and end cap units.
   1. Basis-of-Design Product: The design for copings is based on the stand aluminum coping extrusions manufactured by Centria Architectural Systems. Subject to compliance with requirements, provide either the named product or a comparable product by another approved manufacturer. Color as selected by Architect.
      a. Coping Caps: Snap-on, fabricated from the following exposed metal: Aluminum: 0.063 inch thick. Provide at copings associated with masonry and elsewhere as indicated on drawings
   2. Corners: Mechanically clinched and sealed watertight.
   3. Special Fabrications: As indicated on drawings.
   4. Snap-on Coping Anchor Plates: Concealed, galvanized steel sheet, 12 inches wide, 0.028 inch thick, with integral cleats.

2.5 ROOF EDGE FLASHINGS

A. Roof Edge Fascia: Manufactured, two-piece, roof edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous formed- or extruded-aluminum anchor bar with integral drip edge cleat to engage fascia cover. Provide matching mitered and welded corner units.

   1. Basis-of-Design Product: The design for copings is based on the standard manufacturer's flashings manufactured by Centria Architectural Systems. Subject to compliance with requirements, provide either the named product or a comparable product by another approved manufacturer.
   2. Fascia Cover: Snap-on, fabricated from the following exposed metal: Aluminum: 0.063 inch thick. Provide at fascia cover associated with aluminum composite wall panels, and elsewhere as indicated on drawings
   3. Corners: Mechanically clinched and sealed watertight.
   4. Special Fabrications: As indicated on drawings.
   5. Snap-on Fascia Anchor Plates: Concealed, galvanized steel sheet, 12 inches wide, 0.028 inch thick, with integral cleats.

2.6 COUNTERFLASHINGS AND REGLETS

A. Counterflashings:

1. Manufactured units in lengths not exceeding 12 feet designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal in thickness indicated:
2. Aluminum: 0.050 inch thick.

B. Reglets:

1. Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashings indicated with factory-mitered and -welded corners and junctions, from the following exposed metal in thickness indicated:
2. Aluminum: 0.050 inch thick.
3. Type: For masonry application, with offset top flange for embedment in masonry mortar joint.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the following;
   a. Fry Reglet Corporation
   b. Hickman: W. P. Hickman Co.
   c. Keystone Flashing Company

C. Accessories: Counterflashing wind-restraint clips.

2.7 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.
   1. Examine walls, roof edges, and parapets for suitable conditions for manufactured roof specialties.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
   3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install manufactured roof specialties according to manufacturer's written instructions. Anchor manufactured roof specialties securely in place and capable of resisting forces specified in performance requirements. Use fasteners, separators, sealants, and other miscellaneous items as required to complete manufactured roof specialty systems.

   1. Install manufactured roof specialties with provisions for thermal and structural movement.
   2. Torch cutting of manufactured roof specialties is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of manufactured roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing exposed-to-view components of manufactured roof specialties directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Install manufactured roof specialties level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil-canning, buckling, or tool marks.
D. Install manufactured roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
E. Expansion Provisions: Provide for thermal expansion of exposed manufactured roof specialties. Space movement joints at a maximum of 12 feet with no unplanned joints within 18 inches of corners or intersections.
F. Fasteners: Use fasteners of type and size recommended by manufacturer but of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
G. Seal joints with elastomeric sealant as required by manufacturer of roofing specialties.

3.3 COPING INSTALLATION

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.
B. Anchor copings to resist uplift and outward forces according to performance requirements.
1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at manufacturer's recommended spacing.

3.4 ROOF EDGE FLASHING INSTALLATION

A. Install cleats, cant dams, and other anchoring and attachment accessories and devices with concealed fasteners.
B. Anchor roof edgings to resist uplift and outward forces according to performance requirements.

3.5 COUNTERFLASHING AND REGLET INSTALLATION

A. Counterflashings: Coordinate installation of counterflashings with installation of base flashings. Insert counterflashings in reglets or receivers and fit tightly to base flashings. Extend counterflashings 4 inches over base flashings. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant.
B. Reglets: Installation of reglets is specified in Division 4 Section "Unit Masonry Assemblies".

3.6 CLEANING AND PROTECTION

A. Clean and neutralize flux materials. Clean off excess solder and sealants.
B. Remove temporary protective coverings and strippable films as manufactured roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.
C. Replace manufactured roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 71 00

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SECTION 07 72 00 – ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Roof curbs.
   2. Roof hatches.

B. Related Sections include the following:
   1. Division 6 Section "Rough Carpentry" for wood cant and wood nailers.
   2. Division 7 Section "Sheet Metal Flashing and Trim" for shop-and field-fabricated metal flashing and counterflashing and miscellaneous sheet metal trim and accessories.
   3. Division 7 Section "Roof Specialties" for coping, fascia, and counterflashing.

1.3 SUBMITTALS

A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for roof accessories. Show layouts of roof accessories including plans and elevations. Indicated dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed factory-applied finish required and for each type of roof accessory indicated, prepared on samples of size to adequately show color.

1.4 QUALITY ASSURANCE

A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

1.6 PROJECT CONDITIONS

Field Measurements: Verify required openings for each type of roof accessory by field measurements before fabrication and indicated measurements on Shop Drawings.

1.7 COORDINATION

Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

PART 2 – PRODUCTS

2.1 METAL MATERIALS

A. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coated and mill phosphatized for field painting.

B. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized to comply with ASTM A 123/A 123M, unless otherwise indicated.

C. Steel Tube: ASTM A 500, round tube, baked-enamel finish.

D. Galvanized Steel Tube: ASTM A 500, round tube, hot-galvanized to comply with ASTM A 123/A 123M.

E. Galvanized Steel Pipe: ASTM A 53/A 53M.

2.2 MISCELLANEOUS MATERIALS

A. Glass-Fiber Board Insulation: ASTM C 726, 1 inch thick.

B. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for above ground use, complying with AWPA C2; not less than 1-1/2 inches thick.

C. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

D. Polyethylene Sheet: 6-mil-thick, polyethylene sheet complying with ASTM D 4397.

E. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

F. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by roof accessory manufacturer. Match finish of exposed fasteners with finish material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.

G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.

H. Elastomeric Sealant: ASTM C 920, silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

I. Roofing Cement: ASTM D 4586, nonabestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

2.3 ROOF CURBS

A. Roof Curbs: Provide metal roof curbs, internally reinforced and capable of supporting superimposed live and dead loads, including equipment loads and other construction to be superimposed on roof curbs. Fabricate with welded or sealed mechanical corner joints, with stepped integral metal cant raised the thickness of roof insulation and integral formed mounting flange at perimeter bottom. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Custom Curb, Inc.

   b. LM Curbs.

   c. Pate Company (The)

   d. ThyCurb; Div. of Thybar Corporation.

   e. Uni-Curb, Inc.

2. Load Requirements: As indicated on Drawings.

3. Material: Galvanized steel sheet, minimum 0.052 inch thick, with prime painted finish.

4. Liner: Same material as curb, of manufacturer's standard thickness and finish.

5. Factory install wood nailers at tops of curbs.

6. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.

7. Factory insulate curbs with 1-1/2-inch-glass-fiber board insulation.

8. Curb height may be determined by adding thickness of roof insulation and minimum base flashing height recommended by roofing membrane manufacturer. Fabricate units to minimum height of 12 inches, unless otherwise indicated.

2.4 ROOF HATCHES

A. Roof Hatches: Provide 30" x 36" hatch in aluminum or galvanized steel suitable for use in conjunction with interior fixed ladder. Hatch shall have counter-balanced cover design for easy one-hand operation and fully gasketed and insulated construction for weather resistance.

1. Engineered with compression spring operators to provide smooth, easy, one-hand operation, regardless of size.

2. Automatic hold-open arm locks the cover in the open position to ensure safe egress.

3. Overlapping cover design, full welded corners on cover and curb, EPDM rubber gasket, and fully insulated cover and curb ensure weathertightness and energy efficiency.

4. Constructed with corrosion resistant materials to provide many years of trouble free, dependable service.

5. Heavy gauge construction and positive latching mechanism maintain building security.

B. Provide manufacturer's standard 5 year warranty. Roof hatches shall be free from manufacturing defects in materials and fabrication for a period of 5 years from the date of shipment. Should a product fail to function in normal use within this period, manufacturer shall furnish a replacement or new part at Babcock-Davis's discretion.

C. Available manufacturers:
1. Babcock-Davis
2. The Bilco Company
3. Or equal.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored and is ready to receive roof accessories.
2. Verify dimensions of roof openings for roof accessories.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Install roof accessories to fit substrates and to result in watertight performance.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
3. Bed flanges in thick coat of approved roof manufacturer's cement where required by roof accessory manufacturers for waterproof performance.

D. Install roof accessories level, plumb, true to line an elevation, and without warping, jogs in alignment, excessive oil canning, bucking, or tool marks.

E. Roof Curb Installation: Set roof curb so top surface of roof curb is level.

F. Seal joints with elastomeric sealant as required by manufacturer of roof accessories.

3.3 TOUCH UP

Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Division 9 Painting Sections.

3.4 CLEANING

Clean exposed surfaces according to manufacturer's written instructions.

END OF SECTION 07 72 00

SECTION 07 84 13 – THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

B. Related Sections include Division 7 Section "Fire-Resistive Joint Systems".

1.3 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814:

1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.

2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:

   a. Penetrations located outside wall cavities.

   b. Penetrations located outside fire-resistance-rated shaft enclosures.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.

3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.

C. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:

1. Types of penetrating items.
2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.

D. Qualification Data: For Installer.

E. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

F. Meeting Records: Minutes of pre-installation conference.

G. Building Department Submittal: Contractor shall submit to the building department product information for all fireproofing and fire stopping for review and approval. No installation shall proceed until the building department has approved these products.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors".

B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:
   a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
   b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL in its "Fire Resistance Directory".

D. Pre-Installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination".

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Notify inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by inspecting agency and building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Available Products: Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to, those systems indicated on Drawings.

2.2 FIRESTOPPING, GENERAL

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:

1. Permanent forming/damming/backing materials, including the following:

   a. Slag-/rock-wool-fiber insulation.

   b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.

   c. Fire-rated form board.

   d. Fillers for sealants.

2. Temporary forming materials.

3. Substrate primers.

4. Collars.

5. Steel sleeves.

2.3 FILL MATERIALS

A. General: Provide through-penetration firestop systems containing the types of fill materials indicated on drawings by referencing the types of materials described in this Article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.

B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

H. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

I. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.

J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

K. Silicone Sealants:

1. Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

2. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.

2.4 MIXING

For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.

2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:

1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."

2. Contractor's name, address, and phone number.

3. Through-penetration firestop system designation of applicable testing and inspecting agency.

4. Date of installation.

5. Through-penetration firestop system manufacturer's name.

6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Engage a qualified, independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.

B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.6 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

END OF SECTION 07 84 13

SECTION 07 84 46 – FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes fire-resistive joint systems as indicated on the drawings and may include the following:

1. Floor-to-floor joints.
2. Floor-to-wall joints.
3. Head-of-wall joints.
4. Wall-to-wall joints.
5. Perimeter fire-resistive joint systems consisting of floor-to-wall joints between perimeter edge of fire-resistance-rated floor assemblies and exterior curtain walls.

B. Related Sections include the following:

1. Division 7 Section "Through-Penetration Firestop Systems" for systems installed in openings in walls and floors with and without penetrating items.
2. Division 7 Section "Joint Sealants" for non-fire-resistive joint sealants.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed.

B. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide systems with assembly ratings equaling or exceeding the fire-resistance ratings of construction that they join.

C. Perimeter Fire-Resistive Joint Systems: For joints between edges of fire-resistance-rated floor assemblies and exterior curtain walls, provide systems of type and with ratings indicated, as determined by NFPA 285 and UL 2079.

1. UL-Listed, Perimeter Fire-Containment Systems: Integrity ratings equaling or exceeding fire-resistance ratings of floor or floor/ceiling assembly forming one side of joint.

D. For fire-resistive systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. For each fire-resistive joint system, show each kind of construction condition in which joints are installed; also show relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.
2. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.

C. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.

D. Qualification Data: For Installer.

E. Research/Evaluation Reports: For each type of fire-resistive joint system.

F. Meeting Records: Minutes of pre-installation conference.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors".

B. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for fire-resistive joint systems acceptable to authorities having jurisdiction.

2. Fire-resistive joint systems are identical to those tested per methods indicated in Part 1 "Performance Requirements" Article and comply with the following:

a. Fire-resistive joint system products bear classification marking of qualified testing and inspecting agency.

b. Fire-resistive joint systems correspond to those indicated by referencing system designations of the qualified testing and inspecting agency.

D. Pre-Installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination".

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

C. Notify inspecting agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until inspecting agency and building inspector of authorities having jurisdiction have examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to, those systems indicated that are produced by one of the following manufacturers:

1. Grace, W. R. & Co. - Conn.
2. Hilti, Inc.
3. 3M; Fire Protection Products Division.
4. Tremco; Sealant/Weatherproofing Division.
5. USG Corporation.

2.2 FIRE-RESISTIVE JOINT SYSTEMS

A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.

B. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates or damaging adjoining surfaces.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.

B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.

2. Apply fill materials so they contact and adhere to substrates formed by joints.

3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

A. Inspecting Agency: Engage a qualified independent inspecting agency to inspect fire-resistive joint systems and prepare inspection reports.

B. Testing Services: Inspecting of completed installations of fire-resistive joint systems shall take place in successive stages as installation of fire-resistive joint systems proceeds. Do not proceed with installation of joint systems for the next area until inspecting agency determines completed work shows compliance with requirements. Inspecting agency shall state in each report whether inspected fire-resistive joint systems comply with or deviate from requirements.

C. Remove and replace fire-resistive joint systems where inspections indicate that they do not comply with specified requirements.

D. Additional inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

E. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and fire-resistive joint systems comply with requirements.

3.5 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION 07 84 46

SECTION 07 92 00 – JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:

1. Exterior joints in the following vertical surfaces and horizontal nontraffic surfaces:
   a. Construction joints in cast-in-place concrete.
   b. Joints between different materials listed above.
   c. Perimeter joints between materials listed above and frames of doors, windows and louvers.
   d. Control and expansion joints in ceilings and other overhead surfaces.
   e. Other joints as indicated.
2. Exterior joints in the following horizontal traffic surfaces:
   a. Isolation and contraction joints in cast-in-place concrete slabs.
   b. Other joints as indicated.
3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints of exterior openings where indicated.
   c. Tile control and expansion joints.
   d. Perimeter joints between interior wall surfaces and frames of doors, windows, and elevator entrances.
   e. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   f. Other joints as indicated.
4. Interior joints in the following horizontal traffic surfaces:
   a. Isolation joints in cast-in-place concrete slabs.
   b. Control and expansion joints in tile flooring.
   c. Other joints as indicated.

B. Related Sections include the following:

1. Division 7 Section "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
2. Division 8 Section "Glazing" for glazing sealants.
3. Division 9 Section "Tiling" for sealing tile joints.
4. Division 9 Section "Acoustical Tile Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.
B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
D. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
E. Qualification Data: For Installer.
F. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.
G. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
   1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
H. Field Test Report Log: For each elastomeric sealant application.
I. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.
J. Warranties: Special warranties specified in this Section.
K. Meeting Records: Minutes from Pre-Intallation Conference.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
C. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

   1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
   2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
   3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.

D. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency or manufacturer based on testing current sealant formulations within a 36-month period preceding the Notice to Proceed with the Work.

   1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
   2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
   3. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

E. Pre-Construction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each application indicated below:

    a. Each type of elastomeric sealant and joint substrate indicated.
    b. Each type of nonelastomeric sealant and joint substrate indicated.

3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

    a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193.
    b. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

F. Pre-Installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
    1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
    2. When joint substrates are wet.
    3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
    4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
B. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within warranty period of 2 (two) years from date of Substantial Completion.
C. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within warranty period of 10 (ten) years from date of Substantial Completion.
D. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
    1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
    2. Disintegration of joint substrates from natural causes exceeding design specifications.
    3. Mechanical damage caused by individuals, tools, or other outside agents.
    4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.
C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
B. Single-Component Neutral- and Basic-Curing Silicone Sealant:

   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      a. Dow Corning Corporation; 790.
      b. GE Silicones; SilPruf LM SCS2700.
      c. Pecora: 890NST.
      d. Tremco; Spectrem 1 (Basic).
   2. Type and Grade: S (single component) and NS (nonsag).
   3. Class: 100/50.
   4. Use Related to Exposure: NT (nontraffic).
   5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
   6. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.
   7. Applications: Exterior non-traffic and interior wet areas.

C. Multicomponent Pourable Urethane Sealant:

   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      a. Meadows, W. R., Inc.; POURTHANE.
      b. Pecora Corporation; Urexpan NR-200.
      c. Tremco; THC-900.
   2. Type and Grade: M (multicomponent) and P (pourable).
   3. Class: 25.
   4. Use Related to Exposure: T (traffic).
   5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.
   6. Applications: Exterior and interior traffic areas.

2.3 LATEX JOINT SEALANTS

A. Latex Sealant: Comply with ASTM C 834, Type P, Grade NF.
B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Bostik Findley; Chem-Calk 600.
2. Pecora Corporation; AC-20+.
3. Sonneborn, Division of ChemRex Inc.; Sonolac.
4. Tremco; Tremflex 834.

C. Application: Interior joints, except at wet areas, traffic joints, and locations where acoustical or fire-rated joint sealants are required.

2.4 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:

1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
   b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
3. Application: All interior locations indicated on drawing and at all location where penetrations occur in partitions or other construction containing sound attenuation insulation.

2.5 PREFORMED JOINT SEALANTS

A. Preformed Foam Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant that is manufactured from high-density urethane foam impregnated with a nondrying, water-repellent agent; is factory produced in precompressed sizes in roll or stick form to fit joint widths indicated; is coated on one side with a pressure-sensitive adhesive and covered with protective wrapping; develops a watertight and airtight seal when compressed to the degree specified by manufacturer.

B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. EMSEAL Joint Systems, Ltd.; Emseal 25V.
2. Illbruck Sealant Systems, Inc.; Wilseal 600.

C. Properties: Permanently elastic, mildew resistant, nonmigratory, nonstaining, and compatible with joint substrates and other joint sealants. Density: Manufacturer's standard.

D. Application: As indicated on Drawings.

2.6 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include, but are not necessarily limited to, the following:

    a. Concrete.
    b. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include, but are not necessarily limited to, the following:

    a. Metal.
    b. Glass.
    c. Vitreous china.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
   4. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
   5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C 1193. Use masking tape to protect surfaces adjacent to recessed tooled joints.

H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

   1. Extent of Testing: Test completed elastomeric sealant joints as follows:

      a. Perform 10 tests for the first 1000 feet of joint length for each type of elastomeric sealant and joint substrate.
      b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.

2. Test Method:

   a. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab in Appendix X1 in ASTM C 1193, as appropriate for type of joint-sealant application indicated.
   b. For joints with dissimilar substrates, verify adhesion to each substrate separately; do this by extending cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.

   a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
   b. Whether sealants filled joint cavities and are free of voids.
   c. Whether sealant dimensions and configurations comply with specified requirements.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Manufacturer's Field-Adhesion Testing: Perform other field-adhesion testing as required by manufacturer for warranty execution.
C. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 00

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

Standard hollow metal doors and frames.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include elevations, door edge details, frame profiles, metal thicknesses, preparations for hardware, and other details.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required.

E. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.

1.3 QUALITY ASSURANCE

A. Fire-Rated Door Assemblies: Assemblies complying with applicable local codes that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, according to UL 10B or UL 10C.

1. Temperature-Rise Limit: Where indicated, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.

B. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to UL 9. Label each individual glazed lite.

C. Smoke-Control Door Assemblies: Comply with UL 1784.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amweld Building Products, LLC.
2. Ceco Door Products; an Assa Abloy Group company.
3. Curries Company; an Assa Abloy Group company.

4. Kewanee Corporation (The).
5. Mesker Door Inc.
6. Steelcraft; an Ingersoll-Rand company.
7. Windsor Republic Doors.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, CS, Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, CS, Type B.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 (ZF120) metallic coating.

D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.

G. Mineral-Fiber Insulation: ASTM C 665, Type I.

H. Glazing: Division 08 Section "Glazing."

I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat.

2.3 STANDARD HOLLOW METAL DOORS

A. General: Comply with ANSI/SDI A250.8.

1. Design: Flush panel as indicated.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.

   a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
   b. Thermal-Rated (Insulated) Doors: R-value of not less than 12.3 deg F x h x sq. ft./Btu (2.166 K x sq. m/W).

3. Vertical Edges for Single-Acting Doors: Manufacturer's standard.
4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick, end closures or channels of same material as face sheets.
5. Tolerances: SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Width: 1-3/4 inches (44.5 mm), 1-3/8 inches (34.9 mm) or as indicated on Drawings.

2. Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).

C. Hardware Reinforcement: ANSI/SDI A250.6.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8.

B. Interior Frames: Fabricated from cold-rolled steel sheet.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded unless otherwise indicated.
3. Fabricate knocked-down, drywall slip-on frames for in-place gypsum board partitions.
4. Frames for Level 2 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
5. Frames for Wood Doors.

C. Hardware Reinforcement: ANSI/SDI A250.6.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
2. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (50-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.6 HOLLOW METAL PANELS

A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal work.

2.7 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (0.8 mm) thick, same material as door face sheet.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch (0.8 mm) thick, same material as frames.

D. Terminated Stops: Where indicated, terminate stops 6 inches (152 mm) above finish floor with a 45-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- (6.4-mm-thick by 25.4-mm-) wide steel.

C. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

2.9 FABRICATION

A. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

B. Hollow Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors. Seal joints in top edges of doors against water penetration.
2. Glazed Lites: Factory cut openings in doors.
3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated.

C. Hollow Metal Frames: Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:

a. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

1) Three anchors per jamb up to 60 inches (1524 mm) high.
2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
5) Two anchors per head for frames more than 42 inches (1066 mm) wide and mounted in metal-stud partitions.

b. Compression Type: Not less than two anchors in each jamb.

c. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.

7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers.

a. Single-Door Frames: Three door silencers.
b. Double-Door Frames: Two door silencers.

D. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 electrical Sections.

E. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.10 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: ANSI/SDI A250.10.

B. Factory-Applied Paint Finish: ANSI/SDI A250.3.

1. Color and Gloss: Match Architect's selection and approved sample.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hollow Metal Frames: Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

a. At fire-protection-rated openings, install frames according to NFPA 80.

b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
c. Install frames with removable glazing stops located on secure side of opening.
d. Install door silencers in frames before grouting.
e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
6. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

B. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to applicable building code requirements..

C. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (50 mm) o.c. from each corner.

3.2 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

C. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08 11 13

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SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Shop priming and factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Sections:

1. Division 08 Section "Door Hardware" for door hardware for flush wood doors.
2. Division 08 Section "Glazing" for glass view panels in flush wood doors.
3. Division 09 Sections "Painting" for field finishing doors.

1.3 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.

C. Samples for Initial Selection: Color charts consisting of actual materials in small sections for the faces of factory-finished doors. Show the full range of colors available for stained finishes.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edgings representing typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for factory-finished doors.
3. Frames for light openings, 6 inches long, for each material, type, and finish required.

E. Warranty: Sample of special warranty.

F. Meeting Records: Minutes of pre-installation conference.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors and wood paneling from single manufacturer.

B. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated".

C. Fire-Rated Wood Doors:

1. Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252.

2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

D. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.

b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering flush wood door products that may be incorporated into the Work include, but are not limited to, the following:

1. Algoma Hardwoods Inc.

2. Eggers Industries; Architectural Door Division.

3. Marshfield Door Systems

4. VT Industries

2.2 DOOR CONSTRUCTION, GENERAL

A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

B. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-2.
2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
3. Provide doors with glued-wood-stave cores instead of particleboard cores for doors indicated to receive exit devices.

C. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors (as indicated):

1. Grade: Premium, with Grade A faces.
2. Species: White Oak.
3. Cut: Rotary cut.
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Balance match.
6. Pair and Set Match: Provide for doors hung in same opening.
7. Exposed Vertical Edges: Same species as faces.
8. Core: Particleboard.
9. Construction: Five piles with hot press. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.

2.4 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

2.5 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

B. Finish doors at factory that are indicated to receive transparent finish. Field finish doors indicated to receive opaque finish.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: AWI System TR-4 Conversion Varnish.
3. Effect: Open-grain finish.
4. Sheen: Satin (30-50).

5. Coordination: Finish of transparent-finished wood doors, wood paneling, and wood cabinets (millwork) shall be coordinated to provide matching appearance.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.

2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware".

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

C. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 14 16

SECTION 08 41 13 – ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Requirements including but not limited to.

1. Aluminum trim, flashings, and similar items in conjunction with aluminum entrance and storefronts.
2. Accessories necessary for a complete installation.

1.3 PERFORMANCE REQUIREMENTS

A. Coordinate with Section 08 44 13 for performance requirements, fabrication and erection standards; in addition provide the following:

1. Design and fabricate aluminum window to withstand the operating loads which result from heavy traffic conditions using the specified hardware, without measurable permanent deflection. Limit elastic deflections so as to provide the normal degree of rigidity required to avoid glass breakage, air leaks and other objectionable results of excessive flexibility. Provide weatherstripping at stiles, sill and head rails of door leaves, to minimize air, water and sound leaks.

B. Provide aluminum entrance and storefront systems meeting or exceeding the following performance requirements:

1. Structural Properties:

a. Wind Loads: The aluminum entrance and storefront work, including glass, shall be designed, fabricated and installed to withstand the maximum inward and outward wind pressures as required by applicable local building code requirements and as indicated on Drawings.

1) Basic Wind Speed: Indicated on structural Drawings.
2) Exposure Category: Indicated on structural Drawings.
3) Importance Factor: Indicated on structural Drawings.

b. Seismic Loads: As required by applicable local building code requirements and indicated on structural Drawings.

c. Deflection Limitations:

a) Deflections: Base calculations for the following deflections upon the combination of maximum direct wind loads, building deflections, thermal stresses, and erection tolerances. The deflection of any framing member in a direction normal to the plane of the wall when subjected to the full code required wind loads specified above shall not exceed L/175 of its clear span.
b) Glass, sealants and interior finishes shall not be included to contribute to framing member strength, stiffness or lateral stability.

2) Do not permit any permanent deformation (set) in the metal framing work. Permanent deformation, fastener, weld, or gasket failure, component breakage or disengagement shall not occur under wind loading equal to 1.5 times the wind loads (positive or negative). Permanent deformation shall be taken as deflection without recovery exceeding 1/1000 times span.

d. Dead Loads:

1) Maximum full deadload deflections, parallel (in-plane) to wall plane, of framing members shall not reduce glass bite or glass coverage, to less than 75% of the design dimension, and shall not reduce edge clearance to less than 25% of design dimension or 1/8 inch (3 mm) whichever is greater.
2) Limit deflections of metal members spanning door openings to 1/300. The clearance between the member and an operable door shall be no less than 1/16 inch (1.5 mm).
3) Twisting (rotation) of the horizontals due to the weight of the glass shall not exceed 1 degree, measured between ends and center of each span.

e. Uniform Structural Loads: Satisfactory uniform wind loading tests of each aluminum entrance and storefront assembly (each swinging and sliding door) shall have been conducted in accordance with the requirements of ASTM E330.

1) Subject each assembly to inward and outward acting uniform loads equal to 1.5 times the inward and outward acting design wind loads specified above under paragraph 'wind loads'.
2) Satisfactory performance at these loads shall mean no glass or other component breakage, component disengagement, and no permanent deformation of main framing members in excess of the permanent deformation criteria specified above.

f. Operational (Traffic) Loads: Design and fabricate aluminum entrances to withstand the operating loads which result from heavy traffic conditions using the specified hardware, without measurable permanent deflection.

1) Limit elastic deflections so as to provide the normal degree of rigidity required to avoid glass breakage, air leaks and other objectionable results of excessive flexibility. Provide weatherstripping at stiles, sill and head rails of door leaves, to minimize air, water and sound leaks.

C. Air Leakage: Air leakage through each aluminum entrance and storefront assembly shall not have exceeded 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of fixed wall area when tested in accordance with ASTM E 283 at a static air pressure difference of 6.24 lbf/sq. ft. (300 Pa).

D. Water Penetration:

1. Water penetration in this specification is defined as the appearance of uncontrolled water, other than condensation, on any indoor face of any part of the wall.
2. Provision shall be made to drain to the exterior face of the wall any water entering the system.
3. No uncontrolled water penetration shall have occurred when each entrance and storefront assembly (each entrance and storefront wall) was tested in accordance with the ASTM E331 for one 15 minute cycle at a static pressure difference of 12 lbf/sq. ft. (600 Pa) minimum.

E. Thermal Movements: Fabricate the entrance and storefront work to accommodate for such expansion and contraction of component materials, and supporting elements, as will be caused by surface temperatures ranging from -5 degrees F to +180 degrees F (-20.5 degrees C to +82 degrees C), without causing buckling, glass breakage, failure of joint sealants, undue stress on metal members and fasteners,

failure of doors or other operating units to function properly, reduction of performance, and other detrimental effects.

1. Dimensions shown on Drawings are based on an assumed design temperature of +70 degrees F (+21 degrees C). Fabrication and erection procedures include for ambient temperature range at the time of the respective operations.

F. Building Frame Movement: Design, fabricate and install aluminum entrances and storefronts to withstand building movements including thermal movements, loading deflections, shrinkage, creep and similar movements. Thermal movements shall be as specified. Building frame deflections, shrinkage, creep and other movements are available from the structural engineer.

G. Condensation Resistance: Provide storefront systems with condensation resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.1.

H. Average Thermal Conductance: Provide storefront systems with average U-values of not more than 0.63 Btu/sq. ft. x h x deg F (3.57 W/sq. m x K) when tested according to AAMA 1503.1.

I. Glass Statistical Factor: Glass thicknesses when shown on the drawings, or specified, are for convenience of detailing only and are to be confirmed by the Contractor and/or glass manufacturer. Glass for the size openings shown will be provided in thickness so probability of breakage at the design Wind Load will not exceed 8 lites per 1000 lites (S.F. 2.5) based on a 60 second uniform wind load duration, and reflectance and shading indicated.

1. The glass manufacturer shall provide, on request, substantiating glass breakage data if such data is not otherwise available as manufacturer's published data.

J. Design Modifications:

1. Submit design modifications necessary to meet the performance requirements and field coordination.
2. Variations in details or materials shall not adversely affect the appearance, durability or strength of components.
3. Maintain the general design concept without altering size of members, profiles and alignment.

1.4 SUBMITTALS

A. Shop Drawings: Submit shop drawings showing scaled elevations, plans, and sections of the aluminum entrance and storefront work.

1. Prepare full scale sections and submit for details of the assemblies that cannot be shown in the elevations or sections. Include with shop drawings metal thickness of metal components, glass thickness, metal finishes, and pertinent information as necessary or requested by the Architect to indicate compliance.
2. Indicate details of field connections, anchorage, and relationship to work of others for coordination of work by other building trades.
3. Show details of fastening and sealing methods and product joinery to ensure proper performance of the field installation.
4. Do not fabricate work until shop drawings are approved by Architect for fabrication.
5. All shop drawings to be developed by Kawneer Company.

B. Samples: Submit samples of the following before any work is fabricated:

1. Submit 3 paired sets of samples for each exposed metal finish required. Where finishes involve color and texture variations, include sample sets showing the full range of variations expected. Furnish

samples in either 12 inch (300 mm) lengths of patch fittings, rails, or 12 inch (300 mm) squares of sheet.

C. Structural Calculations: Submit sealed copies of structural calculations indicating complete compliance with the specified performance requirements. Submit calculations prepared, signed, and sealed by a Professional Engineer registered in the state where the project is located.

D. Product Test Reports: Submit certified product test reports based on tests performed by an AAMA Accredited Laboratory clearly describing in written form, and in shop drawing form, compliance of each aluminum entrance and storefront assembly (each swinging and sliding door) with requirements indicated based on comprehensive testing.

E. Maintenance Instructions: Submit copies of manufacturer's written instructions for adjustment, operation and maintenance of doors.

F. Preconstruction Sealant Compatibility and Adhesion Testing: Submit test results.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Building Code: Applicable requirements of the local building authority for exterior cladding.
2. American Architectural Manufacturers Association (AAMA):

   a. AAMA *Aluminum Curtain Wall Design Guide Manual* Volumes 1-9.
   b. AAMA *Aluminum Store Front and Entrance Design Guide Manual*.
   c. AAMA 2603 *Voluntary Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum*.
   d. AAMA 2605 *Specification for Superior Performing Organic Coatings on Architectural Extrusions and Panels*.

3. American Institute of Steel Construction (AISC) *Steel Construction Manual*.
4. Steel Structures Painting Council (SSPC): *Steel Structures Painting Manual, Vol. 2, Systems and Specifications*.
5. Federal Standard 16 CFR 1201, Consumer Product Safety Commission (CPSC): *Safety Standard for Architectural Glazing Materials*, published in Code of Federal Regulations (CFR).

   a. Comply with applicable requirements of authorities having jurisdiction, wherever requirements conflict the more stringent shall be required. Obtain approvals from authorities.
   b. As a minimum provide safety glazing complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.

6. Welding Standards: Welding shall be performed by skilled and qualified mechanics. Welding shall be performed in accordance with the applicable provisions of AWS D1.1 *Structural Welding Code - Steel* and AWS D1.2 *Structural Welding Code--Aluminum*.

B. B. Manufacturer Qualifications: All framing components, drawings and specifications are based on Kawneer Systems and Kawneer Narrow, Medium and Wide Style doors**.**

C. Installer Qualifications: Refer to Section 084413.

D. Sole Source Responsibility: Manufacturer/fabricator of aluminum curtainwall and aluminum storefront and entrances [and aluminum (interior) partition framing and door system] shall be the same.

E. Testing laboratories shall be specifically qualified to conduct laboratory and field performance tests required by these specifications and acceptable to the Architect.

F. Preconstruction Sealant Compatibility and Adhesion Testing: Test results confirming compatibility and adhesion are mandatory for all concealed and exposed sealant materials in contact with exterior glazing, stone, precast, masonry, wood, metals, other sealants, flashings, metal framing, and shims prior to full size sample installation construction. Refer to Section 07 92 00.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements. Prior to the start of the aluminum entrance and storefront work, and at the Contractor's direction, meet at site and review the installation procedures and coordination with work.

H. Meeting shall include Contractor, Owner, aluminum entrance and storefront installer, sealant installer, as well as any other subcontractors or material technical service representatives whose work, or products, must be coordinated with the aluminum entrance and storefront work.

1.6 IDENTIFICATION, DELIVERY, STORAGE, AND HANDLING

A. Comply with the applicable provisions of AAMA *Curtain Wall Manual #10* for the care and handling of aluminum entrance and storefront work from shop to site.

B. Identify components of aluminum entrance and storefront work after fabrication by marks clearly indicating their location in the building. Package components to protect the components from damage during shipping and handling.

C. Storage on Site:

1. Store aluminum entrance and storefront components in a location and in a manner to avoid damage to the components. Stacking shall be done in a way which will prevent bending, excessive pressure, abrasion or permanent damage of the component and its finished surfaces.
   Store aluminum entrance and storefront components and materials in a clean, dry location, away from uncured concrete, masonry work, sprayed on fireproofing work, and other construction activities. Cover with non-staining waterproof paper, tarpaulin, or polyethylene sheeting to permit circulation of air inside the covering.

D. Keep handling on site to a minimum. Exercise particular care to avoid damage to finishes of metals.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of supporting structure by field measurements before fabrication so that the entrance and storefront work will be accurately designed, fabricated, and fitted to the structure. Indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work. Use Contractor’s lines and benchmarks as a basis for measurements.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating entrance and storefront work without field measurements. Coordinate supporting structure construction to ensure actual dimensions correspond to established dimensions.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including, but not limited to, excessive deflection.
   b. Noise or vibration caused by thermal movements.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   d. Adhesive or cohesive sealant failures.
   e. Water leakage through fixed glazing and framing areas.
   f. Failure of operating components.
2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Recycled Content of Steel and Aluminum Products: To the extent practical, provide products with an average recycled content of steel and aluminum products so postconsumer recycled content plus one/half of preconsumer recycled content is not less than 25 percent.

B. MATERIALS:
1. Manufacturer:
   a. Kawneer 250 Series Standard Entrance Style Doors – Basis of Design Product
      Kawneer Trifab 451T – Basis of Design Product
   b. YKK
   c. Tubelite
   d. Vistawall

2. Installer: To be approved by Entrance Manufacturer and General Contractor.

C. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

D. Carbon Steel: For carbon steel components required to join, reinforce or support the assembly of aluminum components provide carbon steel conforming to ASTM A 36/A 36M for structural shapes, plates, and bars; ASTM A 1008/A 1008M for cold rolled sheet and strip; or ASTM A 1011/A 1011M for hot-rolled sheet and strip.

E. Glass and Glazing Materials: Section 08 80 00.

F. Anchors and Fasteners:

1. Material: Stainless steel.
2. Anchor and Fastener Metal Alloy Types, Designations and Standards: Alloys as selected by fabricator to prevent corrosion resistance with the components fastened. Do not use self drilling, self tapping type fasteners.
3. Do not use exposed anchors and fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.
4. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
5. Recycled Content: Fabricated from remelted steel.

G. Concealed Flashing: Dead-soft, 0.018-inch- (0.457-mm-) thick stainless steel, complying with ASTM A 666, Type 304.

H. Weather Stripping: Manufacturer's standard replaceable weather stripping as follows:

1. Compression Weather Stripping: Molded neoprene complying with ASTM D 2000 requirements or molded PVC complying with ASTM D 2287 requirements.
2. Sliding Weather Stripping: Wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing complying with AAMA 701 requirements.

2.2 GLAZING SYSTEMS

A. Glazing: Refer to Section 088000.

B. Glazing Gaskets: Compression types, replaceable, molded or extruded, that maintain uniform pressure and watertight seal.

C. Spacers and Setting Blocks: Elastomeric types.

D. Bond Breaker Tape: TFE fluorocarbon or polyethylene material to which sealants will not develop adhesion.

E. Glazing Sealants: For structural-sealant-glazed systems, recommended by manufacturer for joint type and as follows:

1. Structural Sealant: ASTM C 1184, neutral curing silicone formulation compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant, and approved by structural sealant manufacturer for use in aluminum-framed systems indicated.

   a. Color: Selected by Architect.

2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; neutral curing silicone formulation compatible with structural sealant and system components with which it comes in contact; and recommended by structural and weatherseal sealant and aluminum framed system manufacturers for this use.

   a. Color: Matching structural sealant.

3. Toxicity/IEQ: Low VOC products.

2.3 SEALING MATERIALS

A. Concealed Sealing Materials: Provide silicone sealant for concealed applications within entrances and storefronts, compatible with and adherent to each material it will be in contact with, recommended by the manufacturer to fulfill performance requirements.

B. Exposed Sealing Materials: Equal to DOW Corning 791, one-component, medium modulus, neutral curing silicone sealant.

2.4 FABRICATION

A. Fabricate entrances and storefronts to the designs, shapes, and sizes shown using materials specified and shown to produce assemblies which meet or exceed the performance requirements. To the greatest

extent possible complete fabrication, assembly, finishing, hardware applications and work before shipment to site.

1. Metal Wall Thickness: Provide shapes as shown and as required to suit the performance requirements but with wall thickness of not less than 1/8 inch (3 mm).

B. Joints in Metal Work: All exposed work shall be carefully fitted and matched to produce continuity of line and design, with all joints, being accurately fitted for hairline contact and rigidly secured. Where additional rigidity or strength is required to satisfy the performance requirements reinforce entrance components with aluminum or carbon steel shapes, bars, and plates.

C. Shop Assembly: As far as practicable, all fitting and assembly work shall be done in a fabrication shop.

1. For exterior entrances, provide weepholes and internal water passages in the glazing framing recesses as recommended by the respective glass and framing manufacturers to conduct infiltrating water to the exterior. Provide weep baffles secured to inside of frame behind weepholes.

D. Exposed Fasteners: Not permitted.

E. Protection of Metals: Wherever dissimilar metals are in contact, except in the case of aluminum in contact with galvanized steel, zinc, or separate such surfaces with a coating of zinc rich primer, bituminous paint, or separation gaskets as the condition requires. Wherever aluminum comes in contact with concrete surfaces separate such surfaces with a coating of zinc rich primer, bituminous paint, or separation gaskets as the condition requires.

2.5 FINISHES

A. Comply with NAAMM *Metal Finishes Manual for Architectural and Metal Products* for recommendations relative to applying and designating finishes.

B. Appearance of Finished Work: During production, maintain large size color range samples for use in comparing against production material. Variations in appearance of abutting or adjacent pieces are acceptable if they are within the range of approved samples. Noticeable variations in the same piece are not acceptable.

C. Exposed Aluminum frame finish shall be Black Anodized – Kawneer #29 anodized aluminum (Aluminum Association Specification AA-M10C21A44) with a 5 year finish warranty.

D. Concealed Metal Surface Coating: Apply protective coatings to surfaces of metals concealed in the construction:

1. Coating for Carbon Steel: Hot dip galvanized, complying with ASTM A123.
2. Coating for Aluminum, Carbon Steel, and Bronze: Where aluminum or carbon steel surfaces are to be in contact with each other or in contact with dissimilar materials such as masonry or concrete, and where hot dip galvanizing of carbon steel is incompatible with component parts because of galvanic action or component fabrication tolerances provide one of the following:

   a. Bituminous Paint: Cold-applied, non-sagging, asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos. Apply in two coats for an overall minimum dry film thickness of 25 mils.
   b. Zinc Rich Primer: Organic zinc-rich primer, complying with SSPC-Paint 20.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate entrance and storefront materials with the project schedule and provide items to be placed during the installation of work at the proper time to avoid delays.

B. Templates and Diagrams: Furnish templates, diagrams, and other data to fabricators and installers of related work, as necessary for coordinating entrance and storefront installation.

C. Place such items, including concealed overhead framing, accurately in relation to the final location of entrance and storefront components.

3.2 EXAMINATION

A. Examine substrates, adjoining construction, and conditions under which the work is to be installed. Proceed with installation after unsatisfactory conditions have been corrected.

1. Before beginning installation of the entrance and storefront work examine building structural frame and building cladding indicated to support the entrance and storefront work.
2. Notify Contractor in writing, of any dimensions, or conditions, found which prevent proper execution of the entrance and storefront work, including specified tolerances. Use Contractor's offset lines and bench marks as basis of measurements.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for protecting, handling, and installing entrance and storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight. Clean excess joint sealants from finished surfaces.

1. Cut and trim component parts of the entrance and storefront work during erection only with the approval of the manufacturer or fabricator, and in accordance with his recommendations. Restore finish completely to protect material and remove all evidence of cutting and trimming. Remove and replace members where cutting and trimming has impaired strength or appearance, as directed by Architect.
2. Set components within the erection tolerances with uniform joints. Place components on shims and fasten to supporting substrates using bolts and similar fasteners. Use stainless steel shims at structural connections only. U shaped shims at structural connections are not permitted. Use aluminum, stainless steel or high impact polystyrene shims at other connections.
3. Do not erect components which are warped, deformed, bowed, dented, defaced, or damaged as to impair its strength or appearance. Remove and replace members damaged in the process of erection.
4. Coat concealed surfaces of dissimilar materials, and any ferrous metal components, with a heavy coating of bituminous paint, zinc rich primer or other separation in accordance with manufacturer's recommendations. Where aluminum components will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
5. No holes or slots shall be burned, cut into, or field drilled in any building framing member without the written acceptance of the structural engineer.

B. Entrance and Storefront Framing: Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.

C. Install glazing to comply with requirements of Section 08 80 00 unless otherwise indicated.

D. Install perimeter sealant to comply with requirements of Section 07 92 00, unless otherwise indicated.

E. Concealed Sealing Components: Apply sealant and gasket components which are integral to the entrance and storefront systems in strict accordance with the each component manufacturers printed instructions.

1. Before applying components remove all mortar, dust, dirt, moisture, and foreign matter which will be deleterious to the intended performance of the component. Mask adjoining exposed surfaces to avoid spilling, dripping, dropping or other unintended contact of the sealing components onto adjacent exposed surfaces.

F. Anchorage: For entrance and storefront work to the structure and surrounding cladding, install in accordance with the accepted shop drawings.

G. Welding: Weld with electrodes and by methods recommended by manufacturer of material being welded, and in accordance with AWS D1.1 for concealed steel members.

1. Welds and adjacent metal areas shall be thoroughly cleaned and coated with a single coat of bituminous paint.

3.4 ERECTION TOLERANCES

A. The entrance and storefront systems shall be fabricated and erected to accommodate the dimensional tolerances of the structural frame and surrounding cladding while providing the following as installed tolerances.

1. Variation from theoretical calculated position as located in plan or elevation in relation to established floors lines, column lines and fixed elements of the structure, including variations from plumb, level, straight and member size: +/- 1/4 inch max in any 20’0” (+/- 6 mm in any 6 m) run, column to column bay, or floor to floor height.
2. Alignment: Where surfaces abut in line, and where they meet at corners, limit offset from true alignment to 1/32 inch (.75 mm).
3. Variation from angle, or plumb, shown: +/- 1/8 inch max in any 10’0” (+/- 3 mm in any 3 m) run or story height, non-cumulative.
4. Variation from slope, or level, shown: +/- 1/8 inch max in any 20’0” (+/- 3 mm in any 6 m) run or column-to-column bay, non-cumulative.

3.5 REMOVAL OF DEBRIS

A. Debris caused by, or incidental to, the erection of the entrance and storefront work shall be removed from the site and legally disposed or recycled.

3.6 CLEANING

A. Clean metal surfaces promptly after installation, exercising care to avoid damage to factory finished exposed surfaces.

B. Wash glass on both faces not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer. Remove excess glazing and sealant compounds, dirt, and other substances.

C. Immediately remove any deleterious material from surfaces of aluminum.

3.7 PROTECTION

A. Institute protective measures required throughout the remainder of the construction period to ensure that entrance and storefront work will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION 08 41 13

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SECTION 08 71 00 - DOOR HARDWARE

a. GENERAL

a SUMMARY

a This Section includes the following:
- a Commercial door hardware.
- b Cylinders for doors specified in other Sections.
- c Hardware for aluminum doors.

b See Division 08 door sections for astragals and door silencers.

b SUBMITTALS

a Product Data: For each type of product indicated.

b Shop Drawings: Details of electrified door hardware, including wiring diagrams.

c Samples: For each exposed finish.

d Product certificates or test reports.

e Other Action Submittals:
- a Door Hardware Sets: Prepared by or under the supervision of Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as procedures and diagrams.
  - a Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
  - b Content: Include the following information:
    - a Identification number, location, hand, fire rating, and material of each door and frame.
    - b Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device.
    - c Complete designations of every item required for each door or opening including name and manufacturer.
- b Keying Schedule: Prepared by or under the supervision of Architectural Hardware Consultant, detailing Owner's final keying instructions for locks.

c QUALITY ASSURANCE

a Installer Qualifications: An employer of workers trained and approved by lock manufacturer.
- a Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying. Security software must be compatible with existing software.

b Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

c Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252
  a Test Pressure: Positive Pressure UL10C

d Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system.

e Pre-installation Conference: Conduct conference at Project site.

d DELIVERY, STORAGE, AND HANDLING

a Deliver keys to Owner by registered mail or overnight package service.
  a Blankenship & Partners, LLC
    Address: 1112 E Weisgarber Road, 2nd Floor, Knoxville, TN 37909

e COORDINATION

a Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

f WARRANTY

a Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
  a Warranty Period: One years from date of Substantial Completion, except as follows:
    a Exit Devices: Two years from date of Substantial Completion.
    b Manual Closers: 10 years from date of Substantial Completion.

b. PRODUCTS

a SCHEDULED DOOR HARDWARE

a General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in Part 3 "Door Hardware Sets" Article
  a Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.

b Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by using door hardware designations, as follows:
  a Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Sets" Article.

b HINGES, GENERAL

a Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

b Hinge Base Metal: Unless otherwise indicated, provide the following:
- a Exterior Hinges: Brass Base
- b Interior Hinges: Steel
- c Hinges for Fire-Rated Assemblies: Steel

c Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for out-swinging exterior doors, access-controlled doors, and where else specified for increased security.

d Fasteners: Comply with the following:
- a Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
- b Wood Screws: For wood doors and frames.
- c Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
- d Screws: Phillips flat-head; Finish screw heads to match surface of hinges.

c HINGES

a Butts and Hinges: BHMA A156.1.

b Template Hinge Dimensions: BHMA A156.7.

c Manufacturers:
- a Hager Companies (HAG).
- b McKinney Products Company; an ASSA ABLOY Group company (MCK).
- c Best Access Systems; A Dormakaba Group company (BES).
- d Ives Hardware; an Allegion company (IVE).

d CONTINUOUS HINGES

a Standard: Geared Aluminum Hinge

b General: Minimum 0.120-inch- (3.0-mm-) thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.

c Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves; joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.
- a Manufacturers:
  - a ABH Manufacturing. (ABH)
  - b Hager Companies (HAG).
  - c Pemko Manufacturing Co. (PEM).
  - d Select Products Limited (SPL).

e LOCKS AND LATCHES, GENERAL

a Accessibility Requirements: Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22 N).

b Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf (67 N) to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

c Lock Trim:
- a Levers: “15”
- b Rose/Escutcheon: “D”

d Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors.

e Backset: 2-3/4 inches (70 mm), unless otherwise indicated.

f Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set.

f MECHANICAL LOCKS AND LATCHES

a Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with the following:
- a Bored Locks: BHMA A156.2.

b Bored Locks: BHMA A156.2 Grade 1, Series 4000.
- a Manufacturers:
  - a Best Access Systems; a Dormakaba Group company (BES). 9K Series.
  - b No Substitutions.

g EXIT DEVICES

a Exit Devices: BHMA A156.3 Grade 1

b Accessibility Requirements: Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22 N).

c Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than 15 lbf (67 N) to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

d Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

e Fire Exit Devices: Devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.

f Removable Mullions: BHMA A156.3.

g Fire-Exit Removable Mullions: Provide removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions shall be used only with exit devices for which they have been tested.

h Outside Trim: Lever, material and finish to match locksets, unless otherwise indicated.
- a Match design for locksets and latchsets, unless otherwise indicated.

i Manufacturers:
- a Best Access Systems; a Dormakaba Group company (BES). Precision 2000 Series.
- b No Substitutions.

h LOCK CYLINDERS

a Standard Lock Cylinders: BHMA A156.5 Grade 1

b Cylinders: to be small format interchangeable core (SFIC) cylinders capable of accepting 7 pin cylinder cores.

c Construction Keying: Comply with the following:
- a Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
- b Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
  - a Furnish permanent cores to Owner for installation.

d Manufacturer: Cylinder cores to be provided as specified by Owner, in their keyway, as required.

e Manufacturers:
- a Schlage Commercial Lock Division; an Allegion Company (SCH).
- b Sargent Commercial Locks and Hardware; an ASSA ABLOY Group company (SAR).
- c Best Access Systems; a Dormakaba Group Company. (BES)

i KEYING

a Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference into master key system.

b Keys: Nickel silver
- a Quantity: In addition to one extra key blank for each lock, provide three cylinder change keys and five master keys.

j CLOSERS

a Accessibility Requirements: Comply with the following maximum opening-force requirements:
- a Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
- b Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
- c Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

b Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf (133 N) to set door in motion and not more than 15 lbf (67 N) to open door to minimum required width.

c Hold-Open Closers/Detectors: Coordinate and interface integral smoke detector and closer device with fire alarm system.

d Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

e Surface Closers: BHMA A156.4 Grade 1, Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated. Closer Body must be cast-iron
- a Manufacturers:
  - a Best Access Systems; a Dormakaba Group company (BES). EHD9000 Series.
  - b LCN Closers; an Allegion Company (LCN). 4040XP Series
  - c Sargent Commercial Locks and Hardware; an ASSA ABLOY Group company (SAR). 281 Series.

k PROTECTIVE TRIM UNITS

a Size: 1-1/2 inches (38 mm) less than door width on push side and 1/2 inch (13 mm) less than door width on pull side, by height specified in door hardware sets, unless otherwise noted.

b Metal Protective Trim Units: BHMA A156.6; beveled top and 2 sides;
- a Material: 0.050-inch- (1.3-mm-) thick Stainless Steel
- b Manufacturers:
  - a ABH Manufacturing (ABH).
  - b Hager Companies (HAG).
  - c IVES Hardware; an Allegion Company (IVE).
  - d Rockwood Manufacturing Company (ROC).

l PUSH PLATES, PULLS AND PULL PLATES

a Pulls: Material to be ¾” stainless steel. Pulls to be 6” Center to Center. Provide spanner type thru-bolt back-to-back fasteners at common ends and button tip spanner thru-bolts at free ends.
- a Material: 0.050-inch- (1.3-mm-) thick Stainless Steel
- b Manufacturers:
- c
  - a Hager Companies (HAG).
  - b ABH Manufacturing (ABH).
  - c IVES Hardware; an Allegion Company (IVE).
  - d Rockwood Manufacturing Company (ROC).

m DOOR BOLTS/DUST PROOF STRIKES/COORDINATORS

A. Furnish 12” manual top and bottom flush bolts for non-rated doors. Furnish automatic flush bolts for fire-rated doors.

B. Furnish a dust proof strike for the bottom flush bolt where specified in the hardware sets.

C. Furnish a door coordinator with automatic flush bolts. Size the coordinator according to the width of the opening. Use filler plates where needed. Furnish special mounting brackets for stop mounted hardware.
- a Manufacturers:

a Hager Companies (HAG).
b ABH Manufacturing (ABH).
c IVES Hardware; an Allegion Company (IVE).
d Rockwood Manufacturing Company (ROC).

n STOPS AND HOLDERS

a Stops and Bumpers: BHMA A156.16 Grade 1
a Provide floor stops for doors unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.

b Manufacturers:
a ABH Manufacturing (ABH).
b Glynn Johnson; an Allegion Company (GLY).
c Hager Companies (HAG).
d IVES Hardware; an Allegion Company (IVE).
e Rockwood Manufacturing Company (ROC).

o DOOR GASKETING

a Standard: BHMA A156.22.

b General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
a Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
b Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
c Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

c Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.
a Provide smoke-labeled gasketing on 20-minute-rated doors and on smoke-labeled doors.

d Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.

e Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

f Gasketing Materials: ASTM D 2000 and AAMA 701/702.

g Manufacturers:
a National Guard Products (NGP).
b Pemko Manufacturing Co. (PEM).
c Reese Enterprises, Inc. (RSE).
d Zero International; an Allegion Company (ZER).

p THRESHOLDS

a Standard: BHMA A156.21.

b Accessibility Requirements: Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high

c Thresholds for Means of Egress Doors: Comply with NFPA 101. Maximum 1/2 inch (13 mm) high.

d Manufacturers:
- a National Guard Products (NGP).
- b Pemko Manufacturing Co. (PEM).
- c Reese Enterprises, Inc. (RSE).
- d Zero International; an Allegion Company (ZER).

q MAGNETIC HOLDERS

a Manufacturers:
- a ABH Manufacturing (ABH).
- b LCN; an Allegion Company (LCN).
- c Norton Rixson; An Assa Abloy Company (RIX).

b Requirements:
- a Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of holding force. Coordinate projection of holder and armature with other hardware and wall conditions to ensure that the door sits parallel to the wall when fully open.

c FABRICATION

d Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

e Fasteners: Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
- a Comply with NFPA 80 for fasteners of door hardware in fire-rated applications.

f Finishes: BHMA A156.18, as indicated in door hardware sets.

C. EXECUTION

a INSTALLATION

a Steel Doors and Frames: Comply with DHI A115 Series. Drill and tap doors and frames for surface-applied door hardware according to ANSI A250.6.

b Wood Doors: Comply with DHI A115-W Series.

c Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.

a Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

b Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."

c Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

d Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

e Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

f Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

g Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

a Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.

b Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.

b FIELD QUALITY CONTROL

a Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

c DOOR HARDWARE SETS

Set#: 1
Door(s): CDS-1
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
1	Continuous Hinge	A110HD	ABH	CLR
1	Panic Exit Hardware	2101	BES	630
1	Door Closer	EHD9016-SDS90	BES	689
1	Blade Stop Spacer	as Required	BES	689
1	Support Bracket	as Required	BES	689
1	Drop Plate	as Required	BES	689
1	Door Sweep	200NA	NGP	- - -
1	Threshold	655	NGP	MILL

Note: Weatherstripping by aluminum door manufacturer.

Set#: 1.1
Door(s): 141B, 142B
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
1	Continuous Hinge	A110HD	ABH	CLR
1	Panic Exit Hardware	2101	BES	630
1	Door Closer	EHD9016-SPA90	BES	689
1	Blade Stop Spacer	as Required	BES	689
1	Drop Plate	as Required	BES	689
1	Wall Stop	236W	HAG	630
1	Door Sweep	200NA	NGP	- - -
1	Threshold	425	NGP	MILL

Note: Weatherstripping by aluminum door manufacturer.

Set#: 2
Door(s): 100A
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
1	Continuous Hinge	A110HD EPT	ABH	CLR
1	Power Transfer	PT1000	ABH	628
1	Panic Exit Hardware	MLRTS2103 x 1703A	BES	630
1	Rim Cylinder	as Required	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-SDS90	BES	689
1	Blade Stop Spacer	as Required	BES	689
1	Support Bracket	as Required	BES	689
1	Drop Plate	as Required	BES	689
1	Door Sweep	200NA	NGP	- - -
1	Threshold	655	NGP	MILL
1	Power Supply	PS902 x 900-2RS	VON	- - -
1	Door Position Switch	679-05HM	SCH	- - -
1	Push Button	660PB	SCH	- - -

Note: Weatherstripping by aluminum door manufacturer. 120VAC to power supply by electrical contractor. All low voltage, wiring, card reader, and logic by access control contractor. Providing valid credentials will momentarily unlock door providing authorized entry. Upon power failure the opening will become fail-secure with key override. Free egress is always achieved via the panic exit hardware on the push/interior side of the door. A push button located in Reception 104 will allow for remote release of the door allowing entry.

Set#: 2.1
Door(s): 141A, 142A
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
1	Continuous Hinge	A110HD EPT	ABH	CLR
1	Power Transfer	PT1000	ABH	628
1	Panic Exit Hardware	MLRTS2103 x 1703A	BES	630
1	Rim Cylinder	as Required	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-SPA90	BES	689
1	Blade Stop Spacer	as Required	BES	689
1	Drop Plate	as Required	BES	689
1	Wall Stop	236W	HAG	630
1	Door Sweep	200NA	NGP	- - -
1	Threshold	425	NGP	MILL
1	Power Supply	PS902 x 900-2RS	VON	- - -
1	Door Position Switch	679-05HM	SCH	- - -

Note: Weatherstripping by aluminum door manufacturer. 120VAC to power supply by electrical contractor. All low voltage, wiring, card reader, and logic by access control contractor. Providing valid credentials will momentarily unlock door providing authorized entry. Upon power failure the opening will become fail-secure with key override. Free egress is always achieved via the panic exit hardware on the push/interior side of the door.

Set#: 3
Door(s): 100B, 100C, 100D
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
1	Continuous Hinge	A110HD	ABH	CLR
1	Panic Exit Hardware	2102CD x 1702A	BES	630
1	Mortise Cylinder	as Required	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-SDS90	BES	689
1	Blade Stop Spacer	as Required	BES	689
1	Support Bracket	as Required	BES	689
1	Drop Plate	as Required	BES	689
1	Door Sweep	200NA	NGP	- - -
1	Threshold	655	NGP	MILL

Note: Weatherstripping by aluminum door manufacturer.

Set#: 4
Door(s): 102A
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
1	Continuous Hinge	A110HD EPT	ABH	CLR
1	Power Transfer	PT1000	ABH	628
1	Storeroom Lever	9KW3-DEU-15D-RQE	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-SDS90	BES	689
1	Blade Stop Spacer	as Required	BES	689
1	Drop Plate	as Required	BES	689
1	Support Bracket	as Required	BES	689
1	Door Sweep	200NA	NGP	- - -
1	Threshold	655	NGP	MILL
1	Power Supply	PS902	VON	- - -
1	Door Position Switch	679-05HM	SCH	- - -
1	Latch Guard	341C	HAG	630

Note: Weatherstripping by aluminum door manufacturer. 120VAC to power supply by electrical contractor. All low voltage, wiring, card reader, and logic by access control contractor. Providing valid credentials will momentarily unlock door providing authorized entry. Upon power failure the opening will become fail-secure with key override. Free egress is always achieved via the lever trim on the push/interior side of the door.

Set#: 5
Door(s): 125, 126, 149A, 151, 167B, 170
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
1	Continuous Hinge	A110HD	ABH	CLR
1	Continuous Hinge	A110HD EPT	ABH	CLR
1	Power Transfer	PT1000	ABH	628
1	Key Rem. Mullion	KR822	BES	689
1	Panic Exit Hardware	MLRTS2103 x 1703A	BES	630
1	Panic Exit Hardware	2101	BES	630
2	Rim Cylinder	as Required	BES	626
2	Permanent Core	as Required	- - -	626
2	Door Closer	EHD9016-SDS90	BES	689
2	Blade Stop Spacer	as Required	BES	689
2	Drop Plate	as Required	BES	689
2	Support Bracket	as Required	BES	689
2	Door Sweep	200NA	NGP	- - -
1	Threshold	425	NGP	MILL
1	Mullion Seal	5100N	NGP	- - -
1	Power Supply	PS902 x 900-2RS	VON	- - -
2	Door Position Switch	679-05HM	SCH	- - -

Note: Weatherstripping by aluminum door manufacturer. 120VAC to power supply by electrical contractor. All low voltage, wiring, card reader, and logic by access control contractor. Providing valid credentials will momentarily unlock door providing authorized entry. Upon power failure the opening will become fail-secure with key override. Free egress is always achieved via the panic exit hardware on the push/interior side of the door.

Set#: 6
Door(s): 126A
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
2	Continuous Hinge	A110HD	ABH	CLR
1	Mullion	822	BES	689
2	Exit Device	2101	BES	630
2	Door Closer	EHD9016-SDS90	BES	689
2	Blade Stop Spacer	as Required	BES	689
2	Drop Plate	as Required	BES	689
2	Support Bracket	as Required	BES	689
2	Door Sweep	200NA	NGP	- - -
1	Threshold	425	NGP	MILL
1	Mullion Seal	5100N	NGP	- - -

Note: Weatherstripping by aluminum door manufacturer.

Set#: 7
Door(s): 101A, 101B, 101C
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
1	Continuous Hinge	A110HD	ABH	CLR
1	Panic Exit Hardware	2101	BES	630
1	Door Closer	EHD9016-SDS90	BES	689
1	Blade Stop Spacer	as Required	BES	689
1	Drop Plate	as Required	BES	689
1	Support Bracket	as Required	BES	689

Set#: 8
Door(s): 101D
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
1	Continuous Hinge	A110HD EPT	ABH	CLR
1	Power Transfer	PT1000	ABH	628
1	Panic Exit Hardware	MLRTS2103 x 4903A	BES	630
1	Rim Cylinder	as Required	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-SDS90	BES	689
1	Blade Stop Spacer	as Required	BES	689
1	Drop Plate	as Required	BES	689
1	Support Bracket	as Required	BES	689
1	Power Supply	PS902 x 900-2RS	VON	- - -
1	Door Position Switch	679-05HM	SCH	- - -
1	Push Button	660PB	SCH	- - -

Note: 120VAC to power supply by electrical contractor. All low voltage, wiring, card reader, and logic by access control contractor. Providing valid credentials will momentarily unlock door providing authorized entry. Upon power failure the opening will become fail-secure with key override. Free egress is always achieved via the panic exit hardware on the push/interior side of the door. A push button located in Reception 104 will allow for remote release of the door allowing entry.

Set#: 9
Door(s): 127, 127A
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
2	Continuous Hinge	A110HD	ABH	CLR
2	Panic Exit Hardware	2814LBR x 4914A	BES	630
1	Door Closer	EHD9016-SPA90	BES	689
1	Door Closer	EHD9016-SDS90	BES	689
2	Blade Stop Spacer	as Required	BES	689
2	Drop Plate	as Required	BES	689
1	Support Bracket	as Required	BES	689
1	Wall Stop	236W	HAG	630

Set#: 10
Door(s): 166A, 166B, 166C, 166D
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
1	Continuous Hinge	A110HD	ABH	CLR
1	Panic Exit Hardware	2114 x 4914A	BES	630
1	Door Closer	EHD9016-SDS90	BES	689
1	Blade Stop Spacer	as Required	BES	689
1	Drop Plate	as Required	BES	689
1	Support Bracket	as Required	BES	689

Set#: 11
Door(s): 134A
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1191-5.0x4.5	HAG	626
1	Storeroom Lever	9K3-7-D-15D	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-AF90P	BES	689
1	Armor Plate	190S-30”x2” LDW	HAG	630
1	Wall Stop	236W	HAG	630
1	Weatherstrip	127NA	NGP	- - -
1	Door Sweep	200NA	NGP	- - -
1	Drip Cap	16A	NGP	- - -
1	Threshold	425	NGP	MILL

Set#: 11.1
Door(s): 138
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1191-4.5x4.5 NRP	HAG	626
1	Storeroom Lever	9K3-7-D-15D	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-SDS90	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
1	Weatherstrip	127NA	NGP	- - -
1	Door Sweep	200NA	NGP	- - -
1	Drip Cap	16A	NGP	- - -
1	Threshold	425	NGP	MILL

Set#: 12
Door(s): 139
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1191-5.0x4.5 NRP	HAG	626
1	Panic Exit Hardware	2103 x 1703A	BES	630
1	Rim Cylinder	as Required	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-SDS90	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
1	Weatherstrip	127NA	NGP	- - -
1	Door Sweep	200NA	NGP	- - -
1	Drip Cap	16A	NGP	- - -
1	Threshold	425	NGP	MILL

Set#: 13
Door(s): 182A
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
6	Butt Hinge	BB1199-4.5x4.5 NRP	HAG	626
1	Key Rem. Mullion	KR822	BES	689
2	Panic Exit Hardware	2101	BES	630
1	Rim Cylinder	as Required	BES	626
1	Permanent Core	as Required	BES	626
1	Door Closer	EHD9016-SPA90 (LHR)	BES	689
1	Door Closer	EHD9016-SDS90 (RHR)	BES	689
2	Kick Plate	190S-8”x2” LDW	HAG	630
1	Wall Stop	236W	HAG	630
1	Weatherstrip	127NA	NGP	- - -
2	Door Sweep	200NA	NGP	- - -
1	Drip Cap	16A	NGP	- - -
1	Threshold	425	NGP	MILL
1	Mullion Seal	5100N	NGP	- - -

Set#: 14
Door(s): CA, CB, CC-2, CD, CDS-2, 156A, 180B
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1279-4.5x4.5 NRP	HAG	652
1	Classroom Lever	9K3-7-R-15D	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-SPA90	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
1	Wall Stop	236W	HAG	630
3	Silencer	608-RKW	ROC	- - -

Note: @ “CA” doors, where door may hit cabinets/wall mounted items before wallstop, change closer arm to SDS90.

Set#: 14.1
Door(s): 132, 156B, 181
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1279-4.5x4.5	HAG	652
1	Classroom Lever	9K3-7-R-15D	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-AF90P	BES	689
1	Wall Stop	236W	HAG	630
3	Silencer	608-RKW	ROC	- - -

Set#: 14.2
Door(s): 134B
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1279-5.0x4.5	HAG	652
1	Classroom Lever	9K3-7-R-15D	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-AF90P	BES	689
1	Wall Stop	236W	HAG	630
3	Silencer	608-RKW	ROC	- - -

Set#: 14.3
Door(s): 155, 163, 165A, 174A
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1279-4.5x4.5	HAG	652
1	Classroom Lever	9K3-7-R-15D	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-AF90P	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
1	Wall Stop	236W	HAG	630
3	Silencer	608-RKW	ROC	- - -

Set#: 14.4
Door(s): 180
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1261-4.5	HAG	652
1	Classroom Lever	9K3-7-R-15D	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-AF90P	BES	689
1	Wall Stop	236W	HAG	630
3	Silencer	608-RKW	ROC	- - -

Set#: 15
Door(s): CB-RR
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1261-4.5	HAG	652
1	Privacy Lever	9K3-0-L-15D	BES	626
1	Door Closer	EHD9016-SIS90	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
1	Mop Plate	190S-4”x1” LDW	HAG	630
1	Wall Stop	236W	HAG	630
1	Perimeter Seal	2525C	NGP	- - -

Set#: 15.1
Door(s): CC-RR, 105, 176
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1279-4.5x4.5	HAG	652
1	Privacy Lever	9K3-0-L-15D	BES	626
1	Door Closer	EHD9016-SIS90	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
1	Mop Plate	190S-4”x1” LDW	HAG	630
1	Wall Stop	236W	HAG	630
1	Perimeter Seal	2525C	NGP	- - -

Set#: 15.2
Door(s): CDS-RR, 108A, 112
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1279-4.5x4.5	HAG	652
1	Privacy Lever	9K3-0-L-15D	BES	626
1	Door Closer	EHD9016-SPA90	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
1	Wall Stop	236W	HAG	630
1	Perimeter Seal	2525C	NGP	- - -

Set#: 15.3
Door(s): 124A
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1279-4.5x4.5	HAG	652
1	Privacy Lever	9K3-0-L-15D	BES	626
1	Door Closer	EHD9016-SPA90	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
1	Overhead Stop	9000S	ABH	630
1	Perimeter Seal	2525C	NGP	- - -

Set#: 15.4
Door(s): 133
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1261-4.5	HAG	652
1	Privacy Lever	9K3-0-L-15D	BES	626
1	Door Closer	EHD9016-SIS90	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
1	Mop Plate	190S-4”x1” LDW	HAG	630
1	Wall Stop	236W	HAG	630
1	Perimeter Seal	2525C	NGP	- - -

Set#: 16
Door(s): 102B, 106, 107, 108, 111, 111A, 113, 114, 179
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1279-4.5x4.5	HAG	652
1	Office Lever	9K3-7-B-15D	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-AF90P	BES	689
1	Wall Stop	236W	HAG	630
3	Silencer	608-RKW	ROC	- - -

Set#: 16.1
Door(s): 124
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1279-4.5x4.5 NRP	HAG	652
1	Office Lever	9K3-7-B-15D	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-SPA90	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
1	Wall Stop	236W	HAG	630
3	Silencer	608-RKW	ROC	- - -

Set#: 16.2
Door(s): 131
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1279-5.0x4.5	HAG	652
1	Office Lever	9K3-7-B-15D	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-AF90P	BES	689
1	Wall Stop	236W	HAG	630
3	Silencer	608-RKW	ROC	- - -

Set#: 17
Door(s): 103, 117, 123
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1279-4.5x4.5	HAG	652
1	Passage Lever	9K3-0-N-15D	BES	626
1	Door Closer	EHD9016-AF90P	BES	689
1	Wall Stop	236W	HAG	630
3	Silencer	608-RKW	ROC	- - -

Set#: 17.1
Door(s): 109
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1279-4.5x4.5	HAG	652
1	Passage Lever	9K3-0-N-15D	BES	626
1	Door Closer	EHD9016-AF90P	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
1	Wall Stop	236W	HAG	630
3	Silencer	608-RKW	ROC	- - -

Set#: 17.2
Door(s): 164
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1261-4.5	HAG	652
1	Passage Lever	9K3-0-N-15D	BES	626
1	Door Closer	EHD9016-SISH90	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
1	Wall Stop	236W	HAG	630
3	Silencer	608-RKW	ROC	- - -

Set#: 17.3
Door(s): 127B, 178
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1279-4.5x4.5	HAG	652
1	Passage Lever	9K3-0-N-15D	BES	626
1	Door Closer	EHD9016-SPA90	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
1	Wall Stop	236W	HAG	630
3	Silencer	608-RKW	ROC	- - -

Set#: 18
Door(s): 104
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
1	Butt Hinge	BB1168-4.5x4.5 ETW6	HAG	652
1	Butt Hinge	BB1168-4.5x4.5 NRP	HAG	652
1	Storeroom Lever	9KW3-7-DEU-15D-RQE	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-SPA90	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
1	Wall Stop	236W	HAG	630
3	Silencer	608-RKW	ROC	- - -
1	Threshold	655	NGP	MILL
1	Power Supply	PS902	VON	- - -
1	Door Position Switch	679-05WD	SCH	- - -
1	Push Button	660PB	SCH	- - -

Note: 120VAC to power supply by electrical contractor. All low voltage, wiring, card reader, and logic by access control contractor. Providing valid credentials will momentarily unlock door providing authorized entry. Upon power failure the opening will become fail-secure with key override. Free egress is always achieved via the panic exit hardware on the push/interior side of the door. A push button located in Reception 104 will allow for remote release of the door allowing entry.

Set#: 19
Door(s): 111B, 172
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1279-4.5x4.5 NRP	HAG	652
1	Storeroom Lever	9K3-7-D-15D	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-SPA90	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
1	Wall Stop	236W	HAG	630
3	Silencer	608-RKW	ROC	- - -

Set#: 19.1
Door(s): 116
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1168-4.5x4.5	HAG	652
1	Storeroom Lever	9K3-7-D-15D	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-AF90P	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
1	Wall Stop	236W	HAG	630
3	Silencer	608-RKW	ROC	- - -

Set#: 19.2
Door(s): 118, 150, 154, 171
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1279-4.5x4.5	HAG	652
1	Storeroom Lever	9K3-7-D-15D	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-AF90P	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
1	Wall Stop	236W	HAG	630
3	Silencer	608-RKW	ROC	- - -

Set#: 19.3
Door(s): 119A, 121, 122, 135, 143, 145, 146, 168
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1261-4.5	HAG	652
1	Storeroom Lever	9K3-7-D-15D	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-SPA90	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
1	Wall Stop	236W	HAG	630
3	Silencer	608-RKW	ROC	- - -

Set#: 19.4
Door(s): 157, 179A
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1279-4.5x4.5	HAG	652
1	Storeroom Lever	9K3-7-D-15D	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-AF90P	BES	689
1	Wall Stop	236W	HAG	630
3	Silencer	608-RKW	ROC	- - -

Set#: 19.5
Door(s): 175
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1261-4.5	HAG	652
1	Storeroom Lever	9K3-7-D-15D	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-AF90P	BES	689
1	Overhead Stop	9000S	ABH	630
3	Silencer	608-RKW	ROC	- - -

Set#: 19.6
Door(s): 177
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1279-4.5x4.5 NRP	HAG	652
1	Storeroom Lever	9K3-7-D-15D	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-SDS90	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
3	Silencer	608-RKW	ROC	- - -

Set#: 20
Door(s): 115
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
6	Butt Hinge	BB1279-4.5x4.5	HAG	652
2	Flush Bolt	282D	HAG	626
1	Dust-Proof Strike	280X	HAG	626
1	Storeroom Lever	9K3-7-D-15D	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-AF90P (Active leaf)	BES	689
2	Wall Stop	236W	HAG	630
2	Silencer	608-RKW	ROC	- - -

Set#: 20.1
Door(s): 140
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
6	Butt Hinge	BB1279-4.5x4.5	HAG	652
2	Flush Bolt	282D	HAG	626
1	Dust-Proof Strike	280X	HAG	626
1	Storeroom Lever	9K3-7-D-15D	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-AF90P (Active leaf)	BES	689
1	Kick Plate	190S-8”x2” LDW (Active Leaf)	HAG	630
2	Wall Stop	236W	HAG	630
2	Silencer	608-RKW	ROC	- - -
1	Threshold	655	NGP	MILL

Set#: 21
Door(s): 159, 162
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1168-4.5x4.5	HAG	652
1	Push Plate	30S-8”x16”	HAG	630
1	Pull Plate	H33G-4”x16”	HAG	630
1	Door Closer	EHD9016-AF90P	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
1	Mop Plate	190S-4”x1” LDW	HAG	630
1	Wall Stop	236W	HAG	630
3	Silencer	608-RKW	ROC	- - -

Set#: 22
Door(s): 128A, 128B, 128C, 128D, 158B, 182B
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1168-4.5x4.5 NRP	HAG	652
1	Panic Exit Hardware	2108 x 4908A	BES	630
1	Rim Cylinder	as Required	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-SPA90	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
1	Wall Stop	236W	HAG	630
3	Silencer	608-RKW	ROC	- - -

Set#: 22.1
Door(s): 129A, 129B, 129C, 129D
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
3	Butt Hinge	BB1261-4.5	HAG	652
1	Panic Exit Hardware	2108 x 4908A	BES	630
1	Rim Cylinder	as Required	BES	626
1	Permanent Core	as Required	- - -	626
1	Door Closer	EHD9016-SDST90	BES	689
1	Kick Plate	190S-8”x2” LDW	HAG	630
3	Silencer	608-RKW	ROC	- - -

Set#: 23
Door(s): 149B
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
6	Butt Hinge	BB1168-4.5x4.5 NRP	HAG	652
1	Panic Exit Hardware	2208LBR x 4908A	BES	630
1	Panic Exit Hardware	2201LBR	BES	630
1	Rim Cylinder	as Required	BES	626
1	Permanent Core	as Required	- - -	626
2	Door Closer	EHD9016-SPA90	BES	689
2	Kick Plate	190S-8”x1 LDW	HAG	630
2	Silencer	608-RKW	ROC	- - -
2	Magnetic Holder	2100	ABH	630

Note: 120VAC to magnetic holder by electrical contractor.

Set#: 23.1
Door(s): 167A
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
6	Butt Hinge	BB1168-5.0x4.5 NRP	HAG	652
1	Panic Exit Hardware	2208LBR x 4908A	BES	630
1	Panic Exit Hardware	2201LBR	BES	630
1	Rim Cylinder	as Required	BES	626
1	Permanent Core	as Required	- - -	626
2	Door Closer	EHD9016-SPA90	BES	689
2	Kick Plate	190S-8”x1 LDW	HAG	630
2	Silencer	608-RKW	ROC	- - -
2	Magnetic Holder	2100	ABH	630

Note: 120VAC to magnetic holder by electrical contractor.

Set#: 24
Door(s): 153A, 153B
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
6	Butt Hinge	BB1168-4.5x4.5	HAG	652
2	Panic Exit Hardware	2201LBR	BES	630
2	Door Closer	EHD9016-SDS90	BES	689
2	Kick Plate	190S-8”x1” LDW	HAG	630
2	Silencer	608-RKW	ROC	- - -

Set#: 25
Door(s): 182
Each To Have:

Quantity	Item	Model Number	Manufacturer	Finish
6	Butt Hinge	BB1168-4.5x4.5 NRP	HAG	652
1	Key Rem. Mullion	KR822	BES	689
1	Panic Exit Hardware	2108 x 4908A	BES	630
1	Panic Exit Hardware	2101	BES	630
2	Rim Cylinder	as Required	BES	626
2	Permanent Core	as Required	- - -	626
2	Door Closer	EHD9016-SPA90	BES	689
2	Kick Plate	190S-8”x2” LDW	HAG	630
2	Wall Stop	236W	HAG	630
2	Silencer	608-RKW	ROC	- - -

*** END ***

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SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Glazed entrances.
   2. Interior borrowed lites.
   3. Storefront framing.

1.3 DEFINITIONS

A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
   1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
      a. Specified Design Wind Loads: As indicated on Structural Drawings.
      b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
         1) Load Duration: 60 seconds or less.
      c. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.
         1) For monolithic-glass lites heat treated to resist wind loads.

2) For insulating glass.

3) For laminated-glass lites.

C. Thermal Movements:
1. Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
2. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
3. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:

a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F.

b. Solar Heat Gain Coefficient: NFRC 200.

c. Solar Optical Properties: NFRC 300.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: For the following products, in the form of 12-inch- square Samples for glass and of 12-inch-long Samples for sealants. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
1. Each color of tinted float glass.
2. Ceramic-coated spandrel glass.
3. Insulating glass for each designation indicated.
4. For each color (except black) of exposed glazing sealant indicated.

C. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.

D. Qualification Data: For installers.

E. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

F. Product Test Reports: For each of the following types of glazing products:
1. Tinted float glass.
2. Coated float glass.
3. Insulating glass.
4. Glazing sealants.
5. Glazing gaskets.

G. Warranties: Special warranties specified in this Section.

H. Meeting Records: Minutes of pre-installation conference.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of

successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: Clear float glass, coated float glass, laminated glass and insulating glass.

C. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

D. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
   1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

E. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
   1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
   2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.

F. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:
   1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
   2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
   3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
   5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.

G. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.
   1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency or manufacturer acceptable to authorities having jurisdiction.
   2. Where glazing units, including Kind FT and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

H. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. GANA Publications: GANA Laminated Division's "Laminated Glass Design Guide" and GANA's "Glazing Manual."
   2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

I. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:
   1. Insulating Glass Certification Council.

J. Pre-Installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination".

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 PROJECT CONDITIONS

A. Environmental Limitations:
1. Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
2. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.9 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass:
1. Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Basis-of-Design Product: The design for each glazing product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 GLASS PRODUCTS

A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.

3. For uncoated glass, comply with requirements for Condition A.
4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.

C. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.
1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.
3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
4. Sealing System:
   a. Dual seal, with primary and secondary sealants as follows:
   b. Manufacturer's standard sealants.
5. Spacer Specifications: Manufacturer's standard spacer material and construction.

2.3 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
1. EPDM, ASTM C 864.
2. Silicone, ASTM C 1115.
3. Thermoplastic polyolefin rubber, ASTM C 1115.
4. Any material indicated above.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
1. EPDM.
2. Silicone.
3. Thermoplastic polyolefin rubber.
4. Any material indicated above.

C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.4 GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:
1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Neutral-Curing Silicone Glazing Sealants:
   a. Available Products:
      1) Dow Corning Corporation; 791.
      2) Dow Corning Corporation; 795.
      3) GE Silicones; SilPruf NB SCS9000.
      4) GE Silicones; UltraPruf II SCS2900.
      5) Pecora Corporation; 865.
      6) Pecora Corporation; 895.
      7) Pecora Corporation; 898.
   b. Type and Grade: S (single component) and NS (nonsag).
   c. Class: 50.
   d. Use Related to Exposure: NT (nontraffic).
   e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
      1) Use O Glazing Substrates: Coated glass, aluminum coated with a high-performance coating, and wood.
   f. Applications: Structural and non-structural glazing of glass and metal.
2. Class 25 Neutral-Curing Silicone Glazing Sealant:
   a. Available Products:
      1) Dow Corning Corporation; 799.
      2) GE Silicones; UltraGlaze SSG4000.
      3) GE Silicones; UltraGlaze SSG4000AC.
      4) Tremco; Proglaze SG.
      5) Tremco; Spectrem 2.
      6) Tremco; Tremsil 600.
   b. Type and Grade: S (single component) and NS (nonsag).
   c. Class: 25.
   d. Use Related to Exposure: NT (nontraffic).
   e. Uses Related to Glazing Substrates:
      1) G, A, and, as applicable to glazing substrates indicated, O.
      2) Use O Glazing Substrates: Coated glass, aluminum coated with a high-performance coating, and wood.
   f. Applications: Structural and non-structural glazing of glass and metal.

2.5 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes:
   1. Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
   2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
   1. Type 1, for glazing applications in which tape acts as the primary sealant.
   2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.6 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Film: Provide anti-shatter film where indicated.

2.7 FABRICATION OF GLAZING UNITS

Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

2.8 MONOLITHIC FLOAT-GLASS UNITS

A. Uncoated Clear Float-Glass Units:
   1. Class 1 (clear) Kind FT (fully tempered) float glass (as manufactured by PPG)..
   2. Thickness: 6.0 mm, unless otherwise indicated.

2.9 INSULATING-GLASS UNITS

A. Clear Insulating Glass Units:
   1. 1” Overall SolarBan 60 Insulating Glass Unit (as manufactured by VITRO – formerly PPG Glass)
      a. 1/4” Clear with VE1-2M (low-e) coating on the #2 surface HS
      b. 1/2" Mill Finished Airspace, Black Silicone
      c. 1/4” Clear HS

2.10 SPANDREL GLASS

A. Spandrel Glass: 1” insulated glass unit to match PPG Solarban 60 on the exterior glass and ¼” thick heat strengthened float glass with colored Opaci-Coat 3000 coating the back of the interior glass.
   1. Color: As selected by Architect to match sample on file.
   2. Provide Low-E coating on the #2 Surface.
   3. Provide spandrel coating on the #3 Surface.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
   2. Presence and functioning of weep system.
   3. Minimum required face or edge clearances.
   4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 LOCK-STRIP GASKET GLAZING

Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system, unless otherwise indicated.

3.8 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 08 80 00

SECTION 09 22 16 – NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes non-load-bearing steel framing members for the following applications:

1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

B. Related Sections include the following:

1. Division 05 Section "Cold-Formed Metal Framing" for exterior non-load-bearing wall studs.
2. Division 07 Section "Fire-Resistive Joint Systems" for head-of-wall joint systems installed with non-load-bearing steel framing.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Show layout, spacings, sizes, thicknesses, and types of steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining Work.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
2. Protective Coating: ASTM A 653, G40, hot-dip galvanized, unless otherwise indicated.

2.2 SUSPENSION SYSTEM COMPONENTS

A. Tie Wire: ASTM A 641, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.

B. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency. Type shall be cast-in-place anchor, designed for attachment to concrete forms, or postinstalled expansion anchor.

C. Wire Hangers: ASTM A 641, Class 1 zinc coating, soft temper, 0.162-inch diameter.

D. Carrying Channels:

1. Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.

2. Depth: 2-1/2 inches, unless otherwise indicated.

E. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.

2. Steel Studs: ASTM C 645.

a. Minimum Base-Metal Thickness: 0.0179 inch, unless otherwise indicated.

b. Depth: 2-1/2 inches, unless otherwise indicated.

3. Hat-Shaped, Rigid Furring Channels:

a. ASTM C 645, 7/8 inch deep.

b. Minimum Base Metal Thickness: 0.0179 inch, unless otherwise indicated.

4. Resilient Furring Channels:

a. 1/2-inch-deep members designed to reduce sound transmission.

b. Configuration: Hat shaped.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.0179 inch, unless otherwise indicated.

2. Depth: As indicated on Drawings.

B. Slip-Type Head Joints: Where indicated, provide the following:

1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

C. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0179 inch, unless otherwise indicated.

2. Depth: As indicated on Drawings.

D. Resilient Furring Channels:

1. 1/2-inch-deep, steel sheet members designed to reduce sound transmission.

2. Configuration: Asymmetrical.

E. Cold-Rolled Furring Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges.

1. Depth: 3/4 inch.

2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare-steel thickness of 0.0312 inch.

3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

B. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

C. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

B. Coordination with Sprayed Insulation Materials:

1. Before sprayed insulation materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.

2. After sprayed materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of insulation materials below that required for insulation ratings indicated. Protect adjacent materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard:

1. ASTM C 754, except comply with framing sizes and spacing indicated.

2. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

2. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

4. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

5. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

6. Do not attach hangers to steel roof deck.

7. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.

8. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.

9. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

1. Space studs as follows:

a. Single-Layer Application: 16 inches o.c., unless otherwise indicated.

b. Multilayer Application: 16 inches o.c., unless otherwise indicated.

c. Tile backing panels: 16 inches o.c., unless otherwise indicated.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

a. Install two studs at each jamb, unless otherwise indicated.

b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.

c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

6. Direct Furring: Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

D. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 09 22 16

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SECTION 09 29 00 – GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Interior gypsum board.
2. Tile backing panels.

B. Related Sections include the following:

1. Division 05 Section "Cold-Formed Metal Framing" for exterior non-load-bearing wall studs that support gypsum board.
2. Division 06 Section "Sheathing" for gypsum sheathing.
3. Division 07 Section "Building Insulation" for insulation installed in assemblies that incorporate gypsum board.
4. Division 07 Section "Fire-Resistive Joint Systems" for head-of-wall assemblies that incorporate gypsum board.
5. Division 09 Section "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For trim accessories; Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.5 STORAGE AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36 or ASTM C 1396, as applicable to type of gypsum board indicated and whichever is more stringent.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering gypsum board and related products that may be incorporated into the Work include, but are not limited to, the following:
   a. American Gypsum Co.
   b. G-P Gypsum.
   c. National Gypsum Company.
   d. USG Corporation.

B. Regular Type:

1. Thickness: 5/8 inch, unless otherwise indicated.
2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
3. Location: Vertical surfaces, unless otherwise indicated.

C. Type X:

1. Thickness: 5/8 inch.
2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
3. Location: Where required for fire-resistance-rated assembly.

D. Type C:

1. Thickness: 5/8 inch, unless otherwise indicated.
2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
3. Location: As indicated and where required for specific fire-resistance-rated assembly indicated.

E. Sag-Resistant Gypsum Wallboard: ASTM C 36, manufactured to have more sag resistance than regular-type gypsum board.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   a. American Gypsum Co.; Interior Ceiling Board.
   b. National Gypsum Company; ½" High Strength Ceiling Board.
   c. United States Gypsum Co.; SHEETROCK Brand Sag-Resistant Interior Gypsum Ceiling Board.
2. Thickness: 1/2 inch, unless otherwise indicated.
3. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
4. Location: Ceiling surfaces, unless otherwise indicated.

F. Moisture-Resistant Type: With moisture-resistant core and surfaces.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. American Gypsum Co.; Aquabloc.

b. National Gypsum Company; Gold Bond Moisture Resistant Board.

c. United States Gypsum Co.; SHEETROCK Brand Water-Resistant Board.

2. Thickness: 5/8 inch, Type X where required.

3. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

4. Location: Toilet room wall not receiving tile, unless otherwise indicated.

G. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces.

1. Available Product: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, "SHEETROCK Brand Humitek Gypsum Panels" manufactured by United States Gypsum Co.

2. Thickness: 5/8 inch, Type X where required.

3. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

4. Location: Inside face of exterior walls, unless otherwise indicated.

2.3 TILE BACKING PANELS

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178.

1. Available Product: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, "Dens-Shield Tile Backer" manufactured by G-P Gypsum Corp.

2. Thickness: 1/2 inch, Type X where required.

3. Location: Walls receiving tile finish.

2.4 POURED IN PLACE TERRAZZO BASE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, “DUROCK Cement Board” manufactured by United States Gypsum Co.

2. Thickness: 1/2 inch.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.

2. Shapes:

a. Cornerbead.

b. Expansion (control) joint.

c. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Fry Reglet Corp.
   b. Gordon, Inc.
   c. Pittcon Industries.
2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:
   1. Interior Gypsum Wallboard: Paper.
   2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
   3. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints**,** rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
   3. Fill Coat: For second coat, use setting-type, sandable topping compound.
   4. Finish Coat: For third coat, use drying-type, all-purpose compound.

D. Joint Compound for: Glass-Mat, Tile Backing, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
   1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
   2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.

B. Install sound attenuation blankets and building insulation before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

F. Form control and expansion joints with space between edges of adjoining gypsum panels.

G. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.

2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

H. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

I. Attachment to Steel Framing:

1. Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

2. Attach gypsum panels to framing provided at openings and cutouts.

J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

K. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.

L. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.

2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of panels.

b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

3. Fastening Methods: Apply gypsum panels to cold-formed metal framing with steel drill screws.

B. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3. Fastening Methods: Fasten base layers and face layers separately to cold-formed metal framing with screws.

C. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch-long straight sections at ends of curves and tangent to them.

2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3. Fastening Methods: Fasten base layers and face layers separately to cold-formed metal framing with screws.

3.4 APPLYING TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Panel: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch gap where panels abut other construction or penetrations.

B. Areas Not Subject to Wetting: Install regular-type gypsum wallboard panels to produce a flat surface except at showers, tubs, and other locations indicated to receive water-resistant panels.

C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

D. Fastening Methods: Fasten base layers and face layers separately to cold-formed metal framing with screws.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners**,** unless otherwise indicated.

2. Curved-Edge Cornerbead: Use at curved openings.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints**,** rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.

2. Level 5: At panel surfaces that will be exposed to view, unless otherwise indicated.
Level 5 quality is defined by the industry as having "no marks and no ridges". All finished gypsum board surfaces will be reviewed with a variable direction light source to locate all imperfections, corrected and completed to painting.

E. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.

3.7 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

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SECTION 09 30 00 - TILING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Ceramic mosaic tile.
2. Glazed wall tile.
3. Stone thresholds installed as part of tile installations.
4. Waterproof membrane for thin-set tile installations.
5. Crack-suppression membrane for thin-set tile installations.
6. Cementitious backer units installed as part of tile installations.
7. Metal edge strips installed as part of tile installations.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints.

C. Samples:

1. Each type, composition, color, and finish of tile.
2. Assembled samples with grouted joints for each type, composition, color, and finish of tile.
3. Stone thresholds in 6-inch (150-mm) lengths.

1.3 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution

1. Build mockup of each type **of** floor tile installation.
2. Build mockup of each type of wall tile installation.

3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
5. Basis-of-Design Product: The design for each tile type is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 TILE PRODUCTS

A. ANSI Ceramic Tile Standard: Provide Standard grade tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated. Manufacturer shall be one of the following:

B.

1. American Olean : Division of Dal-Tile International
2. **Crossville, Inc. – Crossville, Tennessee =** Basis of Design Intent
3. Stonepeak Ceramics,- Crossville, Tennessee

C. **Tile Type PT-1**: Porcelain Tile name = **"NOTORIOUS"** manufactured by Crossville, Inc.

D. Composition: Porcelain.

E. Face Size: Various sizes are available – see the drawings – more than one size may be used.

F. Thickness: 10.5 mm

G. Face: Solid Color across face of tile.

H. Tile Color and Pattern: Architect will select from manufacturer's color palette.

I. Grout Color: As selected by Architect from manufacturer's full range of colors.

2.3 ACCESSORY MATERIALS

A. Thresholds: Fabricate to provide transition between adjacent floor finishes. Bevel edges at 1:2 slope, limit height of bevel to 1/2 inch (12.7 mm) or less, and finish bevel to match face of threshold.

1. Marble Thresholds: ASTM C 503 with a minimum abrasion resistance of **12** per ASTM C 1353 or ASTM C 241 and with honed finish.

   a. Description: Uniform, fine- to medium-grained white stone with gray veining.

B. Waterproofing and Crack-Suppression **Membranes** for Thin-Set Tile Installations: Manufacturer's standard product that complies with ANSI A118.10**,** selected from the following

1. Fabric-Reinforced, Modified-Bituminous Sheet Product: SBS-modified-bituminous sheet with woven reinforcement facing, 0.040-inch (1.01-mm) nominal thickness.

   a. Available Product: National Applied Construction Products, Inc.; Strataflex.

2. Fabric-Reinforced, Fluid-Applied Product: Liquid-latex rubber**,** with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24**),** with fabric reinforcement.

   a. Available Products:

      1) Custom Building Products; Trowel & Seal Waterproofing and Anti-Fracture Membrane.
      2) LATICRETE International Inc.; Laticrete 9235 Waterproof Membrane.
      3) MAPEI Corporation; PRP M19.
      4) Summitville Tiles, Inc.; S-9000.

3. Unreinforced, Fluid-Applied Product: Liquid-latex rubber**,** with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

   a. Available Products:

      1) Boiardi Products Corporation; Elastiment.
      2) Custom Building Products; LevelQuick Waterproofing and Anti-Fracture Membrane.
      3) Jamo Inc.; Waterproof.

2.4 SETTING AND GROUTING MATERIALS

A. Manufacturers:

1. Atlas Minerals & Chemicals, Inc.
2. Boiardi Products Corporation.
3. Bonsal, W. R., Company.
4. Bostik.
5. C-Cure.
6. Custom Building Products.
7. DAP, Inc.
8. Jamo Inc.
9. LATICRETE International Inc.
10. MAPEI Corporation.
11. Southern Grouts & Mortars, Inc.
12. Summitville Tiles, Inc.
13. TEC Specialty Products Inc.

B. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.1A.

C. Dry-Set Portland Cement Mortar (Thin Set): ANSI A118.1.

1. For wall applications, provide nonsagging mortar.

D. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

1. Prepackaged dry-mortar mix containing dry additive to which only water must be added.
2. Prepackaged dry-mortar mix combined with liquid-latex additive.

3. For wall applications, provide nonsagging mortar.

E. Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy: ANSI A118.3

F. Water-Cleanable, Tile-Setting Epoxy Adhesive: ANSI A118.3

G. Organic Adhesive: ANSI A136.1, Type I

H. Standard Sanded Cement Grout: ANSI A118.6, color as indicated.

I. Standard Unsanded Cement Grout: ANSI A118.6, color as indicated.

J. Polymer-Modified Tile Grout: ANSI A118.7, color as indicated.

1. Polymer Type: Dry, redispersible form, prepackaged with other dry ingredients.
2. Polymer Type: Liquid-latex form for addition to prepackaged dry-grout mix.

K. Grout for Pregrouted Tile Sheets: Same silicone rubber used in factory to pregrout tile sheets.

2.5 MISCELLANEOUS MATERIALS

A. Elastomeric Sealants: Elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 07 Section "Joint Sealants."

1. Use sealants that have a VOC content of **250** g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. One-Part, Mildew-Resistant Silicone: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for in-service exposures of high humidity and extreme temperatures.

a. Products:

1) Dow Corning Corporation; Dow Corning 786.
2) GE Silicones; Sanitary 1700.
3) Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
4) Tremco, Inc.; Tremsil 600 White.

3. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.

a. Products:

1) Bostik; Chem-Calk 550.
2) Mameco International, Inc.; Vulkem 245.

3) Pecora Corporation; NR-200 Urexpan.
4) Tremco, Inc.; THC-900.

B. Cementitious Backer Units: ANSI A118.9 in maximum lengths available to minimize end-to-end butt joints.

1. Thickness: 1/2 inch (12.7 mm)

2. Products:

a. C-Cure; C-Cure Board 990.
b. Custom Building Products; Wonderboard.
c. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
d. USG Corporation; DUROCK Cement Board.

C. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials.

D. Metal Edge Strips: Angle or L-shape, stainless steel; ASTM A 666, 300 Series exposed-edge material.

E. Grout Sealer: Manufacturer's standard **silicone** product for sealing grout joints that does not change color or appearance of grout.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions.

C. Remove protrusions, bumps, and ridges by sanding or grinding.

D. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.

E. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.2 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Grind cut edges of tile abutting trim, finish, or built-in items. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

H. Grout tile to comply with requirements of ANSI A108.10, unless otherwise indicated.

1. For chemical-resistant epoxy grouts, comply with ANSI A108.6.

I. At showers, tubs, and where indicated, install cementitious backer units and treat joints to comply with ANSI A108.11.

J. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.

1. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

K. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.

1. Tile floors in wet areas.
2. Tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger.
3. Tile floors composed of rib-backed tiles.

L. Install tile on floors with the following joint widths:

1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm).
2. Quarry Tile: 1/4 inch (6.35 mm) 3/8 inch (9.5 mm).
3. Paver Tile: 1/4 inch (6.35 mm) 3/8 inch (9.5 mm)

M. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

N. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

O. Install metal lath and scratch coat for walls to comply with ANSI A108.1A, Section 4.1.

P. Install tile on walls with the following joint widths:

1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm).
2. Glazed Wall Tile: 1/16 inch (1.6 mm).
3. Quarry Tile: 1/4 inch (6.35 mm)] [3/8 inch (9.5 mm).

Q. Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

3.3 FLOOR TILE INSTALLATION SCHEDULE

A. Interior floor installation on concrete; cement mortar bed (thickset) with cleavage membrane; TCA F111 bonded to concrete; TCA F112].

1. Bond Coat/Thin-Set Mortar: Dry-set Latex- portland cement mortar.
2. Grout: Sand-portland cement

B. Interior floor installation on concrete; thin-set mortar; TCA F113.

1. Thin-Set Mortar: Dry-set Latex- portland cement mortar.
2. Grout: Sand-portland cement

C. Interior floor installation on concrete; organic/ water-cleanable epoxy adhesive; TCA F116.

1. Grout: Sand-portland cement

D. Interior floor installation on waterproof crack-suppression membrane over concrete cement mortar bed (thickset); TCA F121.

1. Bond Coat/Thin-Set Mortar**: Dry-set / Latex-**portland cement mortar.
2. Grout: Sand-portland cement

E. Interior floor installation on waterproof crack-suppression membrane over concrete; thin-set mortar; TCA F122.

1. Thin-Set Mortar: Latex-portland cement mortar.
2. Grout: Polymer-modified sanded grout.

F. Interior floor installation on wood; cement mortar bed (thickset) with cleavage membrane; TCA F141.

1. Bond Coat/Thin-Set Mortar: Dry-set Latex-portland cement mortar.
2. Grout: Sand-portland cement

3.4 WALL TILE INSTALLATION SCHEDULE

A. Interior wall installation; thin-set mortar; over gypsum board; TCA W243 cementitious backer units; TCA W244

1. Thin-Set Mortar: Dry-set Latex- portland cement mortar.
2. Grout: Polymer-modified unsanded grout for joints 1/8" and narrower.

B. Interior bathtub wall installation; thin-set mortar; over **c**ementitious backer units**;** TCA B412 water-resistant gypsum board; TCA B413 and TCA W243

1. Thin-Set Mortar: **Dry-set Latex-** portland cement mortar.
2. Grout: **Sand-portland cement** grout.

C. -Interior wall and shower-receptor installation; cement mortar bed (thickset); over solid backing; TCA B414 and TCA W221**,** metal studs; TCA B414 and TCA W241

1. Bond Coat/Thin-Set Mortar: Dry-set Latex-portland cement mortar.
2. Grout: **Sand-portland cement**

D. Interior wall and shower-receptor installation; thin-set mortar; over cementitious backer units; TCA B415 and TCA W244 glass-mat, water-resistant backer board; TCA B420 and TCA W245

1. Thin-Set Mortar: Dry-set Latex-portland cement mortar.
2. Grout: **Sand-portland cement Standard sanded cement** grout.

END OF SECTION 09 30 00

SECTION 09 51 23 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes acoustical tiles and concealed suspension systems for ceilings.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Coordination Drawings: Drawn to scale and coordinating acoustical tile ceiling installation with hanger attachment to building structure and ceiling mounted items. Show size and location of initial access modules.

C. Samples: For each exposed finish.

D. Product test reports.

E. Research/evaluation reports.

F. Maintenance data.

1.3 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory.

B. Installer Qualifications: Firm with not less than 3 years of successful experience in installation of acoustical ceilings similar to this project.

C. Fire-Test-Response Characteristics:

1. Fire-Resistance Characteristics: Where indicated, provide acoustical tile ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

   a. Identify materials with appropriate markings of applicable testing and inspecting agency.

   b. Fire Resistance Ratings: Indicated by design designations from UL's "fire Resistance directory" or from listings of another testing and inspecting agency.

2. Surface-Burning Characteristics: Acoustical tiles complying with ASTM E 1264 for Class [**A**] materials, when tested per ASTM E 84.

   a. Smoke-Developed Index: 450 or less.

D. Seismic Standard: Comply with the following:

1. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site

G. Single-Source Responsibility for Ceiling Units: Obtain each type of acoustical ceiling unit from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

H. Single-Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

I. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components, and partition system.

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size tiles equal to 2% percent of quantity installed.
2. Suspension System Components: Quantity of each concealed grid and exposed component equal to 2% percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL TILE CEILINGS, GENERAL

A. Acoustical Tile Standard: Comply with ASTM E 1264.

B. Metal Suspension System Standard: Comply with ASTM C 635.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

D. Wire Hangers, Braces, and Ties: Zinc-coated carbon-steel wire; ASTM A 641/A 641M, Class 1 zinc coating, soft temper.

1. Size: Select wire diameter so its stress at 3times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

E. Seismic struts and seismic clips.

F. Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

2.2 ACOUSTICAL TILES FOR ACOUSTICAL TILE CEILING Refer to Reflected Ceiling plans for location

A. Basis-of-Design Product: As shown in the finish schedule or a comparable product by one of the following:

1. BPB USA

2. Armstrong World Industries; **"DUNE Ceiling Tile" =** Basis of Design Intent

Do not assume that every combination of fire-resistance rating, classification, color, light reflectance, acoustical rating, edge detail, thickness, and size listed under each product description is available. Before selecting options below to insert salient characteristics, verify availability with manufacturers' product data.

B. Classification: Provide panels tiles complying with ASTM E 1264 for type and form as follows:

1. Type and Form: Type III, mineral base with painted finish; Form 2, Pattern CE, Fire Class A.

C. Color: White

D. LR: Not less than 0.83

E. NRC: Not less than .50 Type E-400 mounting per ASTM E 795.

F. CAC: Not less than 33

G. Edge/Joint Detail: Beveled Tegular

H. Thickness: 5/8"

2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL TILE CEILING

A. Basis-of-Design Product: Subject to compliance with requirements, provide 15/16" White Exposed Tee System by USG or a comparable product by one of the following:

1. BPB USA

2. Armstrong World Industries

B. Direct-Hung, Suspension System: Intermediate duty structural classification.

C. Access: Upward, with each access unit identified by manufacturer's standard unobtrusive markers.

2.5 METAL SUSPENSION SYSTEM FOR EXTERIOR PANEL CEILING

A. Basis-of-Design Product: Subject to compliance with requirements, provide Prelude XL 15/16" for Exterior Applications by Armstrong World Industries or a comparable product by one of the following:

1. CertainTeed Corp.

2. Chicago Metallic Corporation.

3. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized (galvanized steel, aluminum, or stainless steel) as per ASTM A653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel (aluminum or stainless steel) in baked polyester paint. Main beams and cross tees shall have rotary stitching (exception: extruded aluminum or stainless steel.

1. Structural Classification: ASTM C635 HD.

2. Color: Silver Grey.

C. Attachment Devices: Size for five times design load indicated in ASTM C635, Table 1, Direct Hung unless otherwise indicated.

D. Wire for Hangers and Ties: ASTM A641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least three times design load, but not less than 12 gauge.

E. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer’s standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders.

C. Suspend ceiling hangers from building's structural members, plumb and free from contact with insulation or other objects within ceiling plenum. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers, use trapezes or equivalent devices. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.

1. Do not support ceilings directly from permanent metal forms or floor deck; anchor into concrete slabs.
2. Do not attach hangers to steel deck tabs or to steel roof deck.

D. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical tiles. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.

END OF SECTION 09 51 23

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SECTION 09 56 00 – WOOD FLOORING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Applicable provisions of "General and Special Conditions" shall govern work under this section.

B. This contractor shall provide all labor, materials, tools, and services to furnish, deliver, and install a complete wood floor system from the surface vapor proofing of the slab. When required, through the sanding and finishing, plus the installation of perimeter base moldings, thresholds, and stripe painting.

1.2 QUALITY ASSURANCE

A. Supplier Qualifications:

1. Supplier shall be Somerset Wood Products, Inc. or approved equal.

B. Installer Qualifications:
1. Flooring contractor shall have attended and received a passing grade from the National Wood Flooring Association Installation School or a certified member of a manufacturer's installation school.
2. Flooring Contractor shall have a minimum of 15 years of experience in the sports floor construction.

1.3 SUBMITTALS

A. Manufacturer's product data.
1. Submit five product specification.

B. Samples:
1. Submt one sample of floor system.

C. Maintenance literature
1. Submit three copies of maintenance requirements

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery of materials.
1. Materials shall not be delivered or installed until all masonry, painting, plastering, and tile work are completed. All overhead work which includes installation of mechanical work, lighting, backstops, scoreboards, etc, must be installed prior to flooring installation. Building shall be enclosed and weathertight. Permanent heat shall be installed and operating during and after installation, maintain a temperature range of 55 to 78 degrees and a relative humidity of between 35 to 50%.

1.5 GUARANTEE

A. The suppliers guarantee shall not cover damage caused in whole or in part by casualty, ordinary wear and tear, abuse, use for which material is not designed, faulty construction of the building, settlement of the building walls, failure of the other contractors to adhere to specifications, separation of the concrete slab and excessive moisture from humidity, spillage, migration through the slab or wall, or any other source.

B. Manufacturer shall warrant the flooring materials to be free from the manufacturing defects for a period of one year from the date of substantial completion. The flooring contractor shall warrant the installation to be free from defects for the same period.

PART 2 - PRODUCTS AND EXECUTION

2.1 MATERIALS AND INSTALLATION

A. Moisture Protection
1. One layer of six mil polyethylene as moisture proofing.
2. One layer of 1” closed cell foam cushioning.

B. Sub-Floor.

1. Sub floor shall be two layers of 3/8” x 4’ x 8’ plywood.

C. Flooring
1. Finished flooring shall be ¾” x 2-a/4” x various lengths second and better, or number one common maple hardwood flooring.

D. Baseboard
1. Baseboard shall be 4” x 2” composite baseboard attached at perimeter walls.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect concrete sub floors for proper tolerance and dryness and report any discrepancies to the construction manager in writing.

B. Sub Floor shall be broom cleaned by general contractor

3.2 INSTALLATION

A. Cover concrete slab with one layer of six mil polyethylene as a moisture proofing.

B. Cover concrete slab with one layer of ¼” closed cell foam.

C. Sub floor sheathing shall be installed top layer to bottom layer to bottom 12” O.C. with ½” spacing between each layer and 2” at perimeter walls.

D. Cover subfloor sheathing with one layer of #15 roofing felt.

E. Machine nail hardwood flooring to subfloor sheathing in accordance with NWFA standards,

3.3 FLOOR SANDING

A. Machine sand with coarse, medium, and fine paper to a smooth, even, uniform surface.

B. Remove all sanding dust from entire surface by tack or vacuum.

3.4 FINISHING

A. After removing all sanding dust from surface and cracks of floor, inspect entire area of floor to ensure that surface is acceptable for finishing and completely free from sanding dust and free of drum stop marks, gouges, streaks, and shiners.

B. Apply two coats of Gym Seal and two coats of Gym Finish, buff and clean floor between each coat. Paint game lines between seal and first coat of finish. Game line paint shall be compatible with finish.

3.5 BASE INSTALLATION

A. Affix base to wall with recommended fastening method. Miter all inside and outside corners carefully. Install aluminum thresholds as required, anchoring firmly in concrete floor beyond limits of wood flooring.

3.6 MAINTENANCE

A. Upon completion of floor installation, the owner, attendants, or individuals in charge and responsible for the upkeep of the building are to see that the areas in which the wood floors are installed are always adequately ventilated with natural or mechanical air circulation (heat, if necessary, during high humidity periods). Mechanical equipment shall maintain temperature and humidity ranges spelled out in working conditions.

END OF SECTION 09 56 00

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SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient base.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches (300 mm) long, of each resilient product color, texture, and pattern required.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.4 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive resilient products.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.

C. Install resilient products after other finishing operations, including painting, have been completed.

1.5 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Resilient Base: Full-size base equal to 2% percent of quantity installed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE: B2

A. Resilient Base:

1. Manufacturers: Subject to compliance with requirements, provide the following:

   a. As shown in the finish schedule.

B. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: Type TP (rubber, thermoplastic)
2. Manufacturing Method: Group I (solid, homogeneous)
3. Style: Cove (base with toe)]

C. Minimum Thickness: 0.125 inch

D. Height: 4 inches (102 mm)

E. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length

F. Outside Corners: Preformed

G. Inside Corners: Job formed

H. Finish**:** As selected by Architect from manufacturer's full range

I. Colors and Patterns: As selected from manufacturer's full range.

2.2 RESILIENT STAIR ACCESSORIES (RST-1) – NOT USED FOR THIS PROJECT

A. Base-of-Design Product: Subject to compliance with requirement, provide PRF LISA, Inc. (Pirelli) HP ACTIVA 805 "Iron" full-step rubber stair tread with integrated Riser or comparable product by one of the following:

B. Resilient Stair Treads:

1. Manufactures: As shown in the finish schedule or subject to compliance with requirements, provide products by one of the following:

   a. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
   b. Johnsonite

C. Resilient Stair Treads Standard: ASTM F 2169.

D. Size: Length and depths to fit each stair tread in one piece or, for treads exceeding maximum lengths manufactured, in equal-length units.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Cove Base Adhesives: Not more than 50 g/L.

b. Rubber Floor Adhesives: Not more than 60 g/L.

C. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates that do not conform to tread contours.

D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

E. Floor Polish: Provide protective liquid floor polish products as recommended by resilient stair tread manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Treads and Accessories: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
4. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

   a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
   b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.2 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

3.3 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
2. Tightly adhere to substrates throughout length of each piece.

3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of [**carpet**] [**resilient floor covering**] that would otherwise be exposed.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.

1. Apply two coat(s).

C. Cover resilient products until Substantial Completion.

END OF SECTION 09 65 13

SECTION 09 65 19 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Luxury Vinyl Tile (LVT).

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

C. Samples: Full-size units of each color and pattern of floor tile required.

D. Maintenance data.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.4 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive floor tile.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

1.5 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. LVT: Full-size LVT tiles equal to 2% percent of quantity installed.

PART 2 - PRODUCTS

2.1 LUXURY VINYL TILE

A. Basis-of-Design Product: The design for vinyl floor tile is based on Interface "Boundary Metallics" / LVT. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. Armstrong World Industries, Inc.
2. Mannington
3. Tarkett

B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.

C. Wearing Surface: Smooth.

D. Thickness: 4.5 mm.

E. Size: 25 cm X 1 m.

F. Color and Patterns: As selected by Architect from full range of industry colors. Place on floor in an Ashlar Pattern with long direction determined by Architect.

G. Location: Refer to Flooring Schedule and Floor Finish Plan on the Drawings

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Vinyl Composition Floor Tile Adhesives: Not more than 50 g/L.
b. Rubber Floor Tile Adhesives: Not more than 60 g/L.

C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
4. Moisture Testing: Perform tests recommended by floor covering manufacturer and as follows. Proceed with installation only after substrates pass testing.

   a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m in 24 hours.
   b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are same temperature as space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.2 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles as pattern indicates on floor pattern drawing.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles as pattern indicates on floor pattern drawing.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.3 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.

B. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish.

1. Apply two coat(s).

C. Cover floor tile until Substantial Completion.

END OF SECTION 09 65 19

SECTION 09 68 13 - TILE CARPETING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes carpet tile and installation.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation methods.

B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
1. Carpet Tile: Full-size Sample.
2. Exposed Edge Stripping and Accessory: 12-inch-long Samples.

C. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.

D. Maintenance Data: For carpet tile to include in maintenance manuals specified in Division 1. Include the following:
1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

C. Product Options: Products and manufacturers named in Part 2 establish requirements for product quality in terms of appearance, construction, and performance. Other manufacturers' products comparable in quality to named products and complying with requirements may be considered. Refer to Division 1 Section "Substitutions."

1.04 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with CRI 104, Section 5, "Storage and Handling."

1.05 PROJECT CONDITIONS

A. General: Comply with CRI 104, Section 6.1, "Site Conditions; Temperature and Humidity."

B. Environmental Limitations: Do not install carpet tile until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet tile over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tile, install carpet tile before installing these items.

1.06 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Carpet Tile Warranty: Written warranty, signed by carpet tile manufacturer agreeing to replace carpet tile that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.

1. Warranty Period: 10 years from date of Substantial Completion.

1.07 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 - PRODUCTS

2.01 CARPET TILE

A. Product: As shown on the Finish Key.

2.02 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and that is recommended by carpet tile manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Verify that substrates and conditions are satisfactory for carpet tile installation and comply with requirements specified.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
2. Subfloor finishes comply with requirements specified in Section 03300 - Cast-in-Place Concrete for slabs receiving carpet tile.

3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 INSTALLATION

A. General: Comply with CRI 104, Section 13, "Carpet Modules (Tiles)."

B. Installation Method: As recommended in writing by carpet tile manufacturer for glue-down; install every tile with releasable adhesive.

C. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

D. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

F. Install pattern parallel to walls and borders.

3.04 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 15, "Protection of Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

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SECTION 09 91 00 - PAINTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. General provisions of the Contract, General and Supplementary Conditions, and Division 1 specification sections, General Requirements, apply to this section.

1.02 DESCRIPTION OF WORK

A. Labor, material, equipment and services necessary to provide the painting.

B. The work includes the painting and finishing of all interior and exterior exposed items and surfaces throughout the project, except as otherwise specified. Surface preparation, priming and coats of paint specified are in addition to shop priming and surface treatment specified under other sections.

C. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate, or finish coat.

D. Paint all exposed surfaces whether or not colors are designated in a "schedule", except where the natural finish of the material is obviously intended and specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas. If color or finish is not designated the Architect will select these from standard colors available for the materials systems as specified.

E. Painting of mechanical work is limited to items exposed to view in equipment rooms, finished or occupied spaces and exposed to view or the weather on the exterior of the building. Mechanical items to be painted include, but are not limited to, the following:
   1. Piping, pipe hangers and supports.
   2. Fabricated equipment stands or supports.
   3. Heat exchangers.
   4. Tanks.
   5. Ductwork and supports exposed to view in finished or occupied spaces or exposed to view or the weather on the exterior. Ductwork in mechanical equipment rooms is not to be painted.
   6. Insulated piping exposed to view in finished or occupied spaces. Insulated piping in mechanical rooms is not to be painted except as noted below.
   7. Mechanical equipment exposed to view on the roof or outside the building such as exhaust fans, supply fans, relief or intake bonnets.
   8. Boiler stack and gas flues above the roof.
   9. Fire protection risers and appurtenances in stairwells and other finished or occupied spaces.
   10. Mechanical equipment, such as chillers and pumps, insulated with flexible elastomeric insulation.
   11. Piping insulated with flexible elastomeric insulation.
   12. Piping, pipe hangers and supports on the roof or outside the building.

F. If products description does not match the existing products, verify requirements with the Architects.

1.03 PAINTING NOT INCLUDED

A. The following categories of work are not included as part of the painter-applied finish work, or are included in other sections of these specifications, unless otherwise shown or specified.

B. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under the various sections for structural steel, miscellaneous metal items, hollow metal work, and similar items. Also, for such fabricated components as architectural woodwork, wood casework, and shop-fabricated or factory-built mechanical and electrical equipment or accessories.

C. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified for such items as (but not limited to) metal toilet enclosures, prefinished partition systems, acoustic materials, architectural woodwork and casework, finished mechanical and electrical equipment including light fixtures, switchgear, and distribution cabinets, doors and equipment, except paint covers of electrical panels in rooms other than equipment rooms.

D. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceiling in concealed areas and generally in inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces, and duct.

E. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze, and similar finished materials will not require finish painting, except as otherwise specified.

F. Operating Parts and Labels: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, operable louver or damper blades, sensing devices, motor and fan shafts, will not require finish painting, unless otherwise indicated. Do not paint over code-required labels, such as Underwriters' Laboratories and Factory Mutual, or equipment identification, performance rating, name, or nomenclature plates.

1.04 SUBMITTALS

A. Manufacturer's Data: Submit copies of manufacturer's technical information including paint label analysis and application instructions for each material proposed for use.

B. Samples for Verification:
   1. Submit paint samples on 12" x 12" hardboard for Architect's review of color and texture only. Provide a listing of the material and application for each coat of each finish sample.
   2. Submit stain samples on actual wood specified.

1.05 DELIVERY AND STORAGE

A. Deliver all materials to the job site in original, new, and unopened packages and containers bearing manufacturer's name and label, and application instructions thereon.

1.06 JOB CONDITIONS

A. Apply water-base paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 50° F. and 90° F. unless otherwise permitted by the paint manufacturer's printed instructions.

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 45° F and 95° F unless otherwise permitted by the paint manufacturer's printed instructions.

C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85%; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods.

PART 2 - PRODUCT

2.01 COLORS AND FINISHES

Colors: As selected by Architect from manufacturer's full range, or as indicated on Paint Schedule on the Drawings.

B. Color Pigments: Pure, non-fading, applicable types to suit the substrates and service indicated.

C. Paint Coordination: Provide finish coats which are compatible with prime paints used. Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information on characteristics of finish materials proposed for use, to ensure compatible prime coats are used. Provide barrier coats over incompatible primers or remove and reprime as required. Notify the Architect in writing of any anticipated problems using specified coating systems with substrates primed by others.

2.02 MATERIAL QUALITY

A. Provide the best quality grade of the various types of coatings as regularly manufactured by approved paint materials manufacturers. Materials not displaying the manufacturer's identification as a standard, best-grade product will not be acceptable.

B. Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer, and use only to recommended limits.

2.03 PAINTING SCHEDULE

A. Selections listed are intended to indicate the standard quality and the type of finish required. Product names listed herein are from the manufacturers listed below, unless otherwise noted. Equivalent items of other manufacturers will be acceptable provided the product meets or exceeds the requirements of these specifications.

B. Manufacturers offering products complying with requirements include the following:

Pittsburgh Paints
ICI / Devoe Paints
Sherwin Williams

C. Exterior

1) Ferrous Metal and Galvanized Steel

Pittsburgh Paints:
First Coat: PPG Pitt-Tech Primer/Finish Industrial Enamel, 90-712 or 90-709, Gray.
Second and Third Coats: PPG Pitt-Tech DTM Industrial Enamel, 90-374 Gloss or 90-474, Satin.

2) Wood (Opaque Latex Stain Finish)

Pittsburgh Paints:
First and Second Coats: Rez solid color stain, 77-445/446/447 Series.

3) Wood (Transparent Latex Stain Finish)

Pittsburgh Paints:
First and Second Coats: Rez semi-transparent stain, 77-460 Series.

4) Brick and Masonry:

First Coat: PPG Speedhide Latex Masonry Block Filler, 6-7.
Second and Third Coats: PPG Speedhide Acrylic Latex House Paint, Flat #6-610 and PPG Speedhide Exterior Semi-Gloss Latex House and Trim Paint, Semi-Gloss #6-900.

5) Exterior Galvanized Metal

First Coat: PPG Galvanized Steel Primer, 6-209.
Second and Third Coats: PPG Speedhide Gloss Oil Interior/Exterior Enamel 6-252 Series.

6) Exterior Concrete Block

First Coat: PPG Speedhide Latex Masonry Block Filler, 6-7.
Second and Third Coats: PPG Speedhide Acrylic Latex House Paint, Flat #6-610 and PPG Speedhide Exterior Semi-Gloss Latex House and Trim Paint, Semi-Gloss #6-900.

7) Concrete

First Coat: PPG Pitt-Glaze High Performance Acrylic Latex Block Filler, #16-90.
Second and Third Coats: PPG Pitt-Flex Exterior Masonry Coating, 100% Acrylic-Elastomeric, #4-110.

D. Interior

1) Gypsum Wallboard

Pittsburgh Paints:
First Coat: PPG Latex Sealer, 6-2.
Second and Third Coats: PPG Speedhide Acrylic Latex Interior Latex Eggshell Enamel, 6-411 Series.

2) Gypsum Wallboard (Ceilings and where flat paint is desired)

Pittsburgh Paints:
First Coat: PPG Latex Sealer, 6-2.
Second and Third Coats: PPG Speedhide Acrylic Latex Interior Latex Flat Wall Paint, 6-70 Series.

3) Metal

Pittsburgh Paints:
First Coat: Speedhide water base inhibitive metal primer, 90-712.
Second and Third Coats: Speedhide semi-gloss latex enamel, 6-510 Series.

4) Galvanized Beams, Joist and Deck

First Coat: PPG Interior Flat Dry Fog Galvanized Steel Primer/Finish #G9514.
Second and Thrid Coats: PPG Speedhide Interior Solvent Base Dry Fog #6-160, Flat; 6-114, Semi-Gloss; 6-116, Gloss.

5) Galvanized Metal

First Coat: PPG Speedhide 6-209 Galvanized Steel Primer.
Second and Third Coats: PPG Speedhide Gloss-Oil Interior/Exterior Enamels, #6-252 Series.

6) Concrete and Masonry (Latex Finish)

First Coat: PPG Latex Masonry Block Filler, 6-7.
Second and Third Coats: PPG Speedhide Interior Eggshell Latex Enamel, 6-411 Series.

7) Concrete and Masonry (EPOXY Finish)

First Coat: PPG Pitt Glaze High Performance Acrylic Latex Block Filler, 16-90 Series.
Second and Third Coats: PPG Aquapon Polyamide-Epoxy, 97-Series.

8) Woodwork (Opaque Finish)

Pittsburg Paints:
First Coat: Speedhide water base undercoater, 6-855.
Second and Third Coats: Speedhide semi-gloss latex enamel, 6-510 Series.

9) Woodwork (Transparent Finish)

Pittsburgh Paints:
First Coat: Paste Wood Filler (Stearate Free)
Second Coat: Rez Interior Stain, 77-560, alkyd.
Third Coat: Rez Polyurethane Clear, 77-9.
Fourth Coat: Rez Polyurethane Clear, 77-9.

10) Equipment and Other Metal Surfaces

First coat: PPG Speedhide Rust Inhibitive Steel Primer, #6-208 Series.
Second and Third Coats: PPG Speedhide Gloss-Oil Interior/Exterior Enamels, #6-252 Series.

11) PVC Pipe and Insulated Pipe Covering

First and Second Coats: PPG Pitt-Tech One Pack Interior/Exterior High Performance, High Gloss, DTM Industrial Waterborne Acrylic Enamel, 90 Series.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Applicator must examine the areas and conditions under which painting work is to be applied and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Applicator.

B. Starting of painting work will be construed as the applicator's acceptance of the surfaces within any particular area.

C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable paint film.

3.02 SURFACE PREPARATION

A. General

1) Perform all preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition.

2) Remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish painted, or provide surface-applied protection, prior to surface preparation and painting operations. Remove, if necessary, for the complete painting of the items and adjacent surfaces. Following completion of painting of each space or area, reinstall the removed items by workmen skilled in the trades involved.

3) Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.

B. Cementitious Materials

1) Prepare cementitious surfaces to be painted by removing all efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze.

2) Determine the alkalinity and moisture content of the surfaces to be painted by performing appropriate tests. If the surfaces are found to be sufficiently alkaline to cause blistering and burning of the finish paint, correct this condition before application of paint. Do not paint over surfaces where the moisture content exceeds that permitted in the manufacturer's printed directions.

C. Wood

1) Clean wood surfaces to be painted of all dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other approved sealer, before application of the priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plaster wood-filler. Sandpaper smooth when dried.

2) Prime, stain, or seal wood required to be job painted immediately upon delivery to job. Prime edges, ends, face, undersides, and backsides of such wood, including cabinets, counters, cases, paneling, etc. When transparent finish is required, use spare varnish for backpriming.

D. Ferrous Metals: Clean ferrous surfaces which are not galvanized or shop-coated of all oil, grease, dirt, loose mill scale, and other foreign substances by solvent or mechanical cleaning.

E. Galvanized Surfaces: Clean free of oil and surface contaminants with an acceptable non-petroleum based solvent.

3.03 MATERIALS PREPARATION

A. Mix and prepare painting materials in accordance with manufacturer's directions.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.

C. Stir materials before application to produce a mixture of uniform density, and stir as required during the application of the materials. Do not stir surface film into the material. Remove the film and if necessary, strain the material before using.

3.04 APPLICATION

A. General

1) Apply paint in accordance with the manufacturer's directions. Use applicators and techniques best suited for the substrate and type of material being applied. Spraying of interior finishes not acceptable.
2) Apply additional coats when undercoats, stains or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. Give special attention to insure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

3) Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently-fixed equipment or furniture with prime coat only before final installation of equipment.

4) Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.

5) Paint the back sides of access panels, and removable or hinged covers to match the exposed surfaces.

6) Sand lightly between each succeeding enamel or varnish coat.

7) Omit the first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.

B. Scheduling Painting

1) Apply the first-coat material to surfaces that have been cleaned, pre-treated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

2) Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Minimum Coating Thickness: Apply each material at not less than the manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.

D. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

E. Transparent (Clear) Finishes

1) Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.

2) Provide satin finish for final coats, unless otherwise indicated.

F. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not in compliance with specified requirements.

3.05 CLEAN-UP AND PROTECTION

A. During the progress of the work, remove from the site all discarded paint materials, rubbish, cans, and rags at the end of each work day.

END OF SECTION 09 91 00

SECTION 09 96 00 – HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior high-performance paint and coatings systems including surface preparation.

1.2 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 04 20 00 - Unit Masonry: Concrete Masonry Units (CMU) and brick.

C. Section 05 12 16 - Fabricated Fireproofed Steel Columns.

D. Section 05 50 00 - Metal Fabrications.

E. Section 06 20 00 - Finish Carpentry.

F. Section 06 40 00 - Architectural Woodwork.

G. Section 08 11 13.16 - Custom Hollow Metal Doors and Frames.

H. Section 09 21 16.23 - Gypsum Board Shaft Wall Assemblies.

I. Section 23 05 00 - Common Work Results for HVAC.

J. Section 26 05 00 - Common Work Results for Electrical.

1.3 REFERENCES

A. Steel Structures Painting Council (SSPC):

1. SSPC-SP 1 - Solvent Cleaning.
2. SSPC-SP 2 - Hand Tool Cleaning.
3. SSPC-SP 3 - Power Tool Cleaning.
4. SSPC-SP5/NACE No. 1, White Metal Blast Cleaning.
5. SSPC-SP6/NACE No. 3, Commercial Blast Cleaning.
6. SSPC-SP7/NACE No. 4, Brush-Off Blast Cleaning.
7. SSPC-SP10/NACE No. 2, Near-White Blast Cleaning.
8. SSPC-SP11, Power Tool Cleaning to Bare Metal.
9. SSPC-SP12/NACE No. 5, Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating.
10. SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete.

B. Material Safety Data Sheets / Environmental Data Sheets: Per manufacturer's MSDS/EDS for specific VOCs (calculated per 40 CFR 59.406). VOCs may vary by base and sheen.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: For each paint system indicated, including.

1. Product characteristics.
2. Surface preparation instructions and recommendations.
3. Primer requirements and finish specification.
4. Storage and handling requirements and recommendations.
5. Application methods.
6. Cautions for storage, handling and installation.

C. Selection Samples: Submit a complete set of color chips that represent the full range of manufacturer's products, colors, and sheens available.

D. Verification Samples: For each finished product specified, submit samples that represent the actual product, color, and sheen.

E. Coating Maintenance Manual: Upon conclusion of project, the Contractor or paint manufacturer/supplier will furnish a coating maintenance manual. Manual will include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

F. Only submit complying products based on project requirements (i.e. LEED). One must also comply with the regulations regarding VOCs (CARB, OTC, SCAQMD, LADCO). To ensure compliance with district regulations and other rules, businesses that perform coating activities should contact the local district in each area where the coating will be used.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Paint exposed surfaces. If a color of finish, or a surface is not specifically mentioned, Architect will select from standard products, colors, and sheens available.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels unless indicated.

D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish surfaces for verification of products, colors, and sheens.
2. Finish area designated by Architect.
3. Provide samples that designate primer and finish coats.
4. Compatibility and Adhesion: Check after one week of drying and curing by testing in accordance with ASTM D3359; Adhesion by tape test. If the coating system is incompatible, additional surface preparation up to and including complete removal may be required.
5. Do not proceed with remaining work until the Architect approves the mock-up.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging will bear the manufacturer's name, label, and the following list of information.

1. Product name, and type (description).
2. Application and use instructions.
3. Surface preparation.
4. VOC content.
5. Environmental handling.
6. Batch date.
7. Color number.

B. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

C. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.

D. Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and, in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

B. Furnish Owner with an additional one percent of each material and color, but not less than 1 gal (3.8 l) or 1 case, as appropriate.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers offering products complying with requirements include the following:

1. Sherwin Williams
2. Pittsburgh Paints

B. Requests for substitutions will be considered in accordance with the provisions of Section 01 60 00 - Product Requirements.

2.2 APPLICATIONS/SCOPE

A. High-Performance Interior Paint and Coating Systems:

1. Masonry: Concrete masonry units, including split-face, scored, and smooth block.

2.3 PAINT MATERIALS - GENERAL

A. Paints and Coatings:

1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color. Or follow manufactures product instructions for optimal color conformance.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use a primer categorized as "best" by the manufacturer.

C. Coating Application Accessories: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer's specifications.

D. Color: Refer to Finish Schedule for paint colors, and as selected.

2.4 HIGH-PERFORMANCE INTERIOR PAINT AND COATING SYSTEMS

A. Masonry CMU: Concrete, Split Face, Scored, Smooth, High Density, Low Density, Fluted, and Stucco.

1. Epoxy System; Water based:

a. Gloss Finish:

1) Primer: S-W Extreme Bond Primer (B51W00150)
2) Intermediate Coat: S-W Pro Industrial WB Catalyzed Epoxy Gloss, B73-300 Series.
3) Topcoat: S-W Acrolon 100 (B65-420 Series)

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until the substrates have been properly prepared; notify Architect of unsatisfactory conditions

before proceeding. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

B. Proceed with work only after conditions have been corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

C. Previously Painted Surfaces: Verify that existing painted surfaces do not contain lead-based paints, notify Architect immediately if lead-based paints are encountered.

3.2 SURFACE PREPARATION

A. General: Surfaces will be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint, or other contamination to ensure good adhesion.

1. Prior to attempting to remove mildew, it is recommended to test any cleaner on a small, inconspicuous area prior to use. Bleach and bleaching type cleaners may damage or discolor existing paint films. Bleach alternative cleaning solutions are advised.
2. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply solution and scrub the mildewed area. Allow solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow the surface to dry before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.
3. Remove items including but not limited to thermostats, electrical outlets, switch covers and similar items prior to painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
4. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50 degrees F (10 degrees C), unless products are designed specifically for these conditions. On large expanses of metal siding, the air, surface, and material temperatures must be 50 degrees F (10 degrees F) or higher to use low temperature products.

B. Aluminum: Remove all oil, grease, dirt, oxide, and other foreign material by cleaning per SSPC-SP1, Solvent Cleaning.

C. Block (Cinder and Concrete): Remove all loose mortar and foreign material. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement, and hardeners. Concrete and mortar must be cured at least 30 days at 75 degrees F (24 degrees C). The pH of the surface should be between 6 and 9 unless the products are designed to be used in high pH environments. On tilt-up and poured-in-place concrete, commercial detergents and abrasive blasting may be necessary to prepare the surface. Fill bug holes, air pockets, and other voids with a cement patching compound.

D. Concrete, SSPC-SP13 or NACE 6: This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems. The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces. An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.

E. Cement Composition Siding/Panels: Remove all surface contamination by washing with an appropriate cleaner, rinse thoroughly and allow to dry. Existing peeled or checked paint should be scraped and sanded to a sound surface. Pressure clean, if needed, with a minimum of 2100 psi pressure to remove all dirt, dust, grease, oil, loose particles, laitance, foreign material, and peeling or defective coatings. Allow the surface to dry thoroughly. The pH of the surface should be between 6 and 9 unless the products are designed to be used in high pH environments.

F. Copper and Stainless Steel: Remove all oil, grease, dirt, oxide, and other foreign material by cleaning per SSPC-SP 2, Hand Tool Cleaning.

G. Exterior Composition Board (Hardboard): Some composition boards may exude a waxy material that must be removed with a solvent prior to coating. Whether factory primed or unprimed, exterior composition board siding (hardboard) must be cleaned thoroughly and primed with an alkyd primer.

H. Drywall - Exterior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth, and all dust removed prior to painting. Exterior surfaces must be spackled with exterior grade compounds.

I. Drywall - Interior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth, and all dust removed prior to painting.

J. Galvanized Metal: Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Apply to a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP16 is necessary to remove these treatments.

K. Plaster: Must be allowed to dry thoroughly for at least 30 days before painting unless the products are designed to be used in high pH environments. Room must be ventilated while drying; in cold, damp weather, rooms must be heated. Damaged areas must be repaired with appropriate patching material. Bare plaster must be cured and hard. Textured, soft, porous, or powdery plaster should be treated with a solution of 1 pint household vinegar to 1 gallon of water. Repeat until the surface is hard, rinse with clear water and allow to dry.

L. Steel: Structural, Plate, And Similar Items: Should be cleaned by one or more of the surface preparations described below. These methods are used throughout the world for describing methods for cleaning structural steel. Visual standards are available through the Society of Protective Coatings. A brief description of these standards together with numbers by which they can be specified follow.

1. Solvent Cleaning, SSPC-SP1: Solvent cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.
2. Hand Tool Cleaning, SSPC-SP2: Hand Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Beforehand tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
3. Power Tool Cleaning, SSPC-SP3: Power Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before power tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
4. White Metal Blast Cleaning, SSPC-SP5 or NACE 1: A White Metal Blast Cleaned surface, when viewed without magnification, will be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter. Before blast cleaning, visible deposits of oil or grease will be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
5. Commercial Blast Cleaning, SSPC-SP6 or NACE 3: A Commercial Blast Cleaned surface, when viewed without magnification, will be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining will be limited to no more than 33 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease will be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
6. Brush-Off Blast Cleaning, SSPC-SP7 or NACE 4: A Brush-Off Blast Cleaned surface, when viewed without magnification, will be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose paint. Tightly adherent mill scale, rust, and paint may remain on the surface. Before blast cleaning, visible deposits of oil or grease will be removed by any of the methods specified in SSPC-SP 1 or other agreed upon methods.
7. Power Tool Cleaning to Bare Metal, SSPC-SP11: Metallic surfaces that are prepared according to this specification, when viewed without magnification, will be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxide corrosion products, and other foreign matter. Slight residues of rust and paint may be left in the lower portions of pits if the original surface is pitted. Prior to power tool surface preparation, remove visible deposits of oil or grease by any of the methods specified in SSPC-SP1, Solvent Cleaning, or other agreed upon methods.
8. Near-White Blast Cleaning, SSPC-SP10 or NACE 2: A Near White Blast Cleaned surface, when viewed without magnification, will be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining will be limited to no more than 5 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease will be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
9. High- and Ultra-High Pressure Water Jetting for Steel and Other Hard Materials: SSPC-SP12 or NACE 5: This standard provides requirements for the use of high- and ultra-high pressure water jetting to achieve various degrees of surface cleanliness. This standard is limited in scope to the use of water only without the addition of solid particles in the stream.
10. Water Blasting, SSPC-SP12/NACE No. 5: Removal of oil grease dirt, loose rust, loose mill scale, and loose paint by water at pressures of 2,000 to 2,500 psi at a flow of 4 to 14 gallons per minute.

M. Vinyl Siding, Architectural Plastics, EIFS and Fiberglass: Clean vinyl siding thoroughly by scrubbing with a warm, soapy water solution. Rinse thoroughly. Do not paint vinyl siding with any color darker than the original color. Painting with darker colors may cause siding to warp. Follow all painting guidelines of the vinyl manufacturer when painting. Only paint properly installed vinyl siding. Deviating from the manufacturer's painting guidelines may cause the warranty to be voided.

N. Stucco: Must be clean and free of any loose stucco. If recommended procedures for applying stucco are followed, and normal drying conditions prevail, the surface may be painted in 30 days. The pH of the surface should be between 6 and 9 unless the products are designed to be used in high pH environments such as Loxon.

O. Wood: Must be clean and dry. Prime and paint as soon as possible. Knots and pitch streaks must be scraped, sanded, and spot primed before a full priming coat is applied. Patch all nail holes and imperfections with a wood filler or putty and sand smooth.

3.3 INSTALLATION

A. Apply all coatings and materials with the manufacturer's specifications in mind. Mix and thin coatings according to manufacturer's recommendations.

B. Do not apply it to wet or damp surfaces. Wait at least 30 days before applying to new concrete or masonry. Or follow manufacturer's procedures to apply appropriate coatings prior to 30 days. Test new concrete for moisture content. Wait until wood is fully dry after rain or morning fog or dew.

C. Apply coatings using methods recommended by manufacturer.

D. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

E. Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness.

F. Regardless of the number of coats specified, apply as many coats as necessary for complete hide, and uniform appearance.

G. Inspection: The coated surface must be inspected and approved by the Architect just prior to the application of each coat.

3.4 PROTECTION

A. Protect finished coatings from damage until completion of project.

B. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

END OF SECTION 09 96 00

SECTION 10 21 13 – TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes toilet compartments and screens as follows:

1. Type: Solid-plastic, phenolic core.
2. Compartment Style: Floor supported with headrail.
3. Screen Style: Partition mounted to wall and pilasters.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related Sections include the following:

1. Section 05 50 00 Metal Fabrications: Supports that attach units to overhead structural system.

C. Section 10 28 00 Toilet and Bath Accessories: Toilet paper holders, grab bars, purse shelves, and similar accessories.

1.3 SUBMITTALS

A. Product Data: For each type and style of toilet compartment and screen specified. Include details of construction relative to materials, fabrication, and installation. Include details of anchors, hardware, and fastenings.

B. Shop Drawings: For fabrication and installation of toilet compartment and screen assemblies. Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of reinforcement and cutouts for compartment-mounted toilet assemblies.

C. Samples for Initial Selection: Manufacturer's color charts consisting of sections of actual units showing the full range of colors, textures, and patterns available for each type of compartment or screen indicated.

D. Samples for Verification: Of each compartment or screen color and finish required, prepare on 6-inch-square Samples of same thickness and material indicated for Work.

1.4 PROJECT CONDITION

A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Establish Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to establish dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bobrick Washroom Equipment
2. Crane Plumbing: Sanymetal
3. General Partitions Mfg. Corp.
4. Metpar Corp.
5. Partition Systems, Inc.; Columbia Partitions

2.2 MATERIALS

A. General: Provide materials that have been selected for surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are unacceptable.

B. Solid-Plastic, Phenolic Core: Solid phenolic core with melamine facing on both sides, fused to substrate without visible glue line or seam. Provide units with eased edges and with minimum ¾-inch-thick doors and pilasters and minimum 1/2-inch-thick panels and screens. Provide melamine color as follows:

1. Color: As selected by Architect.

C. Pilaster Shoes and Sleeves (Caps): ASTM A 666, Type 302 or 304 stainless steel, not less than 0.0312 inch thick and 3 inches high, finished to match hardware.

D. Full-Height (continuous) Brackets: Manufacturer's standard design for attaching panels and screens to walls and pilasters of the following material:

1. Material: Clear-anodized aluminum or stainless steel.

E. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories of the following material.

1. Material: Stainless steel.

F. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile in manufacturer's standard finish.

G. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip in manufacturer's standard finish.

H. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

A. General: Provide standard doors, panels, screens, and pilasters fabricated for compartment system. Provide units with cutouts and drilled holes to receive compartment-mounted hardware, accessories, and grab bars, as indicated.

B. Floor Supported Compartments: All S.P.C. (Solid Phenolic Core) partitions shall be floor supported with headrail. Doors – Shall be manufactured of solid phenolic core material 3/4in. thick with high pressure matte finish melamine surfaces. Edges shall be black. Panels – Shall be same construction as doors –

1/2in. thick. Pilasters – Shall be 3/4in. solid phenolic core material. Same construction as doors and panels. Pilasters are to be anchored to floor with standard 3/8in. threaded rod, hex nuts and washers to provide vertical adjustments and necessary strength. Pilasters – Shall be 3/4in. (1in. available) thick solid phenolic core material. Same construction as doors and panels. Pilasters are to be anchored to the floor with heavy gauge angle. Top of pilasters to be securely braced with extruded aluminum headrail with integral crown loafer rail. Headrail – To be 17/8in. x 13/16in. x 1/16in. with integral crown loafer rail, extruded aluminum heat-treated and anodized with necessary fittings.

C. Doors: Unless otherwise indicated, provide 24inch-wide in-swinging doors for standard toilet compartments and 36-inch-wide out-swinging doors with a minimum 32-inch-wide clear opening for compartments indicated to be handicapped accessible.

1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold door open at any angle up to 90 degree.
2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit with combination rubber-faced door strike and keeper designed for emergency access. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
4. Door Bumper: Manufacturer's standard rubber-tipped bumpers at out-swinging doors or entrance screen doors.
5. Door Pull: Manufacturer's standard unit that complies with accessibility requirements of authorities having jurisdiction at out-swinging doors. Provide units on both sides of doors at compartments indicated to be handicapped accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, plumb, and level. Provide clearances of not more than 1/2 inch between pilasters and panels and not more than 1 inch between panels and walls. Secure units in position with manufacturer's recommended anchoring devices.

1. Secure panels to walls and panels with not less than 2 stirrup brackets attached near top and bottom of panel. Locate wall brackets so holes for wall anchors occur in masonry or tile joints. Align brackets at pilasters with brackets at walls.

B. Floor Supported Compartments: Secure pilasters to supporting structure and level, plumb, and tighten. Hang doors and adjust so bottoms of doors are level with bottoms of pilasters when doors are in closed position.

3.2 ADJUSTING AND CLEANING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instruction for proper operation. Set hinges on in-swing doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.

B. Provide final protection and maintain conditions that ensure toilet compartments and screens are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10 21 13

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SECTION 10 28 00 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Public-use washroom accessories.
2. Private-use bathroom accessories.
3. Warm-air dryers.
4. Underlavatory guards.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule:

1. Identify locations using room designations indicated on Drawings.

2. Identify products using designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 PUBLIC-USE WASHROOM ACCESSORIES

A. Manufacturers:

B. Basis-of-Design Product: The design for accessories is based on Bradley Corporation products indicated and shown on the Drawings. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. Bobrick Washroom Equipment, Inc.
2. The Charles Parker Co.

C. Grab Bars:

1. Basis-of-Design Product: Bradley Corporation equipment.
2. Mounting: Flanges with exposed fasteners.
3. Material: Stainless steel, 0.05 inch (1.3 mm) thick.

a. Finish: Smooth, No. 4, satin finish

4. Outside Diameter: 1-1/2 inches (38 mm).
5. Configuration and Length: As indicated on Drawings

D. Mirror Unit:

1. Basis-of-Design Product: Bradley Corporation standard Model 780-2436.

2. Size: 24”x 36”

E. Combination Paper Towel Dispenser and Waste Receptacle

1. Basis-of-Design Product: Bradley Corporation B38034 Recessed Paper Towel Dispenser and Waste Receptacle.
Recessed paper towel dispenser and waste receptacle shall be type-304 stainless steel with all-welded construction; exposed surfaces shall be satin finish. Door shall be 18 gauge (1.2 mm); have 9/16” (14 mm) 90° return edges; be secured to cabinet with a concealed, full-length stainless steel piano-hinge; and equipped with a stainless steel cable door-swing limiter and two tumbler locks keyed like other Bobrick washroom accessories. Paper towel dispenser shall dispense 600 C-fold, 800 multifold, or 1100 singlefold paper towels. Waste receptacle shall be furnished with a removable, leak-proof, rigid molded plastic waste-container with a capacity of 3.8-gal (14.4 L).

F. Combination Unit

1. Basis-of-Design Product: Bradley Corporation 5912 Combination Unit.
Recessed combination unit shall include toilet seat cover dispenser, toilet tissue dispenser, and napkin disposal, and be fabricated of heavy gauge stainless steel with seamless exposed surface in satin finish. Door and back panel shall be 18 gauge. Door shall have piano hinge and tumble lock.
Overall dimensions: 17 1/8” W x 30 5/8” H x 4 ½” D.

G. Soap Dispenser

1. Basis-of-Design Product: Bobrick Model B-42, Surface-Mounted Soap Dispenser.
All black. Valve dispenses all-purpose soaps. Vandal-resistant lid has keyless locking device, pivots up for easy top filling. Translucent container provides visible soap level. Capacity 40 fl oz.

H. Baby Changing Station

1. Basis-of Design Product: Koala Kare KB110-SSRE, horizontal recessed mounted stainless steel finish baby changing station. Provide named product or equal.
2. Baby changing station body shall have 18 gauge, type 304 satin stainless steel exterior finish with high-density grey polyethylene interior. Design of unit shall be recess-mounted. Unit shall be equipped with a pneumatic cylinder for controlled opening and closing of bed. Bed shall be secured to back plate with a concealed, full-length steel-on-steel hinge. Unit shall have Microban® antimicrobial embedded into plastic material. No hinge structure shall be exposed on interior or exterior surfaces.

2.2 PRIVATE-USE BATHROOM ACCESSORIES

A. Manufacturers:

B. Basis-of-Design Product: The design for accessories is based on Bradley Corporation products indicated and shown on the Drawings. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. American Bathroom Accessories, Inc.
2. Bobrick Washroom Equipment, Inc.

2.3 CUSTODIAL ACCESSORIES

A. Manufacturers:

B. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. General Accessory Manufacturing Co. (GAMCO).

C. Mop and Broom Holder

1. Basis-of-Design Product:
2. Description: Unit with shelf, hooks, Bradley Model 9933 holders.
3. Length: 36 inches (914 mm)]
4. Hooks: Three
5. Mop/Broom Holders: Four**,** spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, No. 4 finish (satin).

   a. Shelf: Not less than nominal 0.05-inch- (1.3-mm-) thick stainless steel.

D. Paper Towel (Folded) Dispenser Typical:

2.4 FABRICATION

A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

END OF SECTION 10 28 00

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SECTION 10 44 13 - FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes fire protection cabinets for portable fire extinguishers.

B. This section includes key lock boxes for emergency building access.

C. Related sections include Division 10 Section "Fire Extinguishers".

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.

2. Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size 6 by 6 inches square.

D. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

E. Meeting Records: Minutes of pre-installation conference.

1.4 QUALITY ASSURANCE

Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to fire protection cabinets including, but not limited to, schedules and coordination requirements.

1.5 COORDINATION

A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

B. Stainless-Steel Sheet: ASTM A 666, Type 304.

C. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.2 FIRE PROTECTION CABINET

A. Basis-of-Design Product: The design for fire protection cabinets is based on "Architectural Series" by Larsen's Manufacturing Company. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following:

1. JL Industries, Inc.
2. Potter Roemer; Div. of Smith Industries, Inc.

B. Cabinet Type: FE-1: Larsen's Model No. 2409-R3

FE-2: Larsen's Model No. 2720-RL

C. Cabinet Construction: Nonrated.

D. Cabinet Material: Enameled-steel sheet.

E. Recessed Cabinet:

1. Cabinet box semi-recessed in walls of sufficient depth to suit style of trim indicated.
2. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend) of 1/4 to 5/16 inch.

F. Cabinet Trim Material: Stainless-steel sheet.

G. Door Material: Stainless-steel sheet.

H. Door Style: Vertical duo panel with frame.

I. Door Glazing: Tempered float glass (clear).

J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide projecting lever handle with cam-action latch.
2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

K. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.

L. Finishes:

1. Steel: brushed stainless steel.

2.3 FABRICATION

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.
3. Prepare doors and frames to receive locks.
4. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 KEY LOCK BOX – NOT USED FOR THIS PROJECT

A. Provide and install recessed key lock box for emergency building access at location to be determined by the architect.

1. Exterior Dimensions: Recessed Mount Flange – 9 ½" H x 9 ½" W.
2. Lock: UL Listed. Double-action rotating tumblers and hardened steel pins accessed by a biased cut key.
3. Finish: Knox-Coat proprietary finishing process.
4. Product: KnoxVault 4400 by Knox Company.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 STEEL FINISHES

A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.

B. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

Prepare recesses for recessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General:

1. Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
2. Fire Protection Cabinets: 54 inches above finished floor to top of cabinet.

B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semi-recessed fire protection cabinets.
2. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

C. Identification: Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 44 13

SECTION 10 44 16 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

B. Related Sections: Division 10 Section "Fire Extinguisher Cabinets".

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

B. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

C. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Code Compliance: Fabricate and label fire extinguishers to comply with IBCCI and NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1.5 COORDINATION

Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.6 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.

b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. J. L. Industries, Inc.; a division of Activar Construction Products Group.

b. Larsen's Manufacturing Company.

c. Potter Roemer LLC.

2. Handles and Levers: Manufacturer's standard.

3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 2-A:10-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.2 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

2. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

B. Remove and replace damaged, defective, or undercharged fire extinguishers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

2. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 10 44 16

SECTION 21 10 00 - WATER-BASED FIRE-SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SYSTEM DESCRIPTIONS

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

1.3 PERFORMANCE REQUIREMENTS

A. Standard Piping System Component Working Pressure: Listed for at least 175 psig.

B. Fire-suppression sprinkler system design shall be approved by authorities having jurisdiction.

1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
2. Sprinkler Occupancy Hazard Classifications:

    a. Building Service Areas: Ordinary Hazard, Group 1.
    b. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
    c. General Storage Areas: Ordinary Hazard, Group 1.
    d. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
    e. Office and Public Areas: Light Hazard.
    f. General classrooms: Light Hazard
    g. Science Labs: Ordinary Hazard Group 1.

3. Minimum Density for Automatic-Sprinkler Piping Design:

    a. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
    b. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.
    c. Light - Hazard Occupancy: 0.10 gpm over 1500 - sq. ft. area

4. Maximum Protection Area per Sprinkler: Per UL listing.
5. Maximum Protection Area per Sprinkler:

    a. Office Spaces and Classrooms: 150 sq. ft
    b. Storage Areas: 130 sq. ft. Mechanical Equipment Rooms: 130 sq. ft
    c. Electrical Equipment Rooms: 130 sq. ft
    d. Other Areas: According to NFPA 13 recommendations, unless otherwise indicated.

6. Total Combined Hose-Stream Demand Requirement: According to NFPA 13, unless otherwise indicated:

a. Light Hazard Occupancies: 100 gpm for 60 to 90 minutes.
b. Ordinary-Hazard Occupancies: 250 gpm for 60 to 90 minutes.

C. Seismic Performance: Fire-suppression piping shall be capable of withstanding the effects of earthquake motions determined according to NFPA 13 and ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads." Seismic bracing shall be determined by site classification in IBC Chapter 16. Seismic design category for this project is “C”, Site Class C, CD, & D.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing fire-suppression systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test performed by sprinkler subcontractor.

B. NFPA Standards: Fire-suppression-system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13, "Installation of Sprinkler Systems."

1.5 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounting, steel cabinet with hinged cover, with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler on Project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include but are not limited to, manufacturers specified.

2.2 STEEL PIPE AND FITTINGS

A. Threaded-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, with factory- or field-formed threaded ends.

1. Cast-Iron Threaded Flanges: ASME B16.1.
2. Malleable-Iron Threaded Fittings: ASME B16.3.
3. Gray-Iron Threaded Fittings: ASME B16.4.
4. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe. Include ends matching joining method.
5. Steel Threaded Couplings: ASTM A 865.

B. Grooved-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, hot-dip galvanized where indicated and with factory- or field-formed, roll-grooved ends.

1. Grooved-Joint Piping Systems:

a. Available Manufacturers:

1) Central Sprinkler Corp.
2) Shurjoint Piping Products, Inc.
3) Victaulic Co. of America.

b. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD.
c. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, rubber gasket listed for use with housing, and steel bolts and nuts.

C. Threadable, Thinwall Steel Pipe: ASTM A 135 or ASTM A 795, with wall thickness less than Schedule 40 and greater than Schedule 10.

1. Cast-Iron Threaded Fittings.
2. Ductile-Iron Threadable Fittings.
3. Grooved End Couplings and Fittings.

2.3 DIELECTRIC FITTINGS

A. Assembly shall be copper alloy, ferrous, and insulating materials with ends matching piping system.

B. Dielectric Unions: Factory-fabricated assembly, designed for 250-psig minimum working pressure at 180 deg F Include insulating material that isolates dissimilar materials and ends with inside threads according to ASME B1.20.1.

1. Available Manufacturers:

a. Capitol Manufacturing Co.
b. Watts Industries, Inc.; Water Products Div.
c. Zurn Industries, Inc.; Wilkins Div.

C. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 175-psig minimum working-pressure rating as required for piping system.

1. Available Manufacturers:

   a. Capitol Manufacturing Co.
   b. Epco Sales, Inc.
   c. Watts Industries, Inc.; Water Products Div.

D. Dielectric Flange Insulation Kits: Components for field assembly shall include CR or phenolic gasket, PE or phenolic bolt sleeves, phenolic washers, and steel backing washers.

1. Available Manufacturers:

   a. Advance Products and Systems, Inc.
   b. Central Plastics Company.
   c. Pipeline Seal and Insulator, Inc.

E. Dielectric Couplings: Galvanized steel with inert and noncorrosive thermoplastic lining and threaded ends and 300-psig working-pressure rating at 225 deg F

1. Available Manufacturers:

   a. Calpico, Inc.
   b. Lochinvar Corp.
   c. Central Plastics Company.

F. Dielectric Nipples: Electroplated steel with inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved ends and 300-psig working-pressure rating at 225 deg F

1. Available Manufacturers:

   a. Perfection Corporation.
   b. Precision Plumbing Products, Inc.
   c. Victaulic Co. of America.

2.4 SPRINKLER SPECIALTY FITTINGS

A. Sprinkler Drain and Alarm Test Fittings: Cast- or ductile-iron body; with threaded or locking-lug inlet and outlet, test valve, and orifice and sight glass.

1. Available Manufacturers:

   a. Central Sprinkler Corp.
   b. Viking Corp.
   c. Victaulic Co. of America.

B. Sprinkler Branch-Line Test Fittings: Brass body with threaded inlet, capped drain outlet, and threaded outlet for sprinkler.

1. Available Manufacturers:

   a. Elkhart Brass Mfg. Co., Inc.
   b. Fire-End and Croker Corp.
   c. Potter-Roemer; Fire-Protection Div.

C. Sprinkler Inspector's Test Fitting: Cast- or ductile-iron housing with threaded inlet and drain outlet and sight glass.

1. Available Manufacturers:

a. AGF Manufacturing Co.
b. Central Sprinkler Corp.
c. Triple R Specialty of Ajax, Inc.

2.5 LISTED FIRE-PROTECTION VALVES

A. Valves shall be UL listed, with 175-psig minimum pressure rating. Valves shall have 250-psig minimum pressure rating if valves are components of high-pressure piping system.

B. Ball Valves: Comply with UL 1091, except with ball instead of disc.

1. NPS 1-1/2 and Smaller: Bronze body with threaded ends.
2. NPS 2 and NPS 2-1/2 Bronze body with threaded ends or ductile-iron body with grooved ends.
3. NPS 3 Ductile-iron body with grooved ends.

4. Available Manufacturers:

a. NIBCO.
b. Victaulic Co. of America.
c. Apollo.

C. Butterfly Valves: UL 1091.

1. NPS 2and Smaller: Bronze body with threaded ends.

a. Available Manufacturers:

1) Global Safety Products, Inc.
2) Milwaukee Valve Company.
3) NIBCO

2. NPS 2-1/2and Larger: Bronze, cast-iron, or ductile-iron body; wafer type or with flanged or grooved ends.

a. Available Manufacturers:

1) Central Sprinkler Corp.
2) McWane, Inc.; Kennedy Valve Div.
3) NIBCO.

D. Check Valves NPS 2and Larger: UL 312, swing type, cast-iron body with flanged or grooved ends.

1. Available Manufacturers:

a. Clow Valve Co.
b. Grinnell Fire Protection.
c. Hammond Valve.
d. Mueller Company.

E. Gate Valves: UL 262, OS&Y type.

1. NPS 2and Smaller: Bronze body with threaded ends.

a. Available Manufacturers:

1) Crane Co.; Crane Valve Group; Crane Valves.
2) Hammond Valve.
3) NIBCO.

2. NPS 2-1/2and Larger: Cast-iron body with flanged ends.

a. Available Manufacturers:

1) Milwaukee Valve Company.
2) Mueller Company.
3) NIBCO.

F. Indicating Valves: UL 1091, with integral indicating device and ends matching connecting piping.

1. NPS 2-1/2and Larger: Butterfly valve with cast- or ductile-iron body; wafer type or with flanged or grooved ends, indicating post. Provide with tamper switch.

a. Available Manufacturers:

1) Central Sprinkler Corp.
2) Grinnell Fire Protection.
3) Victaulic Co. of America.

2.6 UNLISTED GENERAL-DUTY VALVES

A. Ball Valves NPS 2and Smaller: MSS SP-110, 2-piece copper-alloy body with chrome-plated brass ball, 600-psig minimum CWP rating, blowout-proof stem, and threaded ends.

B. Check Valves NPS 2and Smaller: MSS SP-80, Type 4, Class 125 minimum, swing type with bronze body, nonmetallic disc, and threaded ends.

C. Gate Valves NPS 2and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, solid wedge, and threaded ends.

D. Globe Valves NPS 2and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, nonmetallic disc, and threaded ends.

2.7 SPECIALTY VALVES

A. Sprinkler System Control Valves: UL listed cast- or ductile-iron body with flanged or grooved ends, and 175-psig minimum pressure rating.

1. Available Manufacturers:

a. Grinnell Fire Protection.
b. Victaulic Co. of America.
c. Viking Corp.

2.8 SPRINKLERS

A. Sprinklers shall be UL listed, with 175-psig minimum pressure rating.

B. Available Manufacturers:

1. Central Sprinkler Corp.
2. Grinnell Fire Protection.
3. Victaulic Co. of America.

C. Automatic Sprinklers: With heat-responsive element complying with the following:

1. UL 199, for nonresidential applications.

D. Sprinkler Types and Categories: Nominal 1/2-inch orifice for "Ordinary" temperature classification rating, unless otherwise indicated or required by application.

E. Sprinkler Finishes: Chrome plated, unless noted otherwise.

F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, one piece, flat.
2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

G. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler.

2.9 BACKFLOW PREVENTERS

A. Double-Check, Backflow Preventers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Ames Co.
   b. FEBCO; SPX Valves & Controls.
   c. Watts Industries, Inc.; Water Products Div.

2. Standard: ASSE 1048 and FMG approved, or UL listed.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
5. Size: 6”
6. Body: Cast iron with interior lining complying with AWWA C550 or that is FDA approved.
7. End Connections: Flanged.
8. Configuration: Designed for vertical flow.
9. Accessories:

   a. Valves: Outside screw and yoke gate-type with flanged ends on inlet and outlet with tamper switch.

2.10 FIRE DEPARTMENT CONNECTIONS

A. Available Manufacturers:

1. Central Sprinkler Corp.
2. Elkhart Brass Mfg. Co., Inc.
3. Guardian Fire Equipment Incorporated.
4. Potter-Roemer; Fire-Protection Div.

B. Wall Type, Fire Department Connection: UL 405, 175-psig minimum pressure rating; with corrosion-resistant-metal body with brass inlets, brass lugged caps with gaskets and brass chains, and brass lugged swivel connections. Include inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, outlet with pipe threads, extension pipe nipples, check devices or clappers for inlets, and escutcheon plate with marking similar to "AUTO SPKR."

1. Type: Exposed, projecting, with two inlets.
2. Finish: Rough chrome-plated.

2.11 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Electrically Operated Alarm: UL 464, with 8-inch-minimum- diameter, vibrating-type, metal alarm bell with red-enamel factory finish and suitable for outdoor use.

1. Available Manufacturers:

a. Potter Electric Signal Company.
b. System Sensor.
c. Grinnell Fire Protection.

C. Water-Flow Indicator: UL 346, electrical-supervision, paddle-operated-type, water-flow detector with 250-psig pressure rating and designed for horizontal or vertical installation. Include two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.

1. Available Manufacturers:

a. Grinnell Fire Protection.
b. ITT McDonnell & Miller.
c. Potter Electric Signal Company.
d. System Sensor.

D. Valve Supervisory Switch: UL 753, electrical, single-pole, double-throw switch with normally closed contacts. Include design that signals controlled valve is in other than fully open position.

1. Available Manufacturers:

a. McWane, Inc.; Kennedy Valve Div.
b. Potter Electric Signal Company.
c. System Sensor.

E. Indicator-Post Supervisory Switch: UL 753, electrical, single-pole, double-throw switch with normally closed contacts. Include design that signals controlled indicator-post valve is in other than fully open position.

1. Available Manufacturers:

a. Potter Electric Signal Company.
b. System Sensor.
c. Grinnell Fire Protection.

2.12 PRESSURE GAGES

A. Available Manufacturers:

1. AGF Manufacturing Co.
2. AMETEK, Inc.; U.S. Gauge.
3. Dresser Equipment Group; Instrument Div.

B. Description: UL 393, 3-1/2- to 4-1/2-inch diameter, dial pressure gage with range of 0 to 250 psig minimum.

1. Water System Piping: Include caption "WATER" on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in Part 1 "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.2 PIPING APPLICATIONS, GENERAL

A. Flanges, flanged fittings, unions, nipples, and transition and special fittings with finish and pressure ratings same as or higher than system's pressure rating may be used in aboveground applications, unless otherwise indicated.

B. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends; cast- or malleable-iron threaded fittings; and threaded joints.

3.3 SPRINKLER SYSTEM PIPING APPLICATIONS

A. Standard-Pressure, Wet-Pipe Sprinkler System, 175-psig Maximum Working Pressure:
1. NPS 1-1/2 and Smaller: Threaded-end, black, standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.

2. NPS 2 Threaded-end, black, standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
3. NPS 2 Grooved-end, black, standard-weight steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

3.4 JOINT CONSTRUCTION

A. Refer to Division 21 Section "Common Work Results for Fire Suppression" for basic piping joint construction.

B. Threaded Joints: Comply with NFPA 13 for pipe thickness and threads. Do not thread pipe smaller than NPS 8 (DN 200) with wall thickness less than Schedule 40 unless approved by authorities having jurisdiction and threads are checked by a ring gage and comply with ASME B1.20.1.

C. Grooved Joints: Assemble joints with listed coupling and gasket, lubricant, and bolts.

1. Steel Pipe: Square-cut or roll-groove piping as indicated. Use grooved-end fittings and rigid, grooved-end-pipe couplings, unless otherwise indicated.

D. Dissimilar-Metal Piping Joints: Construct joints using dielectric fittings compatible with both piping materials.

1. NPS 2 and Smaller: Use dielectric unions, couplings, or nipples.
2. NPS 2-1/2 to NPS 4 Use dielectric flanges.
3. NPS 5and Larger: Use dielectric flange insulation kits.

3.5 SERVICE-ENTRANCE PIPING

A. Connect fire-suppression piping to water-service piping of size and in location indicated for service entrance to building.

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping.

3.6 PIPING INSTALLATION

A. Refer to Division 21 Section "Common Work Results for Fire Suppression" for basic piping installation.

B. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

C. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

D. Install unions adjacent to each valve in pipes NPS 2 and smaller. Unions are not required on flanged devices or in piping installations using grooved joints.

E. Install flanges or flange adapters on valves, apparatus, and equipment having NPS 2-1/2 and larger connections.

F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, sized and located according to NFPA 13.

G. Install sprinkler piping with drains for complete system drainage.

H. Install ball drip valves to drain piping between fire department connections and check valves. Drain to floor drain or outside building.

I. Install alarm devices in piping systems.

J. Hangers and Supports: Comply with NFPA 13 for hanger materials.

1. Install sprinkler system piping according to NFPA 13.

K. Earthquake Protection: Install piping according to NFPA 13 AND International Building Code, Chapter 16, to protect from earthquake damage. Bracing requirements shall be determined by building site classification.

L. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS ¼and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal and install where they will not be subject to freezing.

M. Fill wet-pipe sprinkler system piping with water.

3.7 VALVE INSTALLATION

A. Install listed fire-protection valves, unlisted general-duty valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections. Install permanent identification signs indicating portion of system controlled by each valve.

3.8 SPRINKLER APPLICATIONS

A. Drawings indicate sprinkler types to be used.

3.9 TESTING

A. All piping in the sprinkler system, both inside and outside of the building, shall be tested at a water pressure of 200 psi for a period of not less than two hours. All bracing shall be in place and air shall be removed from the system through the hydrants, drain valves, etc., before the test pressure is applied.

3.10 CLEANING

A. During the progress of the work, keep the premises reasonably clean as regards trash, debris, etc., caused by his materials and workmen. After all work has been completed and prior to final inspection, all equipment shall be thoroughly cleaned and all trash and debris removed from the job site.

3.11 INSTALLATION

A. All sprinkler work including the installation of dedicated underground fire main shall be installed by a Licensed Registered Fire Protection Contractor. Underground fire mains and hydrants shall be installed and in service prior to construction.

B. Install piping with ample flexibility to permit free expansion and contraction of pipework without putting excessive stress on piping, supports, or equipment, or causing damage or breakage. Do not bend any pipe. Ream pipe ends after cutting pipe. For threaded joints, use suitable non-hardening tape. Screw flanges to cast iron and ductile iron pipe; screw or weld flanges to steel pipe.

C. Pipe passing under building grade beams shall have a 6 inch minimum clearance to prevent possible damage from building settlement.

D. Pipe passing through building walls and building floors below grade shall be provided with sleeves of standard weight galvanized steel pipe. The annular spaces between pipe and sleeves shall be sealed with link seal hydro-static pipe wall seal. Sleeves shall be sized as follows:

3" pipe - 8" ID sleeve
4" pipe - 10" ID sleeve
6" pipe - 12" ID sleeve

E. Before permanently filling the site fire water system with water and before connections are made to the automatic sprinkler risers, all parts of the system to be thoroughly flushed until water runs clear. Minimum flow during flushing shall be as follows:

PIPE SIZE	FLOW GPM
3	300
4	400
6	750

F. Install sprinklers in suspended ceiling where indicated on plans. Heads shall be center of tile in 2’ x 2’ tiles.

G. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing. Use dry-type sprinklers with water supply from heated space.

H. System shall be hydraulically calculated by a licensed sprinkler contractor.

I. All areas shown on the Architectural drawings shall be provided with automatic sprinkler protection.

J. Sprinkler protection in freezers, cold rooms, and like occupancies shall be provided with automatic sprinkler protection and dry pendent heads shall be utilized.

K. Sprinkler heads subject to mechanical damage shall be provided with approved type wire guards.

L. All sprinkler heads installed for light hazard occurancy shall be quick response type in accordance with N.F.P.A. 13.

3.12 AS-BUILT DRAWINGS

A. Contractor shall keep an accurate record of the location of all site fire water lines and site potable water lines installed by him and shall provide Owner upon completion of work with a drawing showing all location dimensions and elevations.

3.13 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Connect water-supply piping to fire-suppression piping. Include backflow preventer between potable-water piping and fire-suppression piping.

D. Install ball drip valves at each check valve for fire department connection. Drain to floor drain or outside building.

E. Connect piping to specialty valves, hose valves, specialties, fire department connections, and accessories.

F. Connect alarm devices to fire alarm.

G. Connect wiring according to “Low-Voltage Electrical Power Conductors and Cables."

3.14 LABELING AND IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

3.15 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Energize circuits to electrical equipment and devices.
4. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
5. Coordinate with fire alarm tests. Operate as required.
6. Verify that equipment hose threads are same as local fire department equipment.

B. Report test results promptly and in writing to Architect and authorities having jurisdiction.

3.16 DEMONSTRATION

A. Engage an authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

END OF SECTION 21 10 00

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SECTION 21 10 10 - ELECTRIC-DRIVE, IN-LINE FIRE PUMPS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide a UL/FM Fire Pump to deliver not less than 150% of rated capacity as scheduled on the drawings, at a pressure not less than 65% of rated head. Shutoff pressure should not exceed 120% of the rated pressure. Jockey pump shall deliver 10 psi TDH more than fire pump.

PART 2 - PRODUCTS

2.1 FIRE PUMP

A. Pump to be horizontal split-case. See plans for required performance criteria.

B. Acceptable Manufacturers: Peerless, Aurora, Allis-Chalmers, Fairbanks Morse.

C. Pump unit to meet all requirements of NFPA Pamphlet No. 20 and shall be listed by the UL or approved by the Associated Factory Mutual Fire Insurance Companies.

D. The following accessories to be included with pump unit:

1. Eccentric tapered suction reducer.
2. Concentric tapered discharge increaser.
3. Hose valve head.
4. Hose valves, caps, and chain with local Fire Department hose thread (test manifold connection).
5. 3/4" casing relief valve.
6. Suction and discharge gauges.
7. Automatic air release valve.
8. Pump and driver to be mounted on a common base plate of either cast iron or fabricated steel and direct connected through a flexible coupling.
9. Driver shall be an electric motor of the open drip proof type wound for 208-volt 3-phase, 60-cycle current. Motor to be of such capacity that 110% of full-load amp rating shall not be exceeded at any condition of pump load. Motor winding shall be closed transition wye-delta. Coordinate motor requirements with controller specification.
10. System pressure relief valve. Valve size to be determined by the pump manufacturer.
11. Test header.

E. With an ambient temperature not exceeding 40 degrees C, motor to be designed for a temperature rise not exceeding 40 degrees C when carrying full rated load continuously and be capable of operating continuously with an overload of 15% without stress or injurious rise in temperature. Locked rotor current shall not exceed the values specified in NFPA Pamphlet No. 20.

F. Bearings to be antifriction ball or roller type.

2.2 CONTROLLER

A. Fire and jockey pump controllers to be completely assembled, wired, and tested at factory; and assembly to be specifically listed for fire pump and jockey pump service. Controllers to be marked "Fire Pump Controller" and "Jockey Pump Controller".

B. Acceptable Manufacturers: Firetrol, Master, Joslyn-Clark, Metron.

C. All equipment to be enclosed in one or more approved NEMA 3R or 4 enclosure(s).

D. The controllers shall be of the combined manual and automatic wye-delta, electronic closed transition type incorporating the following:

1. Disconnect Switch: Externally operable, quick-break type.
2. Circuit Breaker: Time delay type with trips in all phases set for 300% of the motor full-load current. Reference Division 26 plans and specifications for fault current ratings.
3. Pressure switches.
4. Running Period Timer: Set to keep motor in operation when started automatically for a minimum of 1 minute for each 10-hp motor rating but not to exceed 7 minutes. Jockey pump shall have a minimum running timer, also.
5. Pilot Lamp: To indicate power available and pump run.
6. Ammeter test link and voltmeter test studs.
7. Alarm Features: Controller shall contain local alarms for pump running, power failure, and phase reversal. Auxiliary contacts, both normally open and closed, shall be provided for remote alarming of the above listed conditions.
8. Control circuits shall be supervised. Upon failure, the controller shall automatically start the fire pump.
9. A remote fire pump alarm panel shall be furnished and installed at the building's fire alarm panel. Remote alarm shall signal - Pump Running, Phase Reversal, Power Failure, and Supervisory Power Failure. Remote alarm panel shall have a separate 115-volt power source. Coordinate wiring the alarms from the controller to the remote alarm panel with Division 26.
10. Manual start/stop buttons and emergency start latch mechanism.
11. Means shall be provided on the controller to operate an alarm signal continuously while the pump is running.
12. Reduced voltage/soft start controller.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine equipment bases and anchorage provisions, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of fire pumps.

B. Examine roughing-in for fire-suppression piping systems to verify actual locations of piping connections before fire-pump installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Fire-Pump Installation Standard: Comply with NFPA 20 for installation of fire pumps, relief valves, and related components.

B. Equipment Mounting:

1. Install fire pumps on cast-in-place concrete equipment bases.

C. Install fire-pump suction and discharge piping equal to or larger than sizes required by NFPA.

D. Support piping and pumps separately, so weight of piping does not rest on pumps.

E. Install valves that are same size as connecting piping.

F. Install pressure gages on fire-pump suction and discharge flange pressure-gage tapping's.

G. Install piping hangers and supports, anchors, valves, gages, and equipment supports according to NFPA 20.

H. Install flowmeters and sensors. Install flowmeter-system components and make connections according to NFPA 20 and manufacturer's written instructions.

I. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not factory mounted. Furnish copies of manufacturers' wiring diagram submittals to electrical Installer.

J. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

3.3 ALIGNMENT

A. Align pump and driver shafts after complete unit has been leveled on concrete base, grout has set, and anchor bolts have been tightened.

B. After alignment is correct, tighten anchor bolts evenly. Fill baseplate completely with grout, with metal blocks and shims or wedges in place. Tighten anchor bolts after grout has hardened. Check alignment and make required corrections.

C. Align piping connections.

D. Align pump and driver shafts for angular and parallel alignment according to HI 1.4 and to tolerances specified by manufacturer.

3.4 CONNECTIONS

A. Comply with requirements for piping and valves specified in "Wet-Pipe Sprinkler Systems." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to pumps and equipment to allow service and maintenance.

C. Connect relief-valve discharge to drainage piping or point of discharge.

D. Connect flowmeter-system meters, sensors, and valves to tubing.

E. Connect fire pumps to their controllers.

3.5 IDENTIFICATION

A. Identify system components. Comply with requirements for fire-pump marking according to NFPA 20.

3.6 FIELD QUALITY CONTROL

A. Test each fire pump with its controller as a unit.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative.

1. After installing components, assemblies, and equipment, including controller, test for compliance with requirements.
2. Test according to NFPA 20 for acceptance and performance testing.
3. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
4. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
5. Test according to NFPA 20 for acceptance and performance testing.

D. Components, assemblies, and equipment will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

F. Furnish fire hoses in number, size, and length required to reach storm drain or other acceptable location to dispose of fire-pump test water. Hoses are for tests only and do not convey to Owner.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire pumps.

END OF SECTION 21 10 10

SECTION 21 10 20 – CORRUGATED, GALVANIZED STEEL WATER STORAGE TANK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Water storage tanks and appurtenances.

1.2 RELATED SECTIONS

A. Section 21 10 00 and Section 21 10 10.

1.3 REFERENCES

A. IBC, FDA , NFPA

1.4 SUBMITTALS

A. Tank dimension drawings shall be submitted for approval prior to tank materials fabrication. All tank appurtenances shall be submitted for review by Designer.

1.5 QUALIFICATION AND EXPERIENCE

A. Tank fabricator shall be experienced in manufacturing corrugated galvanized steel bolted tanks. Tank installer shall be experienced in the installation of tanks and working on commercial construction job sites. Tank installer shall be trained in confined space protocols (OSHA) and be able to prove a minimum of five (5) years of tank building experience.

1.6 DELIVERY, STORAGE AND HANDLING

A. Tank materials shall be shipped from factory on wood pallets designed to protect materials from normal shipping damage. Tank materials shall be stored to prevent the development of white rust onto galvanized steel.

1.7 WARRANTY

A. The manufacturer shall warrant the tank structure against defects in workmanship and materials for a period of thirty (30) years from the date of shipment of the materials from the factory. The manufacturer shall warrant the main liner against defects in workmanship and materials for a minimum of (10) ten years from the date of shipment of the materials from the factory on a pro-rata basis.

PART 2 - PRODUCTS

2.1 WATER STORAGE TANK

A. The water storage tank shall be a CorGal Model 3003.5-WT-LPR with standard 10 degree corrugated roof having a nominal capacity of 56,000 US gallons. Nominal tank dimensions shall be 30'-0" diameter, 11'7" eave height, and 15'41" overall height.

B. General

1. The water storage tank shall be standard factory engineered galvanized steel tanks with liquid tight liners. The water storage tank shall be assembled and erected on site. The tank structure shall consist of corrugated, galvanized steel wall sheets, roof panels, one roof panel with access hatch, standard peak cap, roof ladder angles, anchor clips and necessary hardware for tank assembly.

C. Acceptable manufacturers

1. Water Storage Tanks, Inc. (www.waterstoragetanksinc.com; 800-463-1898) or approved substitute.

D. Bolted Tank Structure

1. Galvanized steel tank wall and roof panels shall be pre-punched at the factory for field assembly.

E. Preliner

1. An 8 oz. black geotextile preliner shall be installed inside of the tank structure. The preliner shall cover the tank floor and the walls on all surfaces at which the main liner could contact the tank structure.

F. Main Liner

1. Water containment system shall be a factory welded seam, flexible membrane main liner. The liners shall be installed inside of the water tank by the CorGal® method utilizing liner hanger bolts, seal washers and grommets for suspension.

2.2 TANK DESIGN CRITERIA

A. Water tank shall be designed to meet or exceed Seismic Zone 2B (Seismic Design Category D) conditions, 105 MPH (UBC), 118 MPH (IBC) wind speed and 11 PSF roof live load. The tank structure shall be designed to contain non-potable water having a density of 62.4 pounds per cubic foot.

2.3 STRUCTURAL MATERIALS

A. Water tanks shall be manufactured from high yield strength US steel (minimum of 57 ksi (393 MPa) yield strength for wall panels) originally sourced from a US steel mill and rolled/corrugated in a US plant.

B. Wall sheets shall be continuous 2-2/3" depth x 1/2" pitch (67.7 MM x 12.7 MM) annularly corrugated galvanized steel, 20 gauge steel or heavier with minimum yield strengths of 57,000 psi (3990 Kg/CM^2) (Tensile strength 65,000+ psi [4550 Kg/CM^2+]). All zinc coating shall conform to G-115 (275 grams/square meter) specifications or higher.

C. Bottom wall sheets have an inward return flange for additional bearing on foundation. Wall sheets shall have a coverage length of 9’ 4-1/2” (2,858 M) long, except for some 6’ 3” (1,905 MM) long sheets used adjacent to the access door.

D. Holes in vertical seams shall be punched for single row or double row connections at 1-1/3” o.c (34 MM). Use of single row or double row of bolts at vertical seam is dependent upon diameter and depth of tank.

E. Horizontal seams shall have a single lap connection with a maximum bolt spacing to be 9-3/8” (238 MM).

F. One-piece, 12 gauge (2.67 MM) or heavier galvanized steel die-formed or welded anchor clips shall be supplied for a minimum of one anchor clip per base wall panel. Anchor clips shall be bolted to the tank wall with four bolts to contact a concrete base.

G. Water tank roofs shall have a 10° slope, and use single-stage self-supporting roof sheets. Roofs shall be designed for a 2 psf dead load, 20 psf live load, 20 psf snow load, and a peak equipment load rating of 2000 pounds (907 Kg). The tank shall be capable of being engineered for higher load ratings should the local conditions require it.

H. Roof sheets shall have triangular sections of galvanized steel, with brake-formed raised ribs along each side, flat area between ribs and a 90° formed drip edge at the eave. Roof panels shall be manufactured from G-115 galvanized steel conforming to ASTM A 446, Grade C, or greater.

J. All roof panels shall be connected to the eave of the tank with center clips and a varying number of rib clips depending on tank diameter. Holes in the top ring wall sheets shall be factory punched for clip installation. Press-on bulb type neoprene eave seal and silicone caulking shall be used to seal between the top wall panel and the roof panel.

K. Roof ladder cleats shall extend from eave to center cap. Ladder cleats shall consist of galvanized steel cold-formed angles of varying lengths bolted to top of one roof panel.

2.4 TANK ACCESS

A. For tanks 30’ in diameter or greater, a 31” X 18” rectangular access hole with hinged cover shall be located on the lower end of one roof sheet. A 24” X 18” trapezoidal access hatch shall be an appropriate replacement. A 20” X 40” bolted side access panel shall be located 22” above the floor on a side panel. The side access shall be bolted closed before final installation of the main liner.

2.5 TANK PENETRATIONS

A. Tank penetrations through the tank wall within the water storage level shall be completed utilizing modified schedule 80 PVC flange sets. Flanges shall be bolted together with stainless steel or brass hex head cap screws with bonded sealing washers at all liquid side holes. Liquid seam sealant may be used to ensure effective sealing.

B. It is NOT acceptable to utilize flanges which use a single set of through-bolts which essentially “sandwich” the liner and flanges faces to the steel wall. This method may cause additional leak points and may compromise the structural integrity of the tank wall.

2.6 TANK FOUNDATION

A. The tank foundation shall be a concrete pad that will extend at least 9" outside of the tank wall in all directions. The foundation design is not covered by this section of the specifications and shall be designed by the project Structural Engineer.

2.7 HARDWARE

A. All bolts and nuts shall be electro-galvanized with JS-1000 clear coat protective coating. Roof bolts shall have factory-installed steel-backed vinyl washers. Wall sheet bolts shall have slotted button heads for insertion from inside toward outside. All bolts shall be heat treated and meet SAE Grade 8.2 or stronger specifications.

2.8 FLEXIBLE MEMBRANE LINER

A. The flexible membrane liner shall have minimum a rated thickness of 24 mil (+/- 10%) and a minimum finished coated weight of 22.0 oz/yd^2 (+2/-1 oz/yd^2). The liner shall be a PVC coated polyester fabric liner or polypropylene coated fabric reinforced liner. The liner shall be fabricated with a minimum of 1.5" factory welded seams and shall have a poly rope in the top hem for reinforcement. Metal or PVC grommets shall be evenly spaced along the top hem to facilitate the CorGal® method of liner hanging.

2.9 ANCHOR CLIPS

A. The anchor clips and anchor bolts shall conform to the structural design calculation package, if provided, and shall always meet site-specific requirements to properly anchor the tank in accordance with seismic, wind load, and other environmental conditions. No fewer than two (2) anchor clips shall be installed per wall panel.

B. Where seismic anchor clips are required, an anchor "chair" shall be utilized with the anchor bolt extending through the base plate and through a 1" hole in the top plate of the chair. A minimum of 9 15/16" inches shall separate the two plates to allow for stretch of the anchor bolt during a seismic event. Additional spacing may be required for various duty of chairs. The anchor chair shall be secured to the wall of the tank with no fewer than six 3/8" bolts.

2.10 TANK AND TANK SYSTEM ACCESSORIES

A. Water storage tank is designed around Water Storage Tanks, Inc. in Dripping Springs, Texas, Nominal capacity of 56,000 gallons, galvanized steel tank with liquid tight 22 oz. Non-Potable Reinforced PVC liner. Warranty: 30 year limited structural, 10 year pro-rated liner.

B. Include Tank Appurtenances:

1. Seismic Anchors.
2. Gooseneck Roof Vent Kit.
3. 4 Ring Ladder extension Package - Riveted Ladder Section with Rail Extension.
4. Industrial tank gauge with stainless steel hardware and polycarbonate site tube.
5. Tank Alarm.
6. Anti-Vortex Assembly , Steel Penetration Flange, , wall mount 6", with 12" steel AV Plate.
7. 6" Galvanized Steel Pressure Rated Wall Mounted Penetration Flange Set for Outlet.
8. Connection to Steel Flange – (1) 2" x 6" GRV x NPT Male Threaded Nipple.
9. 6" Galvanized Steel Pressure Rated Wall Mounted Penetration Flange Set for Inlet.
10. 2" Bronze Float Valve with 8" Ball Float for fill line.
11. 8" Galvanized Steel Pressure Rated Wall Mounted Penetration Flange Set for Overflow.
12. 4" Mozzle Stoppa Hi-Flow Flap Valve – (1) 4" d X 6"l pvc Slip x Slip Nipple.

13. 2" 304 Stainless Steel Class 150 NPT Threaded Female Atmospheric Pressure Wall Mounted Penetration Flange Set(s) for Outlet(s) or Overflow(s).
14. Screw Plug Heater, 3000 Watts, 240V, Single Phase 2" NPT Brass Plug, (3) 0.475 Dia. Copper Elements, @ 22.52 WPSI, Insertion Length ("B"): 18 in., Cold Section: 3 in, Housing: E4-Moisture Resistant, UL 832H/CSA.
15. 2" Foam Board Insulation – Internal Vertical Walls Only.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Tanks shall be and assembled by personnel trained and experienced in the erection of bolted steel tanks and the installation of flexible membrane liners so as to not void any manufacturer warranties. Installation personnel entering the tank must be trained on confined space OSHA protocols.

3.2 FIELD QUALITY CONTROL

A. A representative of the tank materials supplier shall inspect the tank structure before installation of the preliner and main liner. Tank assembly contractor shall comply with tank supplier recommendations for the proper assembly techniques.

3.3 CLEANING AND MAINTENANCE

A. Water tanks are classified as confined spaces and qualified personnel should be employed for any tank entry. The preferred method for cleaning the tanks is to open the bottom drain valve and drain the tank. Then open the roof side cover and use a hand-held water hose to wash down the tank walls and floor toward the tank drain. After cleaning is complete, close and secure the roof access cover and close the bottom drain valve.

B. Water to perform cleanings, pressure testing, and system testing shall be provided by local utility and paid for by end user.

3.4 SYSTEM OPERATION

A. Tank manufacturer/installer shall thoroughly test system for proper operation of tank, controls, floats, alarms, and valves. System testing and operation shall be performed in the presence of the system designer and AHJ.

END OF SECTION 21 10 20

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SECTION 22 05 00 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 QUALITY ASSURANCE

A. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

B. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.4 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete, masonry walls and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces.

D. All equipment shall be installed in accordance with the manufacturer’s drawings and recommendations.

E. The Contractor shall furnish and install all rough-in work and make final connections to all equipment requiring water, gas, drains, and other mechanical work required for connection to equipment furnished under this contract.

F. The equipment shall be properly prepared structurally and mechanically ready to receive a single connection for each of the various mechanical items with all plumbing, piping drains, traps, tailpieces, supply fittings, etc., internal to and part of the equipment installed by the equipment manufacturer or supplier.

1.5 CODES AND FEES

A. All work shall be installed in accordance with the applicable provisions of the local codes, latest adopted International Plumbing Code, AGA, UL, AWWA, ASTM, ASME and ANSI.

B. The Contractor shall pay for fees and inspections as may be required for water, sanitary sewer and gas service, and all other systems requiring inspection by agencies having jurisdiction.

1.6 ELECTRICAL WORK

A. All control wiring and conduit not shown on Electrical drawings shall be furnished and installed under Division 22 according to the National Electrical Code and Division 26 requirements. See G.2.

B. All power wiring and conduit for items furnished under Division 22 shall be furnished and installed under Division 26. See G.1.

C. All disconnects shall be furnished and installed by Division 26.

D. Toggle switches for 1/2 HP motors and less shall be furnished and installed by Division 26.

E. Wiring and conduit for solenoid valves, and control transformers including the transformers shall be furnished and installed by Division 22.

F. Division 26 shall install all starters, toggle switches, disconnects, and all wiring to the respective motor or device. Wiring and conduit from starter to a controller shall be by Division 22.

G. Definitions:

1. Power wiring: Line voltage circuitry rough-in including conduit, boxes, conductors, etc. between the overcurrent protection and the equipment including the connection of the starters.
2. Control wiring: Any voltage circuitry rough-in including conduit, boxes, conductors, etc. between control activator and the controller or starter.

H. Conduit: All power wiring and 120V control wiring shall be in conduit. Low voltage control wiring shall be installed in conduit where exposed, or in return air plenums, in masonry walls, or below slab.

I. It shall be the Contractor's responsibility to determine the characteristics of electrical currents available to operate the mechanical equipment prior to ordering such equipment. All electrically operated equipment shall be designed for operation with the type of electric current available to the project.

1.7 RECORD DRAWINGS

A. The Contractor shall maintain a set of prints that reflect site conditions including location of valves, underground piping, equipment, etc. that have been changed to suit job conditions. The contractor shall prepare a corrected reproducible tracing of the project using the results of the record print. Final

payment shall not be made until such document(s) is turned over to the architect upon completion of the project.

1.8 SEISMIC DESIGN

A. All piping and equipment supports shall be installed according to Chapter 16 of the International Building Code. Site classification shall determine required seismic restraints.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements for Joining Plastic Piping:

1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials, installed between dissimilar metals.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Unions shall be installed on each side of all special valves, regulators, etc., on one side of each check valve and each trap, and at all equipment such as coils, tanks, compressors, pumps, etc., so that such equipment may be readily disconnected. No unions shall be placed in a location which will be inaccessibly after completion of the building.

D. Where flanged valves, regulators, etc., do not permit the removal of flange bolts, two such devices shall be separated by a spool. (3) Connections between pipes of dissimilar metals shall be made with Dielectric (insulated) unions.

E. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

1. Available Manufacturers:

a. Capitol Manufacturing Co.
b. Watts Industries, Inc.; Water Products Div.
c. Zurn Industries, Inc.; Wilkins Div.

F. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

1. Available Manufacturers:

a. Capitol Manufacturing Co.
b. Epco Sales, Inc.
c. Watts Industries, Inc.; Water Products Div.

2.5 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Available Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Plastic. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.6 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

2.7 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

2.8 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.9 FIRE STOPPING

A. Description: Fire stopping compounds, caulks, wraps, as required to maintain integrity of fire rated floors, ceilings, walls and floor/ceiling, roof ceiling assemblies for all pipe penetrations for metal and plastic pipe.

1. Available manufacturer's:

   a. 3M Corporation
   b. Hilti
   c. Pro-Set

2. See plumbing drawings for U.L. system numbers and specific penetration details.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas. Run piping parallel to principle parts of the building and avoid diagonal runs unless specifically indicated on plans.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install escutcheons for penetrations of walls, ceilings, and floors chrome plated, metal at all visible locations:

L. Install sleeves for pipes passing through foundation, concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

   a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls as new walls are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

   a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
   b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint.

M. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

N. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to details on plumbing drawings for U.L. system numbers and specific penetration types.

P. Verify final equipment locations for roughing-in.

Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Cold Expansion Joints: Utilize cold expansion joints for PEX piping. Fittings shall be of same manufacturer as piping and only recommended tools and bits shall be utilized to make joints.

J. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to manufacturer’s instructions.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.4 PIPE PRESSURE TESTING

A. Test all plumbing piping, following installation, but before it is covered or connected to the sewers or fixtures. Furnish necessary labor, materials and equipment for making test. All leaks disclosed by testing shall be reworked in an approved manner and the leaking system shall then be retested until proved tight under pressure. Test all systems for watertightness (or gas-tightness) as required by the authorities having jurisdiction, or in the absence of such requirements the minimum tests shall be made as follows:

1. Fill all storm and sanitary drainage and vent piping with water and allow to stand thus filled for 3 hours without showing leaks. Piping may be tested in sections, but no sections shall be tested with less than a ten foot head.
2. Test all water supply piping by applying a hydro-static pressure of not less than 125 pounds per square inch or 1½ times the working pressure, whichever is greater.
3. Test all gas piping systems with air or inert gas only. Test pressure shall be not less than five times the maximum pressure to which the piping will be subjected in operation for a period not less than 30 minutes.

3.5 EXCAVATING AND BACKFILLING

A. Do all excavating and backfilling required for the installation of underground work required by the plumbing work.

B. Width of trench shall be not less than 18" wider than the pipe outside diameter. Minimum cover over top of water pipe shall not be less than the frost line for the area plus 6". Minimum cover for other pipe shall be not less than 24".

C. Copper piping shall be laid on a 6" bed of sand and backfilled with sand to 12" above top of pipe. Complete backfilling with Washed #57 Stone to underside of building slab and outside of building to underside of pavement. The balance of the fill outside the building not under pavement shall be clean earth thoroughly tamped and crowned, void of stones larger than 4” diameter to allow for subsequent settlement. Compact to 100% density under buildings and paved areas. Protect copper piping at building slab penetration with sleeve or ½” thick “Armaflex” insulation.

D. PVC piping shall be laid on a 6" bed of Washed #57 Stone and backfilled with same stone to 12" above top of pipe. Complete backfilling with Washed #57 Stone to underside of building slab and outside of building to underside of pavement. The balance of the fill outside the building not under pavement shall be clean earth thoroughly tamped and crowned, void of stones larger than 4” diameter to allow for subsequent settlement. Compact to 100% density under buildings and paved areas.

E. All trenches shall be braced as required to protect workmen and adjacent work. Comply with local regulations or, in absence thereof, with provisions of the "Manual of Accident Prevention in Construction", of the AGC.

3.6 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations.

D. Install equipment to allow right of way for piping installed at required slope.

3.7 PAINTING

A. Painting of plumbing systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.8 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases not less than 4 inches larger in both directions than supported water heater and equipment.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Concrete pad shall be minimum of 4” thick.

3.9 GUARANTEE

A. The Contractor shall guarantee all work to be in accordance with contract requirements and free from defective or inferior materials, equipment, and workmanship for a period of one year, and he shall guarantee that all equipment is of proper size and design and so installed as to produce the capacities and results specified and shown on the drawings.

3.10 SUBSTITUTIONS

A. Substitutions shall be allowed in accordance with Division 1. Substitution approval shall be at the sole discretion of the Engineer.

B. Contractor shall note on shop drawings all major differences from specified material or equipment.

C. The contractor shall be responsible to verify that all dimensions, weights, electrical and mechanical requirements of substituted materials and equipment meet project requirements. Andy required modifications for substituted equipment shall be the responsibility of the contractor making the substitution.

D. All requests for substitution must be submitted to the architect and engineer a minimum of 14 calendar days prior to project bid date. Such submission does not constitute approval. Only items or manufacturers specifically stated in the project specifications, drawings or addenda for use shall be considered as approved.

3.11 SHOP DRAWINGS

A. Submit to the Architect for approval, within 30 days after receipt of Notice to Proceed with the work, detailed shop drawings of all equipment and all material required to complete the project. The shop drawing shall be complete as described herein. The Contractor shall furnish the number of copies required by the General and Special Conditions of the Contract, but in no case less than six (6) copies.

B. All shop drawings to be submitted at one time in a 3-ring binder with cover and drawing index sheet or submitted electronically.

C. The shop drawings shall be detailed, with dimensioned drawings or catalog cuts, showing construction, size, arrangement, operating clearances, performance characteristics and capacity. Each item of equipment proposed shall be a standard catalog product of an established manufacturer and of equivalent quality, finish, and durability to that specified. Submission material and all shop drawings for the various items of equipment shall be marked with the respective mark number or identification of the equipment shown on the drawing or in the specification.

D. Provide a cover sheet for all major equipment, including but not limited to, pumps, plumbing fixtures, water heaters, that shall list in detail all accessories called for in specifications and on drawings that are being supplied. Failure to list these items will result in resubmittal. A copy of a standard catalog will not be sufficient.

E. Shop drawings shall show sizes and details of required concrete and steel machine foundation, location of anchor bolts, physical dimension of equipment, equipment weight or other pertinent data required for equipment support or installation.

F. The contractor shall verify all electrical requirements of equipment with the electrical service available before ordering said equipment.

G. Approved shop drawings do not mean that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the contract drawings or specifications.

END OF SECTION 22 05 00

SECTION 22 05 19 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

PART 2 - PRODUCTS

2.1 METAL-CASE, LIQUID-IN-GLASS THERMOMETERS

A. Available Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Palmer - Wahl Instruments Inc.
2. Trerice, H. O. Co.
3. Weiss Instruments, Inc.
4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Case: Die-cast aluminum or brass, long.

C. Tube: Red or blue reading, organic-liquid filled, with magnifying lens.

D. Tube Background: Satin-faced, nonreflective aluminum with permanently etched scale markings.

E. Window: Glass or plastic.

F. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.

G. Stem: Copper-plated steel, aluminum, or brass for thermowell installation and of length to suit installation.

H. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.2 BIMETALLIC-ACTUATED DIAL THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
2. Trerice, H. O. Co.
3. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Description: Direct-mounting, bimetallic-actuated dial thermometers complying with ASME B40.3.

C. Case: Dry type, stainless steel with 3-inch diameter.

D. Element: Bimetal coil.

E. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.

F. Pointer: Red or other dark-color metal.

G. Window: Glass or plastic.

H. Ring: Stainless steel.

I. Connector: Rigid, bottom type.

J. Stem: Metal, for thermowell installation and of length to suit installation.

K. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.3 THERMOWELLS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
2. Trerice, H. O. Co.
3. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Manufacturers: Same as manufacturer of thermometer being used.

C. Description: Pressure-tight, socket-type metal fitting made for insertion into piping and of type, diameter, and length required to hold thermometer.

2.4 PRESSURE GAGES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
2. Trerice, H. O. Co.
3. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Direct-Mounting, Dial-Type Pressure Gages: Indicating-dial type complying with ASME B40.100.

1. Case: Dry type, drawn steel or cast aluminum, 4-1/2-inch diameter.
2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
3. Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is indicated.
4. Movement: Mechanical, with link to pressure element and connection to pointer.
5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
6. Pointer: Red or other dark-color metal.
7. Window: Glass or plastic.
8. Accuracy: Plus or minus 2 percent of middle half scale.
9. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure.

10. Range for Fluids under Pressure: Two times operating pressure.

C. Pressure-Gage Fittings:

1. Valves: NPS 1/4 brass or stainless-steel needle type.
2. Snubbers: ASME B40.5, NPS 1/4 brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure.

2.5 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Flow Design, Inc.
2. Peterson Equipment Co., Inc.
3. Trerice, H. O. Co.
4. Watts Industries, Inc.; Water Products Div.

B. Description: Corrosion-resistant brass or stainless-steel body with core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping.

C. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

D. Core Inserts: One or two self-sealing rubber valves.

1. Insert material for water service at 20 to 200 deg F shall be CR.
2. Insert material for water service at minus 30 to plus 275 deg F shall be EPDM.

PART 3 - EXECUTION

3.1 THERMOMETER APPLICATIONS

A. Install liquid-in-glass or bimetallic-actuated dial thermometers in the outlet of each domestic, hot-water storage tank.

B. Install dry-case-type, bimetallic-actuated dial thermometers at suction side of hot water recirculation pumps.

C. Provide the following temperature ranges for thermometers:

1. Domestic Hot Water: 30 to 180 deg F, with 2-degree scale divisions.

3.2 GAGE APPLICATIONS

A. Install dry-case-type pressure gages for discharge of each pressure-reducing valve.

3.3 INSTALLATIONS

A. Install direct-mounting thermometers and adjust vertical and tilted positions.

B. Install thermowells with socket extending to center of pipe and in vertical position in piping tees where thermometers are indicated.

C. Install direct-mounting pressure gages in piping tees with pressure gage located on pipe at most readable position.

D. Install remote-mounting pressure gages on panel.

E. Install needle-valve and snubber fitting in piping for each pressure gauge.

F. Install test plugs in tees in piping.

G. Install permanent indicators on walls or brackets in accessible and readable positions.

H. Install connection fittings for attachment to portable indicators in accessible locations.

I. Install thermometers and gages adjacent to machines and equipment to allow service and maintenance for thermometers, gages, machines, and equipment.

J. Adjust faces of thermometers and gauges to proper angle for best visibility.

END OF SECTION 22 05 19

SECTION 22 05 23 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.2 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set ball and plug valves open to minimize exposure of functional surfaces.
4. Set butterfly valves closed or slightly open.
5. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
2. Butterfly Valves: With extended neck.

E. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.
4. Cold Expansion (PEX): F1960

F. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRASS OR BRONZE BALL VALVES

A. Two-Piece, Full-Port, Brass or Bronze Ball Valves with Brass or Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Milwaukee Valve Company.
   b. NIBCO INC.
   c. Red-White Valve Corporation.
   d. VPONOR (on PEX Piping)

2. Description:

   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig.
   c. CWP Rating: 600 psig.
   d. Body Design: Two piece.
   e. Body Material: Bronze or forged brass.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Bronze or brass.
   i. Ball: Chrome-plated brass.
   j. Port: Full.

B. Three-Piece, Full-Port, Brass or Bronze Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Milwaukee Valve Company.
   b. NIBCO INC.
   c. Red-White Valve Corporation
   d. UPONOR (on PEX Piping)

2. Description:

   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig.
   c. CWP Rating: 600 psig.
   d. Body Design: Three piece.
   e. Body Material: Forged brass.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Brass.

i. Ball: Chrome-plated brass.
j. Port: Full.

2.3 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. DeZurik Water Controls.
   b. Hammond Valve.
   c. Kitz Corporation.
   d. Milwaukee Valve Company.

2. Description:

   a. Standard: MSS SP-67, Type I.
   b. CWP Rating: 200 psig.
   c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
   d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
   e. Seat: EPDM.
   f. Stem: One- or two-piece stainless steel.
   g. Disc: Aluminum bronze.

2.4 IRON, GROOVED-END BUTTERFLY VALVES

A. 175 CWP, Iron, Grooved-End Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Kennedy Valve; a division of McWane, Inc.
   b. Shurjoint Piping Products.
   c. Tyco Fire Products LP; Grinnell Mechanical Products.
   d. Victaulic Company.

2. Description:

   a. Standard: MSS SP-67, Type I.
   b. CWP Rating: 175 psig.
   c. Body Material: Coated, ductile iron.
   d. Stem: Two-piece stainless steel.
   e. Disc: Coated, ductile iron.
   f. Seal: EPDM.

2.5 BRONZE SWING CHECK VALVES

A. Class 150, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Crane Co.; Crane Valve Group; Stockham Division.
   d. Kitz Corporation.
   e. Milwaukee Valve Company.
   f. NIBCO INC.
   g. Red-White Valve Corporation.

2. Description:

   a. Standard: MSS SP-80, Type 3.
   b. CWP Rating: 300 psig.
   c. Body Design: Horizontal flow.
   d. Body Material: ASTM B 62, bronze.
   e. Ends: Threaded.
   f. Disc: Bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:

   1. Swing Check Valves: In horizontal position with hinge pin level.

F. Valves in PEX piping shall be of the same manufacturer as the PEX piping.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly valves.
2. Butterfly Valve Dead-End Service: Single-flange (lug) type.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 and Larger: Flanged ends.
3. For Steel Piping, NPS 2 and Smaller: Threaded ends.
4. For Steel Piping, NPS 2-1/2and Larger: Flanged ends.
5. For Grooved-End Copper Tubing and Steel Piping: Valve ends may be grooved.
6. For PEX Piping, all sizes, cold expansion termination.

3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Copper Pipe NPS 2 and Smaller, and PEX Piping All sizes including up to 3” :

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends, cold expansion joint fitting on PEX Piping.
2. Ball Valves: Three piece, full port, brass or bronze with bronze trim. Two piece valves may be used at fixture connections.
3. Bronze Swing Check Valves: Class 150, bronze disc.

END OF SECTION 22 05 23

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SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.2 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."

PART 2 - PRODUCTS

2.1 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Available Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. Grinnell Corp.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Insulation-Insert Material: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for cold piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Available Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Hilti, Inc.
c. ITW Ramset/Red Head.

2.5 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.6 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

3.2 HORIZONTAL PIPING SUPPORT

A. Support of piping shall not exceed the following:

Pipe Size	Rod Dia. Min	Steel Pipe Max. Spacing, Ft.	Copper Pipe Max. Spacing, Ft.	PVC Pipe Max. Spacing, Ft.
Up to ½”	¼”	6	4	3½
¾ “ to 1”	3/8”	7	5	4
1¼ “	3/8”	7	7	5
1½ “	3/8”	8	8	5
2”	3/8”	10	8	5
2½ “	½”	10	9	6
3”	½”	10	10	6
4”	5/8”	10	10	6½

B. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 3 and larger.
2. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2-1/2.

C. Horizontal-Piping Supports: Where specified on drawings, support piping on floor with one of the following:

1. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
2. Adjustable, Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.

3. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

3.3 ATTACHMENTS

A. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

B. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, support

1. From concrete using inserts
2. From beams using beam clamps, rivets or bolts
3. From blocks using toggle or thru-bolts.
4. Do not use plastic anchors, adhesives or explosive charges.
5. Do not support from roof deck.
6. Fasten supports to building in the following order of preference:

   a. Steel Framing
   b. Concrete
   c. Masonry
   d. Wood Sheathing

7. All hangers, rods and inserts shall be UL approved for service intended and shall be the following types per MSS SP-58:

   a. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
   b. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
   c. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
   d. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
   e. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
   f. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
   g. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
   h. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
   i. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

      1) Light (MSS Type 31): 750 lb.
      2) Medium (MSS Type 32): 1500 lb.
      3) Heavy (MSS Type 33): 3000 lb.

j. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

C. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Protection Shields (MSS Type 40): 12 Inch minimum length or of length recommended by manufacturer to prevent crushing insulation, if greater.
2. Steel Pipe-Covering Protection Saddles, for rollers (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

3.4 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. On all pipe, provide hanger within 18” of each elbow and within 18” of connection to each piece of equipment.

C. When supporting PVC pipe, provide 18 ga. 12” long shield at each hanger.

D. Horizontal PEX Piping shall be supported continuously with manufacturer’s continuous Galvanized PEX Support System.

E. Pipes passing through walls shall not bear on construction.

F. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

G. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

H. Fastener System Installation:

1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

I. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

J. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

K. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

L. Install lateral bracing with pipe hangers and supports to prevent swaying.

M. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

N. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

O. Pipe Slopes: Install hangers and supports to provide indicated slope on drawings.

P. Insulated Piping: Comply with the following:

1. When pipes carry material colder than 90 deg F, except domestic cold water, hangers shall be sized to fit outside diameter of insulation. Provide shields at each hanger. On 2½" and larger pipe, insulated with fiberglass, provide thermal hanger shield insert.
2. Install MSS SP-58, Type 40, protective shields on all insulated piping. Shields shall span an arc of 180 degrees. Use MSS SP-58.

   a. Option: Thermal-hanger shield inserts may be used.

3. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4 and larger: 12 inches long and 0.06 inch thick.

4. Thermal-Hanger Shields: On pipes 2-1/2" or larger, install with insulation same thickness as piping insulation.

3.5 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

D. Cut, drill, and fit miscellaneous metal fabrications for equipment supports. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

E. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.6 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support.

3.7 PAINTING

A. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 22 05 29

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SECTION 22 05 40 - ELECTRIC DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following electric water heaters:

1. Household, storage electric water heaters.
2. Light-commercial electric water heaters.
3. Compression tanks.
4. Water heater accessories.
5. Hot water circulators.

1.3 SUBMITTALS

A. Product Data: For each type and size of water heater indicated herein. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of electric water heaters through one source from a single manufacturer where multiple water heaters are utilized on project.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of electric water heaters and are based on the specific system indicated.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. ASME Compliance: Where indicated by model specified, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

E. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for all components that will be in contact with potable water.

1.5 COORDINATION

A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period(s): From date of Substantial Completion:

a. Household Electric Water Heaters:

1) Storage Tank: Five years.
2) Controls and Other Components: Two years.

b. Light-Commercial Electric Water Heaters:

1) Storage Tank: Five years.
2) Controls and Other Components: Two years.
3) Storage Tank: Five years.
4) Controls and Other Components: Three years.

c. Compression Tanks: One year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include but are not limited to, manufacturers specified.

2.2 HOUSEHOLD ELECTRIC WATER HEATERS

A. Household, Standard, Storage Electric Water Heaters: Comply with UL 174.

1. Available Manufacturers:

a. Bradford White Corporation.
b. Lochinvar Corporation.
c. Rheem Water Heater Div.; Rheem Manufacturing Company.
d. Ruud Water Heater Div.; Rheem Manufacturing Company.

2. Storage-Tank Construction: Steel.

a. Tappings: ASME B1.20.1 pipe thread.
b. Pressure Rating: 150 psig.
c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.

3. Factory-Installed Storage-Tank Appurtenances:

a. Anode Rod: Replaceable magnesium.
b. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
c. Drain Valve: ASSE 1005.
d. Insulation: Comply with ASHRAE/IESNA 90.1 or ASHRAE 90.2.
e. Jacket: Steel with enameled finish.

1) Standard: Cylindrical shape.

f. Heat Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
g. Heating Elements: Two; electric, screw-in immersion type with 12 kW or less total, and wired for nonsimultaneous operation, unless otherwise indicated.
h. Temperature Control: Adjustable thermostat for each element.
i. Safety Control: High-temperature-limit cutoff device or system.
j. Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3 for combination temperature and pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.

2.3 LIGHT-COMMERCIAL ELECTRIC WATER HEATERS

A. Description: Comply with UL 174 for household, storage electric water heaters.

1. Available Manufacturers:

a. Bradford White Corporation.
b. Lochinvar Corporation.
c. Rheem Water Heater Div.; Rheem Manufacturing Company.
d. Ruud Water Heater Div.; Rheem Manufacturing Company.
e. Smith, A. O. Water Products Company.
f. State Industries, Inc.

2. Storage-Tank Construction: Steel, vertical arrangement.

a. Tappings: ASME B1.20.1 pipe thread.
b. Pressure Rating: 150 psig.
c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.

3. Factory-Installed Storage-Tank Appurtenances:

a. Anode Rod: Replaceable magnesium.
b. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
c. Drain Valve: ASSE 1005.
d. Insulation: Comply with ASHRAE/IESNA 90.1 or ASHRAE 90.2.
e. Jacket: Steel with enameled finish.
f. Heat Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.

g. Heating Elements: Two; electric, screw-in immersion type; wired for simultaneous operation, unless otherwise indicated.
h. Temperature Control: Adjustable thermostat for each element.
i. Safety Control: High-temperature-limit cutoff device or system.
j. Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3 for combination temperature and pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.

2.4 COMPRESSION TANKS

A. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

1. Available Manufacturers:

a. AMTROL Inc.
b. Armstrong Pumps, Inc.
c. Wessels Co.

2. Construction:

a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1, pipe thread.
b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
c. Air-Charging Valve: Factory installed.

2.5 WATER HEATER ACCESSORIES

A. Combination Temperature and Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input and include pressure setting less than water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

B. Water Heater Stands: Factory-fabricated steel stand for floor mounting and capable of supporting water heater and water with bottom of water heater a minimum of *18 inches* above the floor.

C. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than *NPS 3/4*.

D. Where water heaters are not noted as being installed on stands, mounted on the wall, or mounted above ceiling, install water heater on a 4” thick dedicated reinforced concrete pad dowelled into concrete floor slab. Pad shall be minimum of 4” larger in all directions than installed water heater.

2.6 HOT WATER CIRCULATORS

A. In-line domestic hot water recirculating pump:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Bell & Gossett; ITT Fluid Handling Division.
b. Grundfos, Inc.
c. Taco Pump Co.

2. All bronze or stainless construction.
3. Flanged connections.
4. Hardened steel shaft.
5. Bronze sheathed, diamond-bored sleeve bearing.
6. Bronze impeller.
7. Mechanical seals.
8. Flexible-coupled motor, supported from pump casing.
9. Refer to plumbing drawings for horsepower, voltage and capacities.
10. Strap-on aquastat when mixing valves are not utilized

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

B. Install seismic restraints as required for commercial water heaters. Anchor to substrate.

C. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

D. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 22 Section "Domestic Water Piping Specialties" for hose-end drain valves.

E. Install thermometer on outlet piping of water heaters.

F. Fill water heaters with water - Before Energizing.

G. Charge compression tanks with air.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

C. Connect wiring according to Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections on all large commercial water heaters. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial electric water heaters.

END OF SECTION 22 05 40

SECTION 22 05 45 - FUEL-FIRED DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following fuel-fired water heaters:

1. Commercial, high efficiency, condensing, non-storage, gas water heaters.
2. Commercial, high efficiency, condensing, storage, gas water heaters.
3. Compression tanks.
4. Water heater accessories.
5. Hot water circulators.

1.3 SUBMITTALS

A. Product Data: For each type and size of water heater indicated herein. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of water heaters through one source from a single manufacturer where multiple water heaters are utilized on project.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of water heaters and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. ASME Compliance:

1. Where ASME-code construction is indicated by specified model, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 01.

E. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9" for all components that will be in contact with potable water.

1.5 COORDINATION

A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired water heaters that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including storage tank and supports.
      b. Faulty operation of controls.
      c. Deterioration of metals, metal finishes, and other materials beyond normal use.
   2. Warranty Period(s): From date of Substantial Completion:
      a. Commercial, High Efficiency, Condensing, Non-Storage, Gas Water Heaters:
         1) Heat Exchanger: Five years.
         2) Storage Tank: Five Years
      b. Compression Tanks: One year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 COMMERCIAL, GAS WATER HEATERS

A. Commercial, High Efficiency, Condensing, Non-Storage, Gas Water Heaters: Comply with ANSI Z21.13 for hot-water boilers.
   1. Available Manufacturers:
      a. Lochinvar Corporation.
   2. Description: Packaged unit with boiler, storage tank, pump, piping, and controls.
   3. Boiler Construction: ASME code with 160-psig working-pressure rating for hotwater-boiler-type water heater.
      a. Heat Exchanger: Stainless steel.
      b. Connections: Factory fabricated of materials compatible with boiler. Attach to boiler before testing.
         1) NPS 2 and Smaller: Threaded ends according to ASME B1.20.1.

2) NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges, and according to ASME B16.24 for copper and copper-alloy flanges.

4. Boiler Appurtenances:

a. Insulation: Comply with ASHRAE/IESNA 90.1. Surround entire boiler except connections and controls.
b. Jacket: Steel with enameled finish.
c. Burner: Stainless steel with woven metal fiber for natural-gas fuel.
d. Temperature Control: Adjustable, storage tank temperature-control fitting and flow switch, interlocked with circulator and burner.
e. Safety Control: Automatic, high-temperature-limit cutoff device or system.
f. Automatic Ignition: Intermittent electronic ignition complying with ANSI Z21.20.

5. Energy Management System Interface: Normally closed dry contacts for enabling and disabling water heater.
6. Support: Steel base or skids.
7. Hot-Water Storage Tank: Connected with piping to circulating pump and water heater.

a. Construction: According to ASME Boiler and Pressure Vessel Code: Section VIII, steel with 150-psig working-pressure rating.
b. Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.

1) NPS 2 and Smaller: Threaded ends according to ASME B1.20.1.
2) NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges, and according to ASME B16.24 for copper and copper-alloy flanges.

c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
d. Insulation: Comply with ASHRAE/IESNA 90.1. Surround entire storage tank except connections and controls.
e. Jacket: Steel with enameled finish.
f. Anode Rods: Factory installed, magnesium.
g. Drain Valve: Corrosion-resistant metal complying with ASSE 1005, factory installed.
h. Combination Temperature and Pressure Relief Valves: ANSI Z21.22/CSA 4.4. Include one or more relief valves with total relieving capacity at least as great as heat input and include pressure setting less than water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

8. Circulating Pump: UL 778, all-bronze, centrifugal, overhung-impeller, separately-coupled, in-line pump. Include mechanical seals, 125-psig minimum working-pressure rating, and 225 deg F continuous-water-temperature rating.
9. Piping: Copper tubing; copper, solder-joint fittings; and brazed or flanged joints.
10. Provide with concentric vent kit and condensate neutralization kit.

2.3 COMMERCIAL, GAS WATER HEATERS

A. Commercial, High-Efficiency, Condensing, Storage, Gas Water Heaters: Comply with ANSI Z21.10.3/CSA 4.3.

1. Available Manufacturer:

a. Lochinvar Corporation.

2. Description: Manufacturer's proprietary design to provide at least 95 percent combustion efficiency at optimum operating conditions. Following features and attributes may be modified or omitted if water heater otherwise complies with requirements for performance.
3. Storage-Tank Construction: ASME-code steel with 150-psig Insert psig minimum working-pressure rating.

    a. Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.

        1) NPS 2 and Smaller: Threaded ends according to ASME B1.20.1.
        2) NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges, and according to ASME B16.24 for copper and copper-alloy flanges.

    b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
    c. Lining: Glass complying with NSF 61 barrier materials for potable-water tank linings, including extending lining into and through tank fittings and outlets.

4. Factory-Installed, Storage-Tank Appurtenances:

    a. Anode Rod: Replaceable magnesium. Not required on PVI conquest units.
    b. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
    c. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
    d. Insulation: Comply with ASHRAE/IESNA 90.1. Surround entire storage tank except connections and controls.
    e. Jacket: Steel with enameled finish or polyethylene.
    f. Combination Temperature and Pressure Relief Valves: ANSI Z21.22/CSA 4.4. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

5. Burner or Heat Exchanger: Comply with UL 795 or approved testing agency requirements for high-efficiency water heaters and for natural-gas.
6. Temperature Control: Adjustable thermostat.
7. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.
8. Energy Management System Interface: Normally closed dry contacts for enabling and disabling water heater.
9. Furnish with concentric vent kit and condensate neutralization kit.

2.4 COMPRESSION TANKS

A. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed, butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

1. Available Manufacturers:

    a. AMTROL Inc.
    b. Armstrong Pumps, Inc.
    c. Flexcon Industries.

2. Construction:

    a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include

ASME B1.20.1 pipe thread.

b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
c. Air-Charging Valve: Factory installed.

2.5 WATER HEATER ACCESSORIES

A. Gas Shutoff Valves: ANSI Z21.15/CGA 9.1, manually operated. Furnish for installation in piping.

B. Gas Pressure Regulators: ANSI Z21.18, appliance type. Include pressure rating, capacity, and pressure differential required between gas supply and water heater.

C. Combination Temperature and Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select each relief valve with sensing element that extends into storage tank.

1. Gas Water Heaters: ANSI Z21.22/CSA 4.4.

D. Where water heaters are not noted as being installed on stands, mounted on the wall, or mounted above ceiling install water heater on a 4” thick dedicated reinforced concrete pad dowelled into concrete floor slab. Pad shall be minimum of 4” larger in all directions than installed water heater.

2.6 HOT WATER CIRCULATORS

A. In-line domestic hot water recirculating pump:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Bell & Gossett; ITT Fluid Handling Division.
b. Grundfos, Inc.
c. Taco Pump Co.

2. Flanged connections.
3. Hardened steel shaft.
4. Bronze sheathed, diamond-bored sleeve bearing.
5. Bronze impeller.
6. Mechanical seals.
7. Flexible-coupled motor, supported from pump casing.
8. Refer to plumbing drawings for horsepower, voltage and capacities.
9. Strap-on aquastat when mixing valves are not utilized

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

B. Install seismic restraints for commercial water heaters. Anchor to substrate.

C. Install gas water heaters according to NFPA 54.

D. Install gas shutoff valves on gas supplies to gas water heaters without shutoff valves.

E. Install gas pressure regulators on gas supplies to gas water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.

F. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater, relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

G. Install combination temperature and pressure relief valves in water piping for water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

H. Install water heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains.

I. Install thermometer on outlet piping of water heaters.

J. Assemble and install inlet and outlet piping manifold kits for multiple water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each water heater.

K. Fill water heaters with water - Before Energizing.

L. Charge compression tanks with air.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing for all commercial water heaters.

B. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain and commercial water heaters.

END OF SECTION 22 05 45

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SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, acceptable manufacturers offering products that may be incorporated into the Work include, but are not limited to, to those specified.

1. Craftmark Duramark
2. Seton Set Mark

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 30 feet along each run. Reduce intervals to 15 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Domestic Water Piping – Cold Water:

a. Background Color: Green.
b. Letter Color: White.

2. Sanitary Waste, Storm Drainage, Secondary Storm Drainage, And Condensate Drainage Piping:

a. Background Color: Brown.
b. Letter Color: White.

3. Domestic Water Piping – Hot Water:

a. Background Color: Green.
b. Letter Color: White.

4. Domestic Water Piping – Hot Water Return:

a. Background Color: Green.
b. Letter Color: Black.

5. Natural Gas Piping:

a. Background Color: Yellow.
b. Letter Color: Black.

END OF SECTION 22 05 53

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SECTION 22 07 00 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.4 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.5 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Johns Manville Micro-Lok.
   b. Knauf Insulation.
   c. Owens Corning Fiberglas Pipe Insulation.

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

E. FLEXIBLE TUBULAR ELASTOMERIC PIPE INSULATION

1. Fire-retardant closed-cell slip-on flexible type. Product must be guaranteed by manufacturer to have continuous operational temperature limit of not less than 180° F and a minimum “R” value of 3.57 at 75° F 50% RH.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Products, Division of ITW; CP-82.
   b. Foster Products Corporation, H. B. Fuller Company; 85-20.
   c. ITW TACC, Division of Illinois Tool Works; S-90/80.
   d. Marathon Industries, Inc.; 225.
   e. Mon-Eco Industries, Inc.; 22-25.

C. ASJ Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-35.
b. Foster Products Corporation, H. B. Fuller Company; 30-90.
c. ITW TACC, Division of Illinois Tool Works; CB-50.
d. Marathon Industries, Inc.; 590.
e. Mon-Eco Industries, Inc.; 55-40.
f. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

2.4 SEALANTS

A. Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-76-8.
b. Foster Products Corporation, H. B. Fuller Company; 95-44.
c. Marathon Industries, Inc.; 405.
d. Mon-Eco Industries, Inc.; 44-05.
e. Vimasco Corporation; 750.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.6 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. Metal Jacket:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Products, Division of ITW; Metal Jacketing Systems.
   b. PABCO Metals Corporation; Surefit.
   c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.

   a. Sheet and roll stock ready for shop or field sizing.
   b. 0.016 Inch thickness.
   c. Factory-Fabricated Fitting Covers:

      1) Same material, finish, and thickness as jacket.
      2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
      3) Tee covers.
      4) Flange and union covers.
      5) End caps.
      6) Beveled collars.
      7) Valve covers.
      8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.7 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
   b. Compac Corp.; 104 and 105.
   c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
   d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.8 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Products; Bands.
   b. PABCO Metals Corporation; Bands.
   c. RPR Products, Inc.; Bands.

2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing or closed seal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

   a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

E. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies.

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, backflow preventers and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastromeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations where access is required. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

3.6 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.

4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.8 FINISHES

A. Pipe Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Do not field paint aluminum or stainless-steel jackets.

3.9 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range.

3.10 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water Copper Pipe:

1. 3”, insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe Insulation: 1 inch thick.

B. Domestic Cold Water, Hot Water, and Recirculated Hot Water Pex Pipe:

1. Stick Pex, Sizes ½" Thru 2 ½" Insulation Shall Be The Following:

a. Mineral -Fiber, Pre-Formed Pipe Insulation: ½" Thick.

2. Roll Pex, Sizes ½" and ¾" Insulation shall be the Following:

a. Flexible Tubular Elastomeric: ½" Thick.

3. Multi-port tees and individual piping run outs to fixtures from multi-port Tees inside walls and chases do not need to be insulated.
4. Horizontal cold water Pex piping inside walls and chases doES not need to be insulated.

C. Horizontal Rainwater Leaders and Secondary Roof Drainage System:

1. All Pipe Sizes: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe Insulation: 1 inch thick.

D. Condensate Drain:

1. All Pipe Sizes: Insulation shall be the following:

a. Flexible Tubular Elastomeric: ½ inch thick.

E. Horizontal Sanitary Sewer Piping Above Ceiling:

1. Horizontal sewer piping connected to floor drains receiving condensate:

a. All pipe sizes; mineral-fiber, preformed pipe insulation; 1 inch thick.

3.11 OUTDOOR, ABOVEGROUND PIPING AND WATER PIPING IN EXTERIOR WALL INSULATION SCHEDULE

A. Increase insulation thickness by ½ Inch.

3.12 FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket. Provide for the following:

1. Piping, Outside, above-ground: Aluminum, Smooth: 0.016 inch thick.
2. Piping in Mechanical Rooms, within 7 feet of floor: Aluminum, Smooth: 0.016 inch thick.

END OF SECTION 22 07 00

SECTION 22 11 16 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 61 for potable domestic water piping and components.

1.3 PROJECT CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of water service.
2. Do not proceed with interruption of water service without Architect's written permission.

1.4 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER PIPE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

B. Soft Copper Tube: ASTM B88, Type “K”, soft drawn.

1. Wrought copper solder-joint fittings; and brazed joints.

C. Type “A” cross-linked polyethylene (PEX):

1. Cold expansion joint fittings: ASTM F1960.
2. NPS ½ and NPS ¾ Roll Type. NPS 1 and larger stick type.
3. Color coded piping for NPS 1 and smaller: Blue, Cold Water; Red, Hot Water.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 SPECIALTY VALVES

A. Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for general-duty metal valves.

B. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves, drain valves, backflow preventers, and vacuum breakers.

2.5 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Cascade Waterworks Manufacturing.
b. Dresser, Inc.; Dresser Piping Specialties.
c. Ford Meter Box Company, Inc. (The).

D. Plastic-to-Metal Transition Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Charlotte Pipe and Foundry Company.
   b. Harvel Plastics, Inc.
   c. Spears Manufacturing Company.

2. Description: PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert and one solvent-cement-socket or threaded end.

E. Plastic-to-Metal Transition Unions:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Colonial Engineering, Inc.
   b. NIBCO INC.
   c. Spears Manufacturing Company.

2. Description: PVC four-part union. Include brass threaded end, solvent-cement-joint or threaded plastic end, rubber O-ring, and union nut.

2.6 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. EPCO Sales, Inc.

2. Description:

   a. Pressure Rating: 150 psig at 180 deg F.
   b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. EPCO Sales, Inc.

2. Description:

   a. Factory-fabricated, bolted, companion-flange assembly.
   b. Pressure Rating: 150 psig.

c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Kits:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.

2. Description:

a. Nonconducting materials for field assembly of companion flanges.
b. Pressure Rating: 150 psig.
c. Gasket: Neoprene or phenolic.
d. Bolt Sleeves: Phenolic or polyethylene.
e. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Calpico, Inc.
b. Lochinvar Corporation.

2. Description:

a. Galvanized-steel coupling.
b. Pressure Rating: 300 psig at 225 deg F.
c. End Connections: Female threaded.
d. Lining: Inert and noncorrosive, thermoplastic.

F. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Perfection Corporation; a subsidiary of American Meter Company.
b. Precision Plumbing Products, Inc.
c. Victaulic Company.

2. Description:

a. Electroplated steel nipple complying with ASTM F 1545.
b. Pressure Rating: 300 psig at 225 deg F.
c. End Connections: Male threaded or grooved.
d. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for pressure-reducing valves.

D. Install domestic water piping level and plumb.

E. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

F. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

G. Install thermostats in hot-water circulation piping.

3.2 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

E. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

G. PEX Joints: Cold Expansion - no crimp fittings - make joints using manufacturer’s tool and insert ring firmly against shoulder.

H. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. NPS 1-1/2 and Smaller: Fitting-type coupling.
2. NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.4 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in Division 22 plumbing fixture Sections for connection sizes.
3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.6 IDENTIFICATION

A. Identify system components. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

   a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
   b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

C. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 125 psig. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.8 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

   a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
   b. Adjust calibrated balancing valves to flows indicated.

4. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
7. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.9 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

   a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
   b. Fill and isolate system according to either of the following:

      1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
      2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

   c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
   d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.10 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Under-building-slab, domestic water, building service piping, NPS 4 and smaller, shall be the following:

1. Soft copper tube, ASTM B 88, Type K; wrought-copper solder-joint fittings; and brazed joints.

D. Aboveground domestic water piping, 3” size, thru the water service entrance, size, shall be the following:

1. Hard copper tube, ASTM B 88, Type L; wrought- copper solder-joint fittings; and soldered joints.

E. Aboveground domestic water piping, NPS ½ thru NPS 3 shall be the following:

1. Type “A” crosslinked polyethylene pipe (PEX) with cold mechanical expansion joints, color coded NPS 1 and smaller, roll type NPS ¾ and smaller.
2. Piping from shower valve to shower head, hard copper tube, ASTM B80, Type “L” wrought copper solder joint fittings.
3. Stub-outs to all fixture, Type “L” copper.
4. Utilize bend supports for NPS ¾” and smaller and hard pipe with 90’s for NPS 1 and larger.
5. All risers thru floor slabs 3” and smaller shall be hard stick PEX.

3.11 PEX PIPING WARRANTY

A. PEX piping warranty shall be for 25-years and shall cover pipe fittings, and property damages caused by failure

3.12 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller. Use butterfly, valves with flanged ends for piping NPS 2-1/2 and larger.
2. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves, ball valves.
3. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 22 11 16

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SECTION 22 11 19 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Ames Co.
b. Cash Acme.
c. Conbraco Industries, Inc.
d. FEBCO; SPX Valves & Controls.
e. Watts Industries, Inc.; Water Products Div.
f. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1001.
3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Chrome plated.

2.2 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.
b. FEBCO; SPX Valves & Controls.
c. Watts Industries, Inc.; Water Products Div.
d. Zurn Plumbing Products Group; Wilkins Div.

3. Standard: ASSE 1013.
4. Operation: Continuous-pressure applications.
5. Size: ½” – 3”.
6. Body: Bronze for NPS 2 and smaller; ductile iron for NPS 2-1/2 and larger.
7. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
8. Configuration: Designed for horizontal, straight through flow.
9. Accessories:

a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.
b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

2.3 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cash Acme.
b. Conbraco Industries, Inc.
c. Honeywell Water Controls.
d. Watts Industries, Inc.; Water Products Div.
e. Zurn Plumbing Products Group; Wilkins Div.

3. Standard: ASSE 1003.
4. Pressure Rating: 300 PSIG (2070 kPa).
5. Size: 4" NPS and smaller
6. Body: Bronze for NPS 3 (DN 80) and smaller.
7. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and above.

2.4 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Armstrong International, Inc.
   b. Flo Fab, Inc.
   c. ITT Industries; Bell & Gossett Div.
   d. NIBCO Inc.
   e. TAC Americas.
   f. Taco, Inc.
   g. Watts Industries, Inc.; Water Products Div.

3. Type: Ball valve with two readout ports and memory setting indicator.
4. Body: Brass or bronze,
5. Size: Same as connected piping, but not larger than NPS 2.
6. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

2.5 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Drain: Pipe plug.

2.6 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze: Chrome Plated in public areas.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral non-removable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Include operating key with each operating-key hose bibb.

9. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.7 WALL HYDRANTS

A. Non-freeze Wall Hydrants:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company.
    b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    c. Woodford Manufacturing Company.
    d. Zurn Plumbing Products Group; Specification Drainage Operation.

3. Standard: ASME A112.21.3M for exposed-outlet, self-draining wall hydrants.
4. Pressure Rating: 125 psig.
5. Operation: Loose key.
6. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
7. Inlet: NPS 3/4 (DN 20.
8. Outlet: With integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
9. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
10. Nozzle and Wall-Plate Finish: Rough bronze.
11. Operating Keys(s): Two with each wall hydrant.

2.8 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AMTROL, Inc.
    b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    c. Zurn Plumbing Products Group; Specification Drainage Operation.

3. Standard: ASSE 1010 or PDI-WH 201.
4. Type: Metal bellows.
5. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.9 HOT WATER CIRCULATORS

A. In-line domestic hot water recirculating pump:

1. Available Manufacturer's:

    a. Bell & Gossett; ITT Fluid Handling Division.
    b. Grundfos, Inc.

c. Taco Pump Co.

2. All bronze or stainless construction.
3. Flanged connections.
4. Hardened steel shaft.
5. Bronze sheathed, diamond-bored sleeve bearing.
6. Bronze impeller.
7. Mechanical seals.
8. Flexible-coupled motor, supported from pump casing, provided with manual motor starter and thermal overload protection.
9. Refer to plumbing drawings for horsepower, voltage and capacities.
10. Strap-on aquastat (When mixing valves are not utilized).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers where indicated on drawings.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
3. Do not install bypass piping around backflow preventers.

C. Install water regulators with inlet and outlet shutoff valves and full size valved by-pass. Install pressure gages on inlet and outlet sides where indicated on drawing.

D. Install balancing valves in locations where indicated on hot water recirculating system.

E. Install liquid-in-glass thermometers in the outlet of each domestic, hot-water heater where indicated on water heater piping diagram.

F. Provide the following temperature ranges for thermometers:

1. Domestic Hot Water: 30 to 180 degree F, with 2-degree scale divisions.

G. Install dry-case-type pressure gauges where indicated on plans for discharge or each pressure-reducing valve.

H. Install direct-mounting thermometers and adjust vertical and tilted positions.

I. Install direct-mounting pressure gauges in piping tees with pressure gauge located on pipe at most readable position.

J. Install needle-valve and snubber fitting in piping for each pressure gauge.

K. Install test plugs in tees in piping.

L. Install thermometers and gauges adjacent to machines and equipment to allow service and maintenance for thermometers, gauges, machines and equipment.

M. Adjust faces of thermometers and gauges to proper angle for best visibility.

N. Install Y-pattern strainers for water on supply side of each water pressure-reducing valve.

O. Install water hammer arresters in all areas where indicated on plans including locations with solenoid valves, flush valves, and washer boxes in accordance with PDI-WH 201.

P. Install air vents at high points of water piping.

Q. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fittings. Adjust valve for proper flow.

R. Install strap-on aquastat to control pump operation on hot water circulators.

S. Isolate hot water circulators with a ball valve on each side of the flanged connections.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each double-check, detector-assembly backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.4 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 22 11 19

SECTION 22 13 16 -SANITARY, WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.
2. Chemical Resistant Waste and Vent Piping: 10- foot head of water.

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall be capable of withstanding the effects of seismic events determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures."

1.3 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Shop Drawings:

1. Pipe, tube, fittings and couplings.

C. Field quality-control inspection and test reports.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include but are not limited to manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns, Schedule 40.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Aboveground, soil and waste piping shall be the following:

1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

B. Aboveground, vent piping NPS 1-1/2” shall be the following:

1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

C. Aboveground, vent piping NPS 2 (DN 50) shall be the following:

1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

D. Underground, soil, waste, and vent piping shall be the following:

1. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

E. Aboveground, condensate piping all sizes shall be the following:

1. Type “M” copper tube, wrought-copper solder-joints.

F. Underground, condensate piping all sizes shall be the following:

1. Solid-wall PVC pipe, PVC socket fittings and solvent-cemented joints.

3.2 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Install seismic restraints on piping per local building codes.

C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

D. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.

E. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing."

F. Install wall-penetration fitting at each service pipe penetration through foundation wall. Make installation watertight.

G. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

H. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

I. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 2 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

J. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

K. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

L. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

M. PVC piping will not be permitted in return air plenums.

3.3 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.4 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

3.6 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

6. Prepare reports for tests and required corrective action.

3.7 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.8 PROTECTION

A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION 22 13 16

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SECTION 22 13 19 -SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.3 COORDINATION

A. Coordinate size and location of roof penetrations.

1.4 EXTRA MATERIALS

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company; Josam Div.
    b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    c. Zurn Plumbing Products Group; Specification Drainage Operation.
    d. MIFAB.

3. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
4. Size: Same as connected drainage piping
5. Body Material: as required to match connected piping.
6. Closure: Countersunk, brass plug.
7. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

8. Closure: Stainless-steel plug with seal.

B. Metal Floor Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Zurn Plumbing Products Group; Specification Drainage Operation.
   d. MIFAB.

3. Standard: ASME A112.36.2M for adjustable housing cleanout.
4. Size: Same as connected branch.
5. Type: Adjustable housing.
6. Body or Ferrule: Cast iron.
7. Outlet Connection: Inside calk.
8. Closure: Brass plug with straight threads and gasket.
9. Adjustable Housing Material: Cast iron with threads set-screws or other device.
10. Frame and Cover Material and Finish: Nickel-bronze.
11. Frame and Cover Shape: Square.
12. Top Loading Classification: Heavy Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
14. Standard: ASME A112.3.1.
15. Size: Same as connected branch.
16. Housing: Stainless steel.
17. Closure: Stainless steel with seal.
18. Riser: Stainless-steel drainage pipe fitting to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Zurn Plumbing Products Group; Specification Drainage Operation.
   d. MIFAB

3. Standard: ASME A112.36.2M. Include wall access.
4. Size: Same as connected drainage piping.
5. Body: as required to match connected piping.
6. Closure: Countersunk, brass plug.
7. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
8. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
9. Wall Access: Round, nickel-bronze, wall-installation frame and cover.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company; Josam Div.
    b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    c. Zurn Plumbing Products Group; Specification Drainage Operation.
    d. MIFAB

3. Standard: ASME A112.6.3.
4. Body Material: Gray iron.
5. Outlet: Bottom.
6. Backwater Valve: Not required.
7. Top or Strainer Material: Nickel bronze.
8. Top of Body and Strainer Finish: Nickel bronze.
9. Top Loading Classification: As specified on plans.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Acorn Engineering Company; Elmdor/Stoneman Div.
    b. Thaler Metal Industries Ltd.

B. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch-thick, lead flashing collar and skirt extending at least 6 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

1. Open-Top Vent Cap: Without cap.
2. Low-Silhouette Vent Cap: With vandal-proof vent cap.
3. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Deep-Seal Traps:

1. Description: Cast-iron PVC as specified for piping, with inlet and outlet matching connected piping.
2. Size: Same as connected waste piping.

    a. NPS 2: 4-inch-minimum water seal.
    b. NPS 2-1/2 and Larger: 5-inch-minimum water seal.

B. Floor-Drain, Trap-Seal:

1. Description: Elastomeric flexible PVC extended. Pro-set or approved substitute.

2.5 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft..
2. Vent Pipe Flashing: 8 oz./sq. ft..

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.6 GREASE INTERCEPTORS

A. Grease Interceptors:

1. Refer to details and specifications on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Cleanout Types:

1. Exterior: Cast iron cutoff ferrule with round scoriated frame and cover, secured.
2. Finished Concrete Floors: Neolock Connection, with round Nikaloy scoriated frame and cover.
3. Ceramic Tile Floors: Neolock Connection, with round Nikaloy scoriated frame and cover.
4. Resilient Tile Floors: Neolock Connection, with round recessed Nikaloy smooth round frame and cover.
5. Wall: Smooth round stainless steel access cover with securing screw.
6. Carpet Floor: Neolock Connection with round Nikaloy scoriated frame and cover with carpet marker.
7. Note: Use clamping device on cleanouts than occur in floors having waterproof membrane.

F. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
3. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

H. Install deep-seal traps on floor drains.

I. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

J. Install interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.

K. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

L. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

M. Refer to plumbing drawings for elevator sump pump discharge location.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

F. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 13 19

SECTION 22 14 13 - FACILITY STORM DRAINAGE PIPING

PART 1 - **GENERAL**

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working-pressure, unless otherwise indicated:

1. Storm Drainage Piping: 10-foot head of water.

B. Seismic Performance: Storm drainage piping and installation shall be capable of withstanding the effects of seismic events determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures."

1.3 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings, roof drains.

B. Field quality-control inspection and test reports.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

PART 2 - **PRODUCTS**

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

C. PVC piping not permitted in return air plenums.

PART 3 - **EXECUTION**

3.1 EXCAVATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Aboveground storm drainage piping shall be the following:

1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

B. Underground storm drainage piping shall be the following:

1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

3.3 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers. Cleanouts are specified in Division 22 Section "Storm Drainage Piping Specialties."

C. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

D. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

E. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:

1. Building Storm Drain: 1 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.

F. Install PVC storm drainage piping according to ASTM D 2665.

G. Install underground PVC storm drainage piping according to ASTM D 2321.

H. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

I. Secondary storm drainage piping system shall be of same materials as primary system.

3.4 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results Plumbing."

B. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.5 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Test Procedure: Test storm drainage piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. For a minimum of 2 hours from 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.8 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 22 14 13

SECTION 22 14 23 - STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

1.4 COORDINATION

A. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Josam Company; Josam Div.
    b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    c. Tyler Pipe; Wade Div.
    d. Watts Drainage Products Inc.
    e. Zurn Plumbing Products Group; Specification Drainage Operation.
    f. MIFAB.

2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: as required to match connected piping.
5. Closure: Countersunk, brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Closure: Stainless-steel plug with seal.

B. Metal Floor Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Zurn Plumbing Products
   d. MIFAB

2. Standard: ASME A112.36.2M for adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Adjustable housing.
5. Body or Ferrule: Cast iron.
6. Outlet Connection: Inside calk.
7. Closure: Brass plug with straight threads and gasket.
8. Adjustable Housing Material: Cast iron with.
9. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
10. Frame and Cover Shape: Round.
11. Top Loading Classification: Heavy Duty.
12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
13. Standard: ASME A112.3.1.
14. Size: Same as connected branch.
15. Housing: Stainless steel.
16. Closure: Stainless steel with seal.
17. Riser: Stainless-steel drainage pipe fitting to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Watts Drainage Products Inc.
   d. Zurn Plumbing Products Group; Specification Drainage Operation.
   e. MIFAB

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: as required to match connected piping.
5. Closure: Countersunk, brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
8. Wall Access: Round, nickel-bronze, wall-installation frame and cover.

2.2 ROOF DRAINS

A. Metal Roof Drains:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Watts Drainage Products Inc.
   d. Zurn Plumbing Products Group; Specification Drainage Operation.

e. MIFAB

2. Standard: ASME A112.21.2M.
3. Pattern: Roof drain.
4. Body Material: Cast iron.
5. Outlet: Bottom.
6. Dome Material: Cast iron.
7. Extension Collars: Required.
8. Underdeck Clamp: Required.
9. Sump Receiver: Required.
10. Provide 2” external dam on overflow secondary drains.

2.3 FLASHING MATERIALS

A. Copper Sheet: ASTM B 152/B 152M, 12 oz./sq. ft. thickness.

B. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

D. Fasteners: Metal compatible with material and substrate being fastened.

E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

F. Solder: ASTM B 32, lead-free alloy.

G. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Cleanout Types:

1. Exterior: Cast iron cutoff ferrule with round scoriated frame and cover, secured.
2. Finished Concrete Floors: Neolock Connection, round Nikaloy scoriated frame and cover.
3. Ceramic Tile Floors: Neolock Connection, with round Nikaloy scoriated frame and cover.
4. Resilient Tile Floors: Neolock Connection, with round recessed Nikaloy smooth round frame and cover.
5. Wall: Smooth round stainless steel access cover with securing screw.
6. Carpet Floor: Neolock Connection with round Nikaloy scoriated frame and cover with carpet marker.
7. Note: Use clamping device on cleanouts than occur in floors having waterproof membrance.

F. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.

1. Install roof-drain flashing collar or flange so that there will be no leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Position roof drains for easy access and maintenance.

G. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

H. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

I. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

J. Base of all roof drains and overflow drains shall be insulated in accordance with Division 22, “Plumbing Insulation.”

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 14 23

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SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUBMITTALS

A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and Maintenance Data: For plumbing fixtures to include in operation, and maintenance manuals.

1.3 COORDINATION

A. Contractor shall examine Architectural drawings for exact location and number of plumbing fixtures required. Architect/Engineer shall be notified of any discrepancies between the architectural and plumbing drawings prior to bidding. Failure to examine all drawings will not constitute a change order for fixtures to be added which were shown on one but not the other.

B. Refer to Architectural plans for rough-in dimensions. Do not scale plumbing drawings for rough-in dimensions.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

D. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

E. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

F. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES

A. Specific manufacturers and model numbers of all plumbing fixtures and trim required for this project are indicated in the plumbing fixture schedule on the plumbing drawings. Items specified indicate the quality and appearance required.

B. China or enamel fixtures shall be white in color unless noted otherwise.

C. All fixtures designed for handicap use shall be mounted at handicap height as indicated on plans and herein.

D. Residential grade fixtures will not be accepted unless so specified as the quality and appearance required in the plumbing fixture schedule.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Wash Fountain Faucets:

1) Symmons Industries, Inc.
2) Kohler Co.
3) Delta Commercial

b. Lavatory Faucets:

1) Symmons Industries, Inc.
2) Kohler Co.
3) Delta Commercial.

c. Shower Faucets:

1) Symmons Industries, Inc.
2) Kohler Co.
3) Delta Commercial.

d. Sink Faucets.

1) Symmons Industries, Inc.
2) Kohler Co.
3) Delta Commercial.

e. Flushometers

1) Zurn Plumbing Products.
2) Sloan Valve Co.

f. Toilet Seats (Must be Black)

1) Bemis Manufacturing Co.
2) Centoco Manufacturing Co.
3) Church seats.
4) Kohler Co.

g. Protective Shielding Guards

1) Trubro Inc.
2) Brocar.
3) Plumberex Specialty Products, Inc.

h. Fixture Supports

1) Zurn Plumbing Products.
2) Josam Co.
3) Smith, Jay R. Mfg. Co.
4) Tyler Pipe; Wade Div.

i. Water Closets

1) Kohler Co.
2) American Standard Co.
3) Toto USA, Inc.
4) Zurn

j. Urinals.

1) Kohler Co.
2) American Standard Co.
3) Toto USA, Inc.
4) Zurn

k. Lavatories

1) Kohler Co.
2) American Standard Co.
3) Toto USA, Inc.
4) Zurn

l. Drop-in Commercial Sinks

1) Elkay Mfg. Inc.
2) Just Mfg. Co.
3) Advance Tabco.
4) Kohler Co.

m. Wash Fountains

1) Bradley Corp.

n. Service Sinks and Basins

1) Stern-Williams, Co., Inc.

2) Kohler Co.
3) American Standard Co.
4) Zurn

o. Laundry Sinks

1) Fiat Products.
2) Kohler Co.

p. Drinking Fountains

1) Elkay Mfg., Co.

q. Electric Water Coolers

1) Elkay Mfg., Co.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.

C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-mounting fixtures with tubular waste piping attached to supports.

F. Install counter-mounting fixtures in and attached to casework.

G. Install fixtures level and plumb according to roughing-in drawings.

H. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

I. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

J. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

K. Install toilet seats on water closets.

L. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

M. Install shower flow-control fittings with specified maximum flow rates in shower arms.

N. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

O. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing."

P. Set shower receptors and service basins in leveling bed of cement grout. Grout is specified in Division 22 Section "Common Work Results for Plumbing."

Q. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

3.3 HANDICAP PLUMBING FIXTURE MOUNTING REQUIREMENTS

A. Plumbing fixtures designated for handicap usage shall be mounted at handicap height in accordance with the North Carolina Handicap Code and the Americans with Disabilities Act. Fixture heights and requirements are as follows:

1. Refer to Architectural drawings and plumbing fixture specifications on plans for mounting heights.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. See schedule on plans for connection sizes to fixtures.

D. Connect wall-hung urinals to waste piping with red brass nipples.

E. Each fixture, floor drain, and piece of equipment requiring connection to drainage system to have separate traps installed as close to fixture as possible.

3.5 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

E. Install fresh batteries in sensor-operated mechanisms.

3.6 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

D. Install fresh batteries in sensor-operated mechanisms.

3.7 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.8 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 40 00

SECTION 22 68 00 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
2. Service Regulators: 65 psig minimum unless otherwise indicated.

B. Natural-Gas System Pressures within Buildings: Two pressure ranges. Primary pressure is more than 0.5 psig but not more than 2 psig and is reduced to secondary pressure of 0.5 psig or less.

1.2 SUBMITTALS

A. Product Data: For each type of the following:

1. Piping specialties.
2. Corrugated, stainless-steel tubing with associated components.
3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
4. Pressure regulators. Indicate pressure ratings and capacities.

B. Welding certificates.

C. Field quality-control reports.

D. D.Operation and Maintenance Data: For pressure regulators to include in operation, and maintenance manuals.

1.3 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

1.4 DELIVERY, STORAGE, AND HANDLING

A. A.Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

B. B.Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. C.Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating and protect from direct sunlight.

1.5 PROJECT CONDITIONS

A. A.Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located. Retain first paragraph below if interruption of existing natural-gas service is required

1.6 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. B.Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Division 22 Common Work Results for Plumbing."

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

    a. Material Group: 1.1.
    b. End Connections: Threaded or butt welding to match pipe.
    c. Lapped Face: Not permitted underground.
    d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
    e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground Retain first subparagraph below for underground steel piping. Cathodic protection may be required in addition to protective coating. Coordinate with requirements in Division 26 Section "Cathodic Protection."

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
3. Operating-Pressure Rating: 0.5 psig
4. End Fittings: Zinc-coated steel.
5. Threaded Ends: Comply with ASME B1.20.1.
6. Maximum Length: 72 inches Detail quick-disconnect devices on Drawings for specific gas appliances.

B. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

C. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

A. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

B. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

C. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Conbraco Industries, Inc.; Apollo Div.
   b. McDonald, A. Y. Mfg. Co.
   c. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated brass.
4. Stem: Bronze; blowout proof.

5. Seats: Reinforced TFE; blowout proof.
6. Packing: Separate packnut with adjustable-stem packing threaded ends.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

D. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Conbraco Industries, Inc.; Apollo Div.
   b. McDonald, A. Y. Mfg. Co.
   c. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Bronze Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Lee Brass Company.
   b. McDonald, A. Y. Mfg. Co.

2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig.
7. Listing: Valves NPS 1and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.5 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.

3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

2.6 DIELECTRIC FITTINGS

A. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. McDonald, A. Y. Mfg. Co.
   b. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
   c. Wilkins; Zurn Plumbing Products Group.

2. Minimum Operating-Pressure Rating: 150 psig.
3. Combination fitting of copper alloy and ferrous materials.
4. Insulating materials suitable for natural gas.
5. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

2.7 SLEEVES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.8 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Advance Products & Systems, Inc.
   b. Calpico Inc.
   c. Metraflex Company (The).

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe and sleeve.
3. Pressure Plates: Plastic.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one nut and bolt for each sealing element.

2.9 LABELING AND IDENTIFYING

A. Comply with requirements of Division 22, “Identification for Plumbing and Equipment” for above ground piping identification.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to NFPA 54 to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with NFPA 54 requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

A. Comply with NFPA 54 for installation and purging of natural-gas piping.

B. Install fittings for changes in direction and branch connections.

C. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.

3.4 INDOOR PIPING INSTALLATION

A. Comply with NFPA 54 for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install escutcheons at exposed penetrations of interior walls, ceilings, and floors.

K. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to firestop details on plumbing drawings for U.L. system numbers and specific penetrations utilized.

L. Verify final equipment locations for roughing-in.

M. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

N. Extend relief vent connections for line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

P. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.

1. Exception: Tubing passing through partitions or walls does not require striker barriers.

Q. Prohibited Locations:

1. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
2. Do not install natural-gas piping in solid walls or partitions.

R. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

S. Connect branch piping from top or side of horizontal piping.

T. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

U. Do not use natural-gas piping as grounding electrode.

V. Install strainer on inlet of each line-pressure regulator.

3.5 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

3.6 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

3.7 CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.8 PAINTING

A. Paint exposed, exterior metal piping, valves, service regulators, and piping specialties, except components, with field-applied paint or protective coating.

1. Alkyd System: MPI EXT 5.1D.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
c. Topcoat: Exterior alkyd enamel (flat).
d. Color: As selected by architect.

B. Paint exposed, interior metal piping, valves, and piping specialties, except components, with field-applied paint or protective coating.

1. Latex Over Alkyd Primer System: MPI INT 5.1Q.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex (flat).
d. Color: As selected by architect.

C. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.9 TESTING AND ACCEPTANCE

A. Perform tests and inspections.

B. Tests and Inspections:

1. Test, inspect, and purge natural gas according to NFPA 54 and authorities having jurisdiction.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. For test pressures refer to Section 22 “Common Work Results for Plumbing.”

3.10 PIPING SCHEDULE

A. Aboveground natural-gas piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints for piping 2” and smaller and less than 5 psig operating pressure.
2. Steel pipe with wrought-steel fittings and welded joints for piping 2-1/2” and larger or more than a 2 psig operating pressure.

3.11 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Distribution piping valves for pipe sizes NPS 2 and smaller shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

B. Distribution piping valves for pipe sizes NPS 2-1/2 and larger shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.

2. Bronze plug valve.
3. Cast-iron, nonlubricated plug valve.

C. Valves in branch piping for single appliance shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

3.12 EMERGENCY GENERATOR CONNECTIONS

A. Verify exact location of gas piping connection on emergency generator prior to installation of any piping. Verify that adequate pressure is available to operate selected unit and locate pressure regulator and shut-off valve in accordance with generator manufacturer's recommendations.

1. Gas piping to generator shall have strainer and full port ball valve on upstream side of pressure regulator.
2. Pressure regulator shall be commercial/industrial type, lock-up or hard shut-off option, direct acting, with lock-up or hard shut-off option, internally regulated relief, light spring, sized 1.5 times the generator input BTUH load. Turn down regulator vent to prevent diaphragm damage due to moisture/freezing.
3. Utilize sweep elbows. Flex pipe not acceptable for elbows.
4. Pig all gas pipe prior to use.

END OF SECTION 22 68 00

SECTION 23 05 00 - COMMON WORK FOR HVAC

PART 1 - GENERAL

1.1 WORK INCLUDED

A. It shall be the contractor's responsibility to furnish and install complete all systems, equipment, and related items described under Division 23.

B. It shall be the Contractor's responsibility to determine the characteristics of electrical currents available to operate the mechanical equipment prior to ordering such equipment. All electrically operated equipment shall be designed for operation with the type of electric current available to the project.

C. It shall further be the Contractor's responsibility to locate, layout and make provisions for all openings required in precast or cast in place concrete slabs, etc., necessary to accommodate his work.

D. Do all excavation and backfilling required for the installation of piping and other mechanical work underground. This work shall comply with all applicable provisions of "Excavating and Backfilling" and EARTHWORK as defined in the Civil drawings in the site package.

E. Provide labor, materials, tools, and services for a complete installation of equipment and systems specified herein and indicated on drawings.

F. All equipment shall be installed in accordance with the manufacturer's drawings and recommendations.

G. The Contractor shall furnish and install all rough-in work and make final connections to all equipment requiring ductwork and other mechanical work required for connection to equipment furnished under this contract.

H. The equipment shall be properly prepared structurally and mechanically ready to receive a single connection for each of the various mechanical items with all plumbing, piping drains, traps, tailpieces, supply fittings, ductwork, gas lines, etc., internal to and part of the equipment installed by the equipment manufacturer or supplier.

I. Verify all connections and rough-in locations with the Architect and / or the equipment supplier or contractor prior to the start of their work.

J. Contractor agrees to assume responsibility for liability, workmanship and quality of materials concerning work sublet to others. Before part of contract is sublet, submit to Architect in writing names of proposed subcontractors and obtain written approval.

1.2 CODES AND FEES

A. All work shall be installed in accordance with the applicable provisions of the local codes, latest adopted International Mechanical Code, NFPA, AGA, UL, ASTM, ASHRAE, SMACNA, ASME and ANSI.

B. The Contractor shall pay for fees and inspections as may be required by agencies having jurisdiction.

1.3 ELECTRICAL WORK

A. All control wiring and conduit not shown on Electrical drawings shall be furnished and installed under Division 23 according to the National Electrical Code and Division 26 requirements. See G.2.

B. All power wiring and conduit for items furnished under Division 23 shall be furnished and installed under Division 26. See G.1.

C. All disconnects shall be furnished and installed by Division 26.

D. Toggle switches for 1/2 HP motors and less shall be furnished and installed by Division 26.

E. Wiring and conduit for solenoid valves, and control transformers including the transformers shall be furnished and installed by Division 23.

F. Division 26 shall install all starters, toggle switches, disconnects, and all wiring to the respective motor or device. Wiring and conduit from starter to a controller shall be by Division 23.

G. Definitions

1. Power wiring: Line voltage circuitry rough-in including conduit, boxes, conductors, etc. between the overcurrent protection and the equipment including the connection of the starters.
2. Control wiring: Any voltage circuitry rough-in including conduit, boxes, conductors, etc. between control activator and the controller or starter.

H. Conduit: All power wiring and 120V control wiring shall be in conduit. Low voltage control wiring shall be installed in conduit where exposed, or in return air plenums, in masonry walls, or below slab.

I. Smoke Detectors and Firestats

1. Smoke detectors shall be furnished and installed by Division 23 unless the project has a fire alarm system, then smoke detectors shall be furnished by Division 26, installed in ductwork by Division 23. All wiring and conduit from detector to fan shall be considered control wiring. 110 Volt wiring to the detector shall be power wiring. Wiring from the detector to fire alarm system shall be furnished and installed by Division 26.

1.4 VISIT TO JOB SITE

A. Before submitting bid, Contractor shall visit the job site for the purpose of examining the site and conditions under which the work must be performed. No extra will be allowed for situations arising from failure of Contractor to thoroughly familiarize himself with site conditions.

1.5 RECORD DRAWINGS

A. The Contractor shall maintain a set of prints that reflect site conditions including location of dampers, ductwork, equipment, etc. that have been changed to suit job conditions. The contractor shall prepare a corrected reproducible tracing of the project using the results of the record print. Final payment shall not be made until such document(s) is turned over to the architect upon completion of the project.

1.6 QUALITY ASSURANCE

A. Perform work of this section using skilled workers who are trained and experienced in the required crafts and who are knowledgeable and familiar with the specified requirements and the methods to be used for proper performance of the work.

1.7 COMPLETE WORK

A. Contractor shall provide and install all systems in complete working order. All items normally required for operation shall be provided.

1.8 SEISMIC DESIGN

A. This project is Seismic Category C, according to the International Building Code.

PART 2 - PRODUCTS

2.1 IDENTIFICATION

A. All starters and pushbutton stations shall be labeled to identify the equipment which they control, utilizing Kroy Duratype 240 SE industrial tape, and suitable labeling machine or approved substitute.

B. All air units, fans, etc., shall be labeled with drawing mark number and with description of area served, utilizing engraved plastic laminate nameplates. Nameplates shall be Seton “Setonply” or approved substitute.

C. All air unit thermostats shall be labeled with proper mark number identifying it with air unit it serves, utilizing Kroy Duratype.240 SE industrial tape, and suitable labeling machine or approved substitute.

D. Fire and smoke damper labels shall be placed on a tee bar below the damper. The label shall be the same size as described for valves and shall be marked FIRE DAMPER or SMOKE DAMPER.

2.2 INDOOR ENVIRONMENTAL QUALITY - LOW EMITTING MATERIALS

A. All adhesive and sealants used on the interior of the building (inside the weatherproofing and applied on-site) shall comply with “South Coast Air Quality Management District 9SCAQMD) Rule #1168", current VOC limits.

B. Paints and coatings used on the interior of the building shall comply with the following criteria for VOC limits:

1. Architectural paints, coatings, and primers - Green Seal Standard GS-11, Paints, 1st Edition 5/20/93.
2. Anti-corrosive and anti-rust paints - 250 g/l per Green Seal Standard GC-03, Anti-Corrosive Paints, 2nd Edition, January 7, 1997.

2.3 SERVICE AND MAINTENANCE CONTRACT

A. The Contractor shall make arrangements with an independent service and maintenance contractor, “other than the project mechanical contractor” and as approved by the Architect, to perform all the required

servicing and maintenance of the heating, ventilating and air conditioning system, without cost to the owner, for a period of one year after date of substantial completion. The name of the service contractor shall be part of submittals.

B. The servicing shall be complete in every respect and shall include but not be limited to the following: Replacing or washing of all filters as required for proper equipment operation, replacing bad belts, compressors, bearings, motors, controls, electric heaters, refrigerant specialties, couplings; cleaning drain pans and piping; replacing refrigerant and oil, bearing lubrication, and keeping equipment reasonably clean.

C. This service work shall be performed a minimum of three times a year. Filters may need changing more than 3 times depending on conditions. A written report shall be submitted to the Owner describing each visit. The date the service work starts shall be clearly identified in close out documents.

2.4 EQUIPMENT LIST, SHOP DRAWINGS AND SAMPLES

A. Submit to the Architect for approval, within 30 days after receipt of Notice to Proceed with the work, detailed shop drawings of all equipment and all material required to complete the project. The shop drawing shall be complete as described herein. The Contractor shall furnish the number of copies required by the General and Special Conditions of the Contract, but in no case less than six (6) copies.

B. All shop drawings to be submitted at one time in a 3-ring binder with cover and drawing index sheet.

C. The shop drawings shall be detailed, with dimensioned drawings or catalog cuts, showing construction, size, arrangement, operating clearances, performance characteristics and capacity. Each item of equipment proposed shall be a standard catalog product of an established manufacturer and of equivalent quality, finish, and durability to that specified. Submission material and all shop drawings for the various items of equipment shall be marked with the respective mark number or identification of the equipment shown on the drawing or in the specification.

D. Provide a cover sheet for all major equipment, shall list in detail all accessories called for in specifications and on drawings that are being supplied. Also, list operating capacities shown in schedules or described on drawings. Failure to list these items will result in resubmittal. A copy of a standard catalog will not be sufficient. Shop drawings for controls shall contain a detailed sequence of operation. Provide shop drawings for piping firestop details.

E. Shop drawings shall show sizes and details of required concrete and steel machine foundation, location of anchor bolts, physical dimension of equipment, equipment weight or other pertinent data required for equipment support or installation.

F. The contractor shall verify all electrical requirements of equipment with the electrical service available before ordering said equipment.

G. Approved shop drawings do not mean that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the contract drawings or specifications.

2.5 EQUIPMENT START-UP

A. Before final payment, provide architect and engineer with letter from each equipment supplier stating that equipment has been started and checked by factory qualified field service technicians and is installed and running satisfactory in every respect.

PART 3 - EXECUTION

3.1 TESTS

A. Test all piping, following installation, but before it is covered or connected to equipment. Furnish necessary labor, materials, and equipment for making test. All leaks disclosed by testing shall be reworked in an approved manner and the leaking system shall then be retested until proved tight under pressure. Test all systems for water tightness (or gas-tightness) as required by the authorities having jurisdiction, or in the absence of such requirements the minimum tests shall be made as follows:

1. All refrigerant piping systems shall be tested at 200 pounds with dry nitrogen until all leaks have been made tight. After the pressure tests use suitable vacuum pump to evacuate the system to at least 1000 microns, then charge the system with refrigerant and oil as required. Prior to running the refrigerant equipment all safety and operating devices and controls shall be properly adjusted and tested for proper operation and protection of the equipment.
2. Test all gas piping systems with air or inert gas only. Test pressure shall be not less than five times the maximum pressure to which the piping will be subjected in operation for a period not less than 30 minutes.

B. Test all heating, cooling and ventilating equipment. When installation is complete, all equipment shall be tested for proper operation and functioning as directed by Architect.

1. All equipment, motors, fans, etc., shall run at their required speed and be free from excessive vibration and noise. No bearings, journals, or any part of the motors shall heat to a temperature in excess of 40°C. above the temperature of the surrounding air.
2. The equipment, diffusers, registers, dampers, etc., shall be adjusted to deliver air at all outlets according to the amount of air shown on the drawings or as required to obtain adequate room temperature.
3. Architect reserves the right to require the Contractor to demonstrate the uniformity of heating and cooling in each area of the building.

3.2 COORDINATION

A. The mechanical work shall be installed as neatly as possible in the locations shown but shall be subject to such deviations, modifications and relocations as may be necessary to conform to the requirements of the architectural drawings and as necessary to avoid interferences with the structural work and the work of other trades, and interferences between the various trades. This shall be done at no cost to the Owner. No ductwork or equipment shall be installed which would require ceilings to be lower than required by drawings unless approval is obtained from the Architect.

B. It is the responsibility of the General Contractor to coordinate the work of his subcontractors. To this end, the General Contractor shall require that the various subcontractors carefully examine and familiarize themselves with the architectural and structural drawings and drawings covering the work of other trades, and that they frequently consult with all other trades so that the work may be coordinated.

C. If necessary to coordinate and expedite the work, the Contractor shall prepare "interference drawings" and submit them to the Architect for approval. Such drawings shall show the work of the various trades involved, illustrate proposed details of construction and arrangement of equipment and apparatus, and clearly indicate any deviations from contract requirements.

D. Minor changes in arrangement may be made to suit unforeseen conditions, but no major deviation shall be made without written approval from the Architect. If any deviations are deemed necessary, submit all

details of proposed changes and all reasons therefore, in writing, to the Architect for approval prior to making installation of such work.

E. Do not fabricate ductwork before interferences are verified. No extra will be allowed for piping or ductwork fabricated in advance which cannot be used.

F. Field verify exact sizes of fire dampers and duct balancing dampers before ordering. No extra will be allowed for dampers ordered in advance which cannot be used.

3.3 CUTTING AND REPAIRING

A. All chases, recesses, sleeves and other openings in masonry and concrete shall be built in as the construction work progresses, and it shall be the responsibility of the subcontractor to see that such chases, recesses, sleeves, and other openings required for their work are properly located and installed. If this is not done by the subcontractor whose work required such accommodation, it shall be performed at his expense.

B. Structural members or finished work shall not be cut without the express permission of the Architect. Cutting shall be done neatly and patching or repairing shall match adjacent work.

3.4 PROTECTION AND CLEANING

A. Work shall be protected at all times. Pipe openings shall be closed with caps or plugs until permanent connections are made. Equipment shall be covered, if necessary, to protect against dirt, water, chemical or mechanical damage or defacement. Cover all machine openings and open ends of ductwork to prevent entry of dirt and debris as project construction progresses.

B. Upon completion of the work and after all tests have been made and piping systems proven tight, clean all equipment, traps, dirt pockets, water tanks, circulating systems, filters, etc., and leave in correct operating condition. No air unit shall be operated without filters.

3.5 PAINTING

A. Painting of mechanical equipment, piping, and exposed ductwork in finished spaces, or exposed on the exterior, shall be finished as specified under Section 09 90 00, PAINTING. All equipment exposed on the exterior furnished without factory finish shall be painted.

B. Equipment with a factory applied finish shall have scratches, chips, etc., primed and touched up with materials which will protect the surface and match the adjacent area.

3.6 OPERATING INSTRUCTIONS

A. Furnish the services of competent personnel to instruct the Owner's personnel in the proper operation and maintenance of all equipment, for a period of not less than 3 working days. All owner training sessions shall be videotaped and at the completion of training a DVD format copy of the video shall be given to the owner with all installation, operation, and maintenance manuals.

B. Furnish and deliver to the Owner three sets of operating instructions for all equipment installed under this contract, including shop drawings, piping diagrams, wiring diagrams, maintenance recommendations and information concerning replacement parts. This information must contain mechanical and plumbing contractor names, equipment supplier names, contact personnel, telephone numbers, and facsimile

telephone numbers. This information shall be contained in a three ring binder of suitable size, and labeled on the exterior with project name.

3.7 QUIETNESS OF OPERATION

A. All fans, motors and other apparatus shall be selected and installed for reasonably quiet operation. Any objectionable noise which develops shall be corrected before the work will be accepted. Equipment or duct connections and fittings which produces objectionable noise shall be adjusted or insulated so as to eliminate the noise or shall be removed and replaced by satisfactory equipment. Provide spring or rubber machine mounting isolators and flexible piping and duct connections where necessary to prevent transmission of vibration to building structure or to piping and duct system.

3.8 GUARANTEE

A. The Contractor shall guarantee all work to be in accordance with contract requirements and free from defective or inferior materials, equipment, and workmanship for a period of one year, and he shall guarantee that all equipment is of proper size and design and so installed as to produce the capacities and results specified and shown on the drawings. Compressors shall have an extended 4 year warranty.

3.9 SUBSTITUTIONS

A. Substitutions shall be allowed in accordance with Division 1. Substitution approval shall be at the sole discretion of the Engineer.

B. Contractor shall note on shop drawings all major differences from specified material or equipment.

C. When making requests for substitutions, Contractor assumes the following responsibilities:

1. To have personally investigated the proposed substitute product and determined it is equal or superior in all respects to that specified.
2. To provide the same warranty for substitute that Contractor would for that specified:
3. To provide complete cost data, and waive all claims for additional costs related to substitution, which subsequently become apparent; and
4. To coordinate installation of the accepted substitute, making such changes as may be required for Work to be complete in all respects.

D. All requests for substitution must be submitted to the architect and engineer a minimum of 14 calendar days prior to project bid date. Such submission does not constitute approval. Only items or manufacturers specifically stated in the project specifications, drawings or addenda for use shall be considered as approved.

END OF SECTION 23 05 00

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SECTION 23 05 10 - BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. General provisions of Division 23, General and Supplementary Conditions, and General Requirements of Division 1, apply to this section.

1.2 BASIC REQUIREMENTS

A. Equipment and materials used in the work shall be in accordance with the contract documents, of the best quality and grade for use intended, shall be new and unused and shall be the manufacturer's latest standard or current model for which replacement parts are readily available.

B. Work shall be installed under the constant supervision of a competent superintendent and by skilled and competent mechanics experienced in the trade that contractor is practicing.

C. All apparatus and equipment shall be installed and connected in accordance with the best engineering practices and in accordance with the manufacturer's recommendations. All auxiliary piping, water seals, valves, electrical connections, etc., recommended by the manufacturer or required for proper operation shall be furnished and installed complete.

D. The work of this section is subject to the requirements of the Mechanical General Provisions and the General Provisions in Division 1.

PART 2 - PRODUCTS

2.1 SLEEVES AND PLATES

A. All pipes that pass-through masonry partitions and walls and concrete floor slabs shall be installed with standard weight galvanized steel sleeves. Sleeves through floors shall be long enough to project a minimum of 2" above finished floor. Sleeves shall be large enough for pipe, pipe insulation and required fire caulking. Sleeves in concrete shall be accurately located in the forms and secured in place to prevent displacement during pouring of concrete. Sleeves below grade in exterior walls shall be Link-Seal with wall penetration seal or approved substitution.

B. Sleeves in finished spaces shall finish flush with the finished wall surface. Sleeves for insulated water or refrigerant pipe shall be large enough to accommodate the insulation.

C. Pipes passing through masonry walls and partitions in finished spaces shall be fitted with metal escutcheons or collar plates. Plates occurring in painted walls or ceiling shall be prime coated for painting; other plates shall be chromium plated.

D. Exposed ducts passing through finished walls shall be furnished with sheet metal escutcheons.

E. All pipe penetrations of fire rated floors or walls are to be protected. Space between metal pipe and wall or sleeve shall be protected with Hilti, 3M, Rector seal Fire Barrier Penetration Sealing System. Installation shall be in accordance with the manufacturer’s recommendations for the hourly fire rating of the partition. The system shall be U.L. listed. For insulated chilled water, domestic cold water and

refrigerant pipe, continue insulation and vapor barrier through wall. The sleeve through the wall shall be large enough for the pipe, insulation and fire caulking.

F. PVC pipe passing through rated walls, ceilings or floors shall have Hilti UL Listed Fire Protection System or approved substitute. System number shall be as required by construction and rating.

2.2 ACCESS PANELS

A. Furnish steel access panels, not smaller than 12" for single valve and 12" X 24" or 18" X 18" for two or more valves, for access of concealed valves, unions, dampers, etc., where no other means of access is shown or specified. Access panels shall be turned over to the general contractor for installation.

B. Panels shall be Milcor, or approved substitute, with screwdriver operated cam latch, and of proper design and style for installation in wall, floor or ceiling construction called for on architectural drawings. Access panels in fire rated construction shall have a UL label Class B rating. All panel styles to be verified by the Designer.

2.3 MOTORS

A. Motors shall be in accordance with AIEE, UL, and NEMA standards selected for quiet operation, of standard design for specific voltage available, and for continuous duty 40°C. rise. Unless otherwise specified, they shall be open drip proof, ball bearing, squirrel cage type, equal to Louis Allis, Westinghouse, G. E., or approved substitute. Provide raceway terminal box on each motor, of ample size and with removable cover for connections.

B. Motors up to and including l/2 HP shall be designed for 120 volts, single-phase current; motors 3/4 HP and larger shall be designed for 3-phase current. Voltage will be as called for on the drawings. Verify characteristics of available current at the building before equipment is ordered. Verify with electric drawings.

C. Horsepower for all motors shall be such that when drive apparatus is operated at full capacity, motor shall be under not less than 3/4 load nor more than full rating.

D. Each motor shall have a permanent name plate, showing name of manufacturer model and serial numbers, amperes per phase, horsepower, voltage, speed and cycles.

E. Provide for each belt drive motor a guard shielding perimeter and face of the drive.

2.4 MOTOR CONTROLS

A. All motors shall be furnished with starters under Division 23.

B. Manual starters with overload protection shall be used to control motors 1/2 HP and smaller. Single phase motors requiring interlock and all 3-phase motors shall be provided with magnetic starters.

C. Magnetic starters shall have thermal overload and low voltage protection. Three phase starters shall have (3) thermal overloads. Also, provide ground fault protection. All electrical and mechanical components shall be of the highest quality, and parts subject to wear or deterioration shall be renewable. Starters for motors 3/4 HP and larger shall be combination fused type and incorporate type L.P.S. fuses. Holding coils shall suit the requirements of control diagrams. Provide control voltage transformers in starters as indicated on control diagrams. Starters to be UL listed.

PART 3 - EXECUTION

3.1 GENERAL

A. Run exposed ducts and piping parallel to the principal parts of the building. Ducts and piping shall be run concealed when provisions are made in floors, walls, ceilings and chases through all finished spaces, except at fixture connections and where specifically noted otherwise. Do not run water pipe below ground floor slab except where necessary.

B. Piping, ducts, and equipment shall be kept as close as possible to ceilings, walls, columns, etc., and shall be installed in such an orderly manner as to take up a minimum of space and allow a maximum of headroom, and all offsets, fittings, etc., required to accomplish this shall be furnished and installed, whether or not each offset and fitting is specifically shown or noted. Minimum clearances on exposed piping shall be maintained as specified under "Piping Clearances" herein.

END OF SECTION 23 05 10

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SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUBMITTALS

A. Qualification Data: Submit evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Certified TAB Reports: Submit copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

1.2 QUALITY ASSURANCE

A. Work required under this section shall comply with American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE), National Environmental Balancing Bureau (NEBB) or Associated Air Balance Councils (AABC), Recommendations Pertaining to Measure, Instruments, and Testing, Adjusting and Balancing by Certified technicians.

B. The mechanical contractor shall make arrangements with an independent balancing agency to balance all air flows to the rates indicated on the contract drawings and schedules. This shall include supply fans, exhaust fans and air handling systems. The balancing agency shall be one normally engaged in such work and shall be either AABC or NEBB Certified. Test and balance reports not prepared by an AABC or NEBB certified contractor will be rejected, and the complete system shall be retested by an AABC or NEBB certified contractor at no cost to the owner. All test and balance reports shall be certified per AABC or NEBB.

C. The mechanical contractor shall submit a complete resume of the balancing agency for approval by the architect and engineer prior to beginning any work. The resume shall contain examples of previous projects, references, personnel available, certifications and test and balancing report format.

D. TAB Report Forms: Use standard forms from:

1. AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems.
2. NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."
3. SMACNA's TAB "HVAC Systems - Testing, Adjusting, and Balancing."
4. TAB firm's forms approved by Architect.

E. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.

1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

1.3 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Perform TAB after leakage and pressure tests on air distribution systems have been satisfactorily completed. The work required under this section includes all work necessary for the proper testing, adjusting, and balancing of all air and water systems to achieve the results specified by the contract drawings and specifications.

PART 2 - PRODUCTS

2.1 PATCHING MATERIALS

A. Except as otherwise indicated, use same products as used by original installer for patching holes in insulation, ductwork, and housing which have been cut or drilled for test purposes, including access for test instruments, attaching jigs, and similar purposes. At technician's option, plastic plugs with retainers may be used to patch drilled holes in ductwork and housing. Leave no test holes or access openings uncovered and insure vapor barrier continuity of all insulation.

PART 3 - EXECUTION

3.1 GENERAL

A. TAB fieldwork shall not begin on any system / equipment item until signed pre-functional checklists (PCs), pertaining to applicable equipment, have been submitted by the installing contractor to the Commissioning team.

3.2 PRE-TAB INSPECTION AND REPORT

A. Prior to the start of any test and balancing work, a representative of the test and balancing agency shall visit the project for the purpose of inspecting the work in place and shall prepare and submit a written report to the mechanical contractor and engineer stating work which is to be completed before testing and balancing can proceed. Copies of the TAB agency generated deficiency reports shall be submitted to the Architect.

B. The contractor shall schedule a pre-TAB conference with the TAB representative, Owner, Architect and Engineer to review the report prior to start of TAB Work.

C. No retesting of submitted deficiency items should be attempted by the TAB agency until signed copies of the deficiency reports, certifying completion of the item, have been received back from the applicable installing contractor. Failure to do this will render the test and balance report null and void. If the report is deemed null and void, all testing must be performed again at no additional cost to the owner, in the presence of the architect and/or engineer.

3.3 TESTING, ADJUSTING AND BALANCING REPORT

A. Preliminary copies of the final TAB report shall be made available to the Commissioning team at the completion of the TAB fieldwork for the TAB performance verification phase of the Commissioning procedures.

B. The testing and balancing agency shall record the test results in tabulated formats for both cooling and heating conditions and shall submit a minimum of three copies to the architect for review and approval.

A copy of the completed and approved report shall be placed in each copy of the facility operating and maintenance manuals.

3.4 AIR BALANCING

A. The air balance shall include the following air tests in accordance with the following requirements. Test all air systems with new, clean filters in place.

1. Test and record fan total CFM (design and actual)
2. Test and record fan outside air CFM (design & actual)
3. Test and record fan suction static pressure and fan discharge static pressure (actual)
4. Test and record static pressure on both sides of all filters and coils (actual)
5. Test and record fan RPM (design and actual)
6. Record fan sheave, motor sheave, pitch diameter after adjustment (if variable), center line to center line distance from fan shaft to motor shaft, belt size, and number of belts (actual)
7. Change sheaves, pulleys, and belts, if required to obtain design air flow.
8. Test and record fan motor horsepower, amperage, voltage, and RPM (rated and actual)
9. Record fan motor manufacturer, model and serial numbers and service factor (actual)
10. Record motor starter size (actual)
11. Test and record diffuser, register and grille CFM (preliminary, design and actual) for supply, return and exhaust systems. If the return air quantities are not shown at the return grille locations on the contract documents, use the percentage method (supply air less the outside air equals the percentage of return air) and balance the return air grilles accordingly.
12. Test and record main duct traverse readings for all air handling units and fans (preliminary, design and actual). This shall include exhaust, supply, return and outside air ducts.
13. Record each air handling unit supply air temperature; return air temperature; mixed air temperature and outside air temperature (dry bulb and wet bulb) in heating and cooling modes.
14. Record air temperature and humidity in each room at time of air balance.
15. Record AHU type, location, manufacturer, model number, and serial number.
16. Mark all damper quadrants as to final adjusted position, and lock into place.
17. Check fan rotation on all fan units.
18. Check filters for cleanliness prior to balancing. Test only with new, clean filters of the type specified in place.
19. In cooperation with the control manufacturer's representatives, set and adjust all automatically operated dampers to operate as specified.
20. Record the date, time, outside temperature and outside humidity at the time of recording unit temperatures.

3.5 STEAM BALANCING

A. TESTING TOLERANCES

1. Air and water balancing shall be within plus/minus 5% for all:

   a. Air Units
   b. Supply Fans
   c. Exhaust Fans
   d. Grilles and Registers

END OF SECTION 23 05 93

SECTION 23 07 00 - INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General provisions of the Contract, General and Supplementary Conditions, and General Requirements, apply to this section.

1.2 WORK INCLUDED

A. Work required under this section consists of insulation for piping and duct systems and equipment as hereinafter specified.

B. The work of this section is subject to the requirements of the Mechanical General Provisions and Basic Material Specifications.

1.3 BASIC REQUIREMENTS

A. All materials used for insulation of pipe and ducts and equipment covered in this section shall be UL listed. Fire hazard ratings shall be as follows:

1. Flame spread of 25, and smoke development of 50 for all duct insulation and other insulation located in ceiling plenums or rooms utilized for return air plenums.
2. Flame spread of 25 and smoke development of 200 for other pipe and equipment insulation.

B. Increase the insulation thickness of ½" on all piping outside the building insulation envelope and weatherproof with 0.016" thick aluminum jacket with aluminum fitting covers. This piping shall be protected with electric heat tape installed under the insulation.

C. All insulation and thicknesses are selected to meet the 2012 International Energy Conservation Code.

D. Install 0.016" thick aluminum jacket on all pipe insulation in mechanical rooms 7'-0" from finished floor.

PART 2 - PRODUCTS

2.1 FLEXIBLE TUBULAR ELASTOMERIC

A. Provide fire-retardant closed-cell slip-on flexible type. Product must be guaranteed by manufacturer to have continuous operational temperature limit of not less than 180°F and a minimum "R" value of 3.57 at 75°F 50% RH. Provide insulation for the following:

1. Refrigerant suction and hot gas bypass lines - ½" thick on lines 1" or less - 1" thick on lines larger than 1". Install a 0.016" thick aluminum jacket on insulation outside the building.

2.2 FIBERGLASS BLANKET FOR DUCTS

A. Provide 2" thick 3/4" lb. density fiberglass blanket insulation with FSK or FRK jacket installed “R” value of 5.6. Install according to manufacturer's recommendations. For ducts 30" wide and over support

insulation on bottom of duct with rows of welded insulpins on 18" center. Lap jacket 2" at seams and vapor seal. Provide this insulation for the following:

1. All supply air ducts. Supply ducts exposed in conditioned spaces do not require external insulation.
2. Outside air ducts.
3. Top of supply air diffusers.
4. Return air ducts installed below building insulation shall not be insulated unless noted otherwise.

PART 3 - EXECUTION

3.1 GENERAL

A. Install all insulation products in strict accordance with manufacturer's instructions.

B. All items requiring service such as strainers, balancing valves, etc., provide removable insulation caps of insulation equal in thickness to pipe covering.

C. Cover all joint, rips, tears, punctures, staples, insulpins or breaks in vapor barrier jacket with 4" wide woven glass fabric tape embedded in vapor barrier fire resistant mastic.

D. No insulation shall be cut where a hanger is located.

E. Flexible tubular elastomeric piping installation shall be as follows:

1. Install pipe insulation by slitting tubular sections and applying onto piping or tubing. Alternately, whenever possible, slide unslit sections over the open ends of piping or tubing. All seams and butt joints shall be adhered and sealed using Armstrong 520 Adhesive. When using AP Armaflex SS only the butt joints shall be adhered using 520 Adhesive.
2. Insulation shall be pushed on the pipe, never pulled. Stretching of insulation may result in open seams and joints.
3. All edges shall be clean cut. Rough or jagged edges of the insulation shall not be permitted. Proper tools such as sharp knives must be used.
4. On cold piping, insulation shall be adhered directly to the piping at the high end of the run using a one-inch strip of 520 Adhesive on the ID of the insulation and on the pipe. All exposed end cuts of the insulation shall be coated with 520 Adhesive.
5. Sheet insulation shall be used on all pipes larger than 6" IPS. Insulation shall not be stretched around the pipe. On pipes larger than 12" IPS, adhere insulation directly to the pipe on the lower 1/3 of the pipe.
6. Seams shall be staggered when applying multiple layers of insulation.
7. All fittings shall be insulated with the same insulation thickness as the adjacent piping. All seams and mitered joints shall be adhered with 520 Adhesive. Screwed fittings shall be sleeved and adhered with a minimum one inch overlap onto the adjacent insulation.
8. Valves, flanges, strainers, and couplings shall be insulated using Armaflex donuts that shall then be covered with sheet or oversized tubular insulation.

END OF SECTION 23 07 00

SECTION 23 23 00 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The work required under this section of the specification include all work necessary for the complete installation of a refrigerant piping system.

B. The work of this section is subject to the requirements of the Mechanical General Provisions and Basic Materials Specifications.

PART 2 - PRODUCTS

2.1 REFRIGERANT PIPING SYSTEM

A. The refrigerant piping shall be Type L copper with wrought copper fittings and high temperature solder joints, silfos, or approved substitute. The piping system shall include but not be limited to the following: liquid line solenoid valves, hot gas bypass and control where noted, charging valves sight glass with moisture indicator, liquid line strainer drier, flexible connectors where required. The piping shall be installed according to the diagrams furnished by the manufacturer's Engineer for approval prior to installation. The piping system shall be tested at 200 pounds with dry nitrogen until all leaks have been made tight. After the pressure test use suitable vacuum pump to evacuate the system to a least 1000 microns, then charge the system with refrigerant, all safety and operating devices and controls shall be properly adjusted and tested for proper operation and protection of the equipment.

PART 3 - EXECUTION

3.1 Route all refrigerant piping between condensing units and evaporator coils by the most direct route possible in order to minimize refrigerant line length.

3.2 All refrigerant piping must be supported from the building structure and affixed to the structures.

3.3 Reasonable measures should be taken to insure that the installed refrigerant piping forms no traps for the system lubricating oil.

3.4 Refrigerant piping extending through the roof shall be sleeved, waterproofed, and flashed watertight.

3.5 Refrigerant piping underground shall be run in PVC piping sleeve. Seal openings between PVC sleeve. Seal openings between PVC sleeve and refrigerant piping with foam to form a weatherproof seal.

3.6 All refrigerant suction and hot gas lines shall be insulated with flexible tubular elastomeric insulation as required in section 23 .0 7.00 herein before.

END OF SECTION 23 23 00

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SECTION 23 30 00 - AIR DISTRIBUTION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The work required under this section includes all work necessary for the complete installation of an air distribution system.

B. The work of this section is subject to the requirements of the Mechanical General Provisions and Basic Materials specifications.

1.2 CERTIFIED RATINGS

A. All fans shall have AMCA certified ratings and be UL listed.

PART 2 - PRODUCTS

2.1 FANS

A. Roof Exhaust Fans shall be Cook, Penn, Greenheck, or as approved low contour power roof type, each complete with: aluminum weatherproof housing with square turned down flanged base for curb mounting, centrifugal wheel; vertical grease lubricated ball bearing motor; vibration absorbing mountings for all rotating parts; bird screen; gravity back draft shutters; and direct or belt drive, as required for the fan involved. Belt drive fans shall have sealed permanently lubricated ball bearings, Vee belt drives, adjustable pitch motor sheaves, and belt adjusting means. Each 1/2 hp and smaller single phase roof fan shall have suitable toggle type disconnect switch furnished and mounted in the fan enclosure by the fan manufacturer.

1. Roof curbs: All roof curbs shall be of galvanized steel construction with flashings, roof fastenings, and 1" thick fiberglass anti-sweat thermal insulation. Provide sloped curb if required by roof pitch. Roof curbs shall be selected to match the roof conditions. As a minimum, the exhaust fan base must be 12" above the roof, with height of the curb to compensate for roof insulation thickness. Contractor should determine exact height of curb required at each unit location and shall verify roof construction with the architectural drawings and specifications and existing conditions if warranted.
2. Excessive noise: at Contractor's expense, each roof exhaust fan which has a sound level higher than that scheduled for the fan involved or is otherwise excessively noisy shall be removed and replaced with an acceptable roof exhaust fan.

B. Ceiling fans shall be direct drive centrifugal type with grille, insulated housing, wall switch, backdraft damper, and discharge duct to roof with roof jack.

C. In-Line Fans shall be duct mounted type, direct connected or belt drive as scheduled, each complete with: square or tubular metal housing, with duct connection flanges: NEMA standard 1,800 maximum rpm sealed grease lubricated ball bearing motor; centrifugal wheel; and vibration absorbing mountings for rotating parts or entire fan assembly. Each belt drive fan shall have fan shaft mounted on grease lubricated ball bearings, either sealed type or with accessible lubricating fittings on housing exterior; Vee belt drive; adjustable pitch motor sheave ONLY for fan with single belts; belt adjusting means; and belt guard.

2.2 DUCTWORK

A. Type:

1. All ductwork shall be sheet metal unless noted otherwise (26 ga. minimum.)
2. Ductwork type as follows:

   a. Supply return and outside air duct on constant volume system to be low pressure.
   b. Exhaust duct to be low pressure.

B. Low Pressure Sheet Metal Ductwork:

1. Sheet metal work, unless noted otherwise, shall be fabricated of Armco Zincgrip-Paintgrip galvanized steel where exposed to weather or to be painted. Sheet metal for concealed ductwork shall be fabricated of galvanized steel, and be "Bethcon", as manufactured by Bethlehem Steel Company, or "Softite", as manufactured by Wheeling or approved substitute.
2. Ducts shall be sizes shown on the drawings, crossbroken, rigidly braced, adequately supported and securely fastened in place. Fabricate and install ducts in accordance with latest SMACNA Duct manual details.
3. Duct connections 24" wide and larger to be made using the "Ductmate System" or approved substitute. The installation to be complete using angles, corners, cleats, gaskets, sealer, and bolts. Install according to Manufacturer's instructions.

C. Leakage Testing of Installed System Acceptance Criteria:

1. The installed duct system shall be tested to the designed operating pressure. This includes supply, return, and exhaust duct.
2. The air leakage at the test pressure shall be measured by a calibrated orifice type of flow meter. Total allowable leakage of the system shall not exceed ½ % of the air handling design capacity of the system.
3. Leakage concentrated at one point may result in objectionable noise even if the system passes the leakage rate criteria. This noise source must be corrected to the satisfaction of the engineer.
4. The orifice flow measurement device must have been individually calibrated against a primary standard, and this calibrated curve permanently attached to the orifice tube assembly.

D. Joint Sealing:

1. All joints shall be sealed with an approved duct sealer specifically formulated for sealing the field joints in duct systems. Sealer for low pressure duct systems (<2"w.g.) Shall be Ductmate Proseal or Foster 32-17 water based sealants.
2. Flanged joints shall be sealed by neoprene rubber gaskets.

2.3 DUCT ACCESSORIES

A. Fire Dampers - All fire dampers shall be Type B, constructed and tested for compliance with the latest edition of UL Standard 555. All dampers shall bear the UL label. Each damper shall be suitable for use in either the horizontal or vertical position and must include an integral drive spring. Sleeves and collars shall be furnished with fire dampers. Dampers shall be designed so as not to restrict air flow. A suitable access door in duct shall be provided for resetting all fire dampers. Install all dampers in accordance with all manufacturer installation instructions.

B. Louvers - Louvers in outside walls shall be high performance, drainable blade weather louvers. Louver to have extruded aluminum construction with anodized finish, color by Architect and 4" frame thickness. Adjustable louvers to have vinyl blade gasket. Louvers to have 0.15" wg., pressure drop maximum at 900

fpm velocity through free area and no water carryover at designed air flow. All louvers to have aluminum bird screen and exterior frame. All louvers are stationary type unless noted on drawings and shall have AMCA seal. See drawings for storm shelter louvers.

C. Combination Fire/Smoke Dampers - All combination fire/smoke dampers shall be constructed and tested for compliance with the latest editions of UL Standard 555 and 555S. All dampers shall bear the UL label. The 120 volt (or 24 volt - designer specify) electric (or pneumatic - designer specify) damper shall be rated to 350° Fahrenheit, with blade seals of silicone rubber capable of withstanding 450° Fahrenheit. Additionally, the damper must be factory supplied with an actuator and sleeve to comply with the requirements of UL 555 and UL 555S. Install all dampers in accordance with all manufacturer installation instructions. Provide a suitable access door in duct for resetting of damper.

D. Brick Vents:

1. Brick vents in exterior walls shall be fabricated of extruded aluminum, 4" deep, with 45°blades. Frame and blades shall be 0.125" thick. Brick vent color shall be as selected by the architect.

E. Manual Balancing Dampers:

1. Manual balancing dampers in rectangular ducts shall be American Warming. Dampers in duct runs and branches shall be Model VC-21. Dampers to be constructed of 16 ga galvanized steel, with vinyl seals for low leakage at shutoff. All dampers to be caulked with silicone between damper and duct, and have external adjustment marked Open-Closed. Dampers shall be furnished with controls when motor operated. Dampers to be opposed blade type if either side is 12" or larger. Dampers under 12" may be single blade type.
2. Manual Balancing Dampers in round ducts shall be American Warming Model VC-22 in sizes up to and including 10" and Model VC-23 in sizes 12" and larger. Dampers to be 16 ga galvanized steel. Provide EPT sponge seals for low leakage.
3. Dampers to have 1% leakage rate at 1" wg duct pressure in accordance with AMCA 500.
4. All dampers to be installed with 2" standoff bracket.
5. Dampers with motor operated control to be furnished under Section 15900 by control contractor.

F. Flexible Duct:

1. Flexible connections from main to terminal supply diffusers may be used above accessible ceiling areas.
2. Flexible duct shall be UL listed Class 1 air duct connector and be Flexmaster type 4M or approved substitute, with 1-1/2", 3/4 pound density glass fiber with flame resistant vapor barrier, R=6.0. Maximum lengths not to exceed 5 feet. Provide airtight inner liner, wire helix, and reinforced metalized outer jacket.
3. Use adjustable steel strap clamps or flexible nylon wire ties when attaching flexible duct to sheet metal collars. Wrap duct and collar with 2" wide duct tape before attaching clamp.
4. System to be UL 181, SBCC, BOCA, NFPA 90A & 90E, and HUD approved.
5. Do not use flexible duct in return or exhaust systems.

G. Grilles, Registers, and Ceiling Outlets:

1. All flat grilles and registers shall be as scheduled on drawings, or approved substitute, as scheduled on the drawings, with baked enamel finish; color as selected by Architect.
2. Coordinate location with reflected ceiling plans.
3. Provide square to round adaptors if required.
4. All outlets and inlets to have sealing gaskets and volume control dampers. Provide frame suitable for wall or ceiling installation used. Verify with Architectural drawings.

H. Roof Air Intakes and Reliefs - Roof air intake and outlet assemblies shall be Jenn Air, Penn, or as approved factory fabricated air hood, complete with: all aluminum weatherproof construction; lock formed or welded seams; turned down flanged base for curb mounting; removable hood; angle framing and reinforcement; bird screens; and damper with gasketed blade edges. Dampers shall be motor operated where indicated otherwise, dampers shall be gravity operated (See Control System, hereinafter). Dampers for reliefs to have counterbalance weights and anti-sweat covering. Provide factory fabricated aluminum or galvanized steel roof curb assembly with flashings for each roof air intake. Roof curbs shall be selected to match the roof conditions. As a minimum, the base of the intake or relief must be 12" above the finished roof. Contractor should determine exact height of curb required at each unit location and shall verify roof construction with the architectural drawings and specifications and existing conditions if warranted.

I. Flexible Connectors:

1. Provide flexible connectors between each air unit or fan and the duct distribution, on both the supply side and the return side.
2. Connectors shall not exceed 10 inches in lengths.
3. Connectors to be of an approved flame-retardant fabric with a maximum flame spread of (25) and a maximum smoke development rating of (50).
4. All connectors on supply duct to be insulated.

J. Branch Connections:

1. Main Supply Branch: (See SMACNA Manual Figure 2-7, 2-8) use unvaned radius transition elbow with splitter damper when branch width is 36" or smaller, and vaned square throat transition elbow when branch width is larger than 36".
2. Sub-Branch Supply: (See SMACNA Manual Figure 2-16) use straight tap with extractor, having manual control rod extended thru main branch side, when extractor weight is 50 lbs or less. For sub-branch sizes where extractor would be heavier than 50 lbs, use 45° or radius entry clinch lock collar. (See SMACNA Figure 2-8, and manual balancing dampers.)
3. Sub-Branch Return: (See SMACNA Manual Figure 2-8) use 45° or radius entry clinch lock collar. (Provide each with manual balancing damper.)
4. Round Supply Take-Offs: Use factory fabricated rectangular to round type galvanized steel fittings and 26 ga manual balancing damper with 2 wing nuts and handle. System to be Crown Model 3300-DS or approved substitute. Provide 2" standoff bracket.
5. Round Return/Exhaust Tap-ins: Use factory fabricated beaded straight spin-in type galvanized steel tap fittings.
6. For low pressure return and/or exhaust application of duct connectors to square ceiling mounted grilles or registers, use factory fabricated square-to-round galvanized steel minimum 3" deep adapter boxes having 2" long beaded round collar.

K. Vanes and Deflectors:

1. Vanes and deflectors to be galvanized steel sheet same thickness as used in ductwork of corresponding size. Vanes to be securely anchored to duct or casing and have

L. Transitions:

1. Increase-in-area transition: Transformation slope not to exceed 20°.
2. Decrease-in-area transition: Transition slope to be maximum 30°, but 20° is preferable.
3. Angle of transformation at connections to heaters or other equipment not to exceed 30° on approaching side of equipment and 45° on leaving side. Angle of approach may be increased to meet space conditions when transformation section is provided with vanes.

M. Elbows:

1. Elbows shall be either full radius type or square throat with turning vanes. No mitred elbows allowed. Short radius elbows with vanes also allowed.
2. Unvaned full radius elbow, shall have throat radius equal to width of duct and full heel radius over than 36" in width.
3. All square heel elbows shall have 3" square throat elbow with large class single thickness vanes thru 36" unsupported vane length and large double thickness vanes for unsupported vane length of 37" thru 72" as per SMACNA Manual Figures 2-3 and 2-4.

2.4 ELECTRIC COILS

A. The electric heating coils shall conform to the applicable portions of Paragraph 422-27 of the National Electric Code, shall be Underwriters' listed, and suitable for the use intended. The heaters shall be for the voltage and phase called for on the drawings or equipment descriptions. Multiple step heaters shall be so arranged that stratification of the heat through the heater will be at a minimum when operating at light loading. Each heater shall be complete with enclosed contactors, air flow switch, control voltage transformers, 200°F high limit thermostat, internal wiring to enclosed terminal, internal fusing, and be ready for connection by the electrician. The number and capacity of the heaters and circuits shall be as called for on the drawings.

B. Where required, fused disconnect switches shall be furnished for the heaters. The Contractor shall make an allowance in his price for all field wiring and materials not shown or included on the electrical drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install Air Distribution Equipment as specified above and as recommended by manufacturer.

B. Sheet metal ducts shall be securely supported, hung or suspended by metal trapeze hangers or straps having a minimum width of one inch. Nails or screws shall not be driven through the duct walls.

C. All duct joints and seams shall be securely fastened and sealed to make airtight. All leaks shall be sealed with Hardcast.

D. All exposed openings in fan housing shall be protected with screens or gratings. All fans shall have belt guards on exposed drives.

E. Flexible duct connectors shall not pass through a fire wall or a partition having a fire resistance rating of (1) hour or more.

F. Do not install flexible ducts that have more than a 90° turn.

G. Contractor to verify duct sizes and fittings required with actual field measurements before fabrication of ductwork. The contractor shall not receive compensation for ductwork fabricated that cannot be used. See section 23 05 00, 3.02.

3.2 EXCESSIVE NOISE AND VIBRATION

A. All air distribution equipment was selected for a noise level recommended for the space it serves. Any equipment causing excess noise or vibration will be replaced at the Contractor's expense.

END OF SECTION 23 30 00

SECTION 23 32 13 - FABRIC AIR SUPPLY DUCT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Description of work:

1. Extent of fabric supply air ductwork is indicated on drawings and by requirements of this section.

1.3 QUALITY ASSURANCE

A. Building Codes and Standards:

1. Product must be Classified by Underwriter's Laboratories in accordance with the 25/50 flame spread/smoke developed requirements of NFPA 90-A and are also classified in accordance with ICC Evaluation Service AC167 and UL 2518.
2. All product sections must be labeled with the logo and classification marking of Underwriter's Laboratories.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's specifications on materials and manufactured products used in the completion of work required by this section.

B. Provide detailed drawings confirming configuration of Fabric Tensioning System (components, support locations, segment lengths) and Textile Dispersion System (diameter, lengths, airflow, pressure, and textile permeability).

C. Provide detailed installation instructions for components to be installed.

D. Provide warranty and maintenance documentation.

1.5 WARRANTY:

A. Manufacturer must provide a 10 Year Product Warranty for products supplied for the fabric portion of this system as well as a Design and Performance Warranty.

1.6 DELIVERY, STORAGE AND HANDLING

A. Protect fabric air dispersion systems and fabric tensioning systems from damage during shipping, storage and handling.

B. Store products inside and protect from exposure to weather.

PART 2 - PRODUCTS

2.1 FABRIC AIR DISPERSION SYSTEM

A. Verona Fabric: Air diffusers shall be constructed of a woven fire retardant fabric complying with the following physical characteristics:

1. Fabric Construction: Flame retardant in accordance with UL 2518.
2. Weight: 6.2 oz. /yd^2 per ASTM D3776.
3. Color: (MUST SPECIFY- blue, white, tan, green, silver, black, custom).
   Contractor shall coordinate color selection with Architect.
4. Air Permeability: 2 (+2/-1) cfm/ft^2 per ASTM D737, Frazier.
5. Temperature Range: 0 degrees F to 180 degrees F.
6. Classified by Underwriters Laboratories in accordance with the requirements of NFPA 90-A and AC-167 (noted above).

B. System Fabrication Requirements:

1. Fabric system to be constructed in modular lengths (zippered) with proper radial securing clips (inlets, endcaps and mid-sections) and top access zippers for vertical cable safety attachment.
2. Linear Vents: Air dispersion accomplished by linear vent and permeable fabric. Linear vent is to consist of an array of open orifices rather than a mesh style vent to reduce maintenance requirements of mesh style vents. Linear vents should also be designed to minimize dusting on fabric surface. Size of vent openings and location of linear vents shall be specified and approved by manufacturer.
3. Inlet connection to metal duct via fabric draw band with anchor patches as supplied by manufacturer. Anchor patches to be secured to metal duct via. zip screw fastener – supplied by contractor.
4. Inlet connection includes zipper for easy removal / maintenance.
5. Lengths to include required intermediate zippers as specified by manufacturer.
6. System to include Adjustable Flow Devices to balance turbulence, airflow and distribution as needed. Flow restriction device shall include ability to adjust the airflow resistance from 0.06 – 0.60 in w.g. static pressure.
7. End cap includes zipper for easy maintenance.
8. Fabric system shall include connectors to accommodate suspension system listed below.
9. Any deviation from a straight run shall be made using a gored elbow or an efficiency tee. Normal 90 degree elbows are 5 gores and the radius of the elbow is 1.5 times the diameter of the fabric dispersion system.
10. Each section of the fabric shall include identification labels documenting order number, section diameter, section length, piece number, code certifications and other pertinent information.

C. Design Parameters:

1. Fabric air diffusers shall be designed from 0.25" water gage minimum to 3.0" maximum, with 0.5" as the standard.
2. Fabric air diffusers shall be limited to design temperatures between 0 degrees F and 180 degrees F (-17.8 degrees C and 82 degrees C.)
3. Design CFM, static pressure and diffuser length shall be designed or approved by the manufacturer.
4. Do not use fabric diffusers in concealed locations.

5. Use fabric diffusers only for positive pressure air distribution components of the mechanical ventilation system.

2.2 SUSPENSION HARDWARE

A. SkeleCore FTS (Fabric Tensioning System): Air diffusers shall be constructed with internal tensioning frame.

1. System shall cylindrically tension fabric along the entire length of the fabric duct.
2. Tensioning system shall include full 360 degree tensioning and intermediate rings with quick connection spacer tubes concealed inside the fabric system.
3. Interior structure to include multiple mechanically adjustable tension devices. To provide proper fabric tensioning, structural and fabric system shall be configured in segments of no more than 45 feet.
4. Fabric components supported solely by metal cylindrical rings.
5. Each cylindrical ring shall require vertical metal to metal vertical cable safety attachment.
6. Available for diameters from 8” to 60”.

PART 3 - EXECUTION

3.1 INSTALLATION OF FABRIC AIR DISPERSION SYSTEM

A. Install chosen suspension system in accordance with the requirements of the manufacturer. Instructions for installation shall be provided by the manufacturer with product.

3.2 CLEANING AND PROTECTION

A. Clean air handling unit and ductwork prior to the Fabric Dispersion System unit-by-unit as it is installed. Clean external surfaces of foreign substance, which may cause corrosive deterioration of facing.

B. Temporary Closure: At ends of ducts which are not connected to equipment or distribution devices at time of ductwork installation, cover with polyethylene film or other covering which will keep the system clean until installation is completed.

C. If Fabric Dispersion Systems become soiled during the installation, they should be removed and cleaned following the manufacturers standard terms of laundry.

END OF SECTION 23 32 13

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SECTION 23 36 00 – AIR TERMINAL UNITS - VAV

PART 1 - GENERAL

1.1 SUBMITTALS

A. Product Data: For each type of product indicated, include rated capacities, furnished specialties, sound-power ratings, and accessories, detail equipment assemblies with dimensions, required clearances, accessories and location and size of each field connection.

B. Operation and Maintenance Data: For air terminal units to include in operation and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data" include the following:

1. Instructions for resetting minimum and maximum air volumes.
2. Instructions for adjusting software set points.
3. Include a schedule showing unique model designation, room location, model number, size, and accessories furnished.
4. Wiring Diagrams: Power, signal, and control wiring.

1.2 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. NFPA Compliance: Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

1.3 COORDINATION

A. Coordinate layout and installation of air terminal units and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 SHUTOFF SINGLE-DUCT AIR TERMINAL UNITS

A. Manufacturers:

1. Envirotec
2. Titus
3. Trane
4. Price

B. VAV terminal units shall be completely factory fabricated and factory assembled and including the following features.

1. Casing: galvanized or coated painted steel, with internal 1" thick, 1.5 PCF acoustical and thermal glass fiber insulation conforming to UL 181 and NFPA 255 (25/50) requirements. Provide hinged access panel.
2. Damper: Single blade, round damper operating within a round chamber enclosed by an insulated sheet metal casing. Steel or extruded aluminum construction with nylon or other permanently lubricated bearings, and air leakage not exceeding 2% of rated air quantity pressure. Sizes larger than 18 inch may utilize rectangular dampers.
3. Provide factory-mounted, UL listed, open-type electric resistance heater for terminal units scheduled on drawings. Provide heaters with automatic primary thermal safety cut-out, manual reset secondary thermal cut-out airflow switch, 80 percent nickel/20 percent chromium elements, stainless steel terminal connections with ceramic or phenolic insulators, and disconnect switch.

2.2 SOURCE QUALITY CONTROL

A. Identification: Label each air terminal unit with plan number, nominal airflow, maximum and minimum factory-set airflows, coil type, and ARI certification seal.

B. Verification of Performance: Rate air terminal units according to ARI 880.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install air terminal unit’s level and plumb.

B. Maintain sufficient clearance for normal service and maintenance. Terminal boxes shall be installed to allow access to the controllers for adjustment and setting and for removal of the coils.

C. Provide minimum 2-1/2 x duct diameter of straight duct at inlet to boxes.

D. Provide 24x24” min. access doors when installed over a hard ceiling area and 24x30” min. access doors when bottom of terminal unit is more than 10’-0” above the finished floor.

3.2 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections. Report results in writing.

B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 23 36 00

SECTION 23 38 13 - COMMERCIAL-KITCHEN HOODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Type I commercial kitchen hoods.

1.3 DEFINITIONS

A. Listed Hood: A hood, factory fabricated and tested for compliance with UL 710 by a testing agency acceptable to authorities having jurisdiction.

B. Standard Hood: A hood, usually field fabricated, that complies with design, construction, and performance criteria of applicable national and local codes.

C. Type I Hood: A hood designed for grease exhaust applications.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Standard hoods.
2. Filters/baffles.
3. Fire-suppression systems.
4. Lighting fixtures.

B. Shop Drawings:

1. Show plan view, elevation view, sections, roughing-in dimensions, service requirements, duct connection sizes, and attachments to other work.
2. Show cooking equipment plan and elevation to confirm minimum code-required overhang.
3. Indicate performance, exhaust and makeup air airflow, and pressure loss at actual Project-site elevation.
4. Show water-supply and drain piping connections.
5. Show control cabinets.
6. Show fire-protection cylinders, piping, actuation devices, and manual control devices.
7. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
8. Wiring Diagrams: Power, signal, and control wiring.
9. Piping Diagrams: Detail fire-suppression piping and components and differentiate between manufacturer-installed and field-installed piping. Include roughing-in requirements for drain connections. Show cooking equipment plan and elevation to illustrate fire-suppression nozzle locations.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Welding: Qualify procedures and personnel according to AWS D1.1/D 1.1M, "Structural Welding Code - Steel," for hangers and supports; and AWS D9.1/D9.1M, "Sheet Metal Welding Code," for joint and seam welding.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 COORDINATION

A. Coordinate equipment layout and installation with adjacent Work, including lighting fixtures, HVAC equipment, plumbing, and fire-suppression system components.

PART 2 - PRODUCTS

2.1 HOOD MATERIALS

A. Stainless-Steel Sheet: ASTM A 666, Type 304.

1. Hood shall be constructed of 18 gauge 304 stainless steel.
2. Finish: Comply with SSINA's "Finishes for Stainless Steel" for recommendations for applying and designating finishes.

   a. Finish shall be free from tool and die marks and stretch lines and shall have uniform, directionally textured, polished finish indicated, free of cross scratches. Grain shall run with long dimension of each piece.

3. Concealed Stainless-Steel Surfaces: ASTM A 480/A 480M, No. 2B finish (bright, cold-rolled, unpolished finish).
4. Exhaust Duct shall be 16 gauge liquid tight welded steel. Exhaust duct must extend a minimum of 18” above roof line.

B. Sealant: ASTM C 920; Type S, Grade NS, Class 25, Use NT. Elastomeric sealant shall be NSF certified for commercial kitchen hood application. Sealants, when cured and washed, shall comply with requirements in 21 CFR, Section 17 7. 2600, for use in areas that come in contact with food.

1. Color: As selected by Architect from manufacturer's full range.
2. Backer Rod: Closed-cell polyethylene, in diameter larger than joint width.

C. Sound Dampening: NSF-certified, nonabsorbent, hard-drying, sound-deadening compound for permanent adhesion to metal in minimum 1/8-inch thickness that does not chip, flake, or blister.

D. Gaskets: NSF certified for end-use application indicated; of resilient rubber, neoprene, or PVC that is nontoxic, stable, odorless, nonabsorbent, and unaffected by exposure to foods and cleaning compounds, and that passes testing according to UL 710.

2.2 GENERAL HOOD FABRICATION REQUIREMENTS

A. Welding: Use welding rod of same composition as metal being welded. Use methods that minimize distortion and develop strength and corrosion resistance of base metal. Make ductile welds free of mechanical imperfections such as gas holes, pits, or cracks.

1. Welded Butt Joints: Full-penetration welds for full-joint length. Make joints flat, continuous, and homogenous with sheet metal without relying on straps under seams, filling in with solder, or spot welding.
2. Grind exposed welded joints flush with adjoining material and polish to match adjoining surfaces.
3. Where fasteners are welded to underside of equipment, finish reverse side of weld smooth and flush.
4. Coat concealed stainless-steel welded joints with metallic-based paint to prevent corrosion.
5. After zinc-coated steel is welded, clean welds and abraded areas and apply SSPC-Paint 20, high-zinc-dust-content, galvanizing repair paint to comply with ASTM A 780/A 780M.

B. For metal butt joints, comply with SMACNA's "Kitchen Equipment Fabrication Guidelines."

C. Where stainless steel is joined to a dissimilar metal, use stainless-steel welding material or fastening devices.

D. Form metal with break bends that are not flaky, scaly, or cracked in appearance; where breaks mar uniform surface appearance of material, remove marks by grinding, polishing, and finishing.

E. Sheared Metal Edges: Finish free of burrs, fins, and irregular projections.

F. In food zones, as defined in NSF, fabricate surfaces free from exposed fasteners.

G. Cap exposed fastener threads, including those inside cabinets, with stainless-steel lock washers and stainless-steel cap (acorn) nuts.

H. Fabricate pipe slots on equipment with turned-up edges sized to accommodate service and utility lines and mechanical connections.

I. Fabricate enclosures, including panels, housings, and skirts, to conceal service lines, operating components, and mechanical and electrical devices including those inside cabinets, unless otherwise indicated.

J. Fabricate equipment edges and backsplashes according to SMACNA's "Kitchen Equipment Fabrication Guidelines."

K. Fabricate enclosure panels to ceiling and wall as follows:

1. Fabricate panels on all exposed side(s) with 20 gauge stainless steel and extend from ceiling to top of hood canopy and from canopy to wall.
2. Wall Offset Spacer: Minimum of 3 inches.
3. Wall Shelves and Overshelves: Fabricate according to SMACNA's "Kitchen Equipment Fabrication Guidelines," with minimum 0.0625-inch-thick, stainless-steel shelf tops.

2.3 TYPE I EXHAUST HOOD FABRICATION

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Captive-Aire Systems.
2. Greenheck.
3. Accurex

B. Weld all joints exposed to grease with continuous welds and make filters/baffles or grease extractors and makeup air diffusers easily accessible for cleaning.

1. Fabricate hoods according to NSF 2, "Food Equipment."
2. Hoods shall be listed and labeled, according to UL 710, by a testing agency acceptable to authorities having jurisdiction.
3. Hoods shall be designed, fabricated, and installed according to NFPA 96.
4. Include access panels as required for access to fire dampers and fusible links.
5. Duct Collars: Minimum 0.0598-inch-thick steel at least 3 inches long, continuously welded to top of hood and at corners. Fabricate a collar with a 0.5-inch-wide duct flange.
6. Duct-Collar Fire Dampers: Collar and damper shall comply with UL 710 testing and listing required for the entire hood.
7. Makeup Air Fire Dampers: Labeled, according to UL 555, by a testing agency acceptable to authorities having jurisdiction.

C. Hood Configuration: Exhaust and makeup air.

1. Makeup air shall be introduced through laminar-flow-type, perforated metal diffusers mounted in the ceiling in front of hood canopy. Furnish laminar-flow-type diffusers with baked white enamel finish and volume-control dampers.
2. The hood supply duct shall be insulated below the roof level.

D. Hood Style: See drawings.

E. Filters/Baffles: Removable, stainless-steel. Fabricate stainless steel for filter frame and removable collection cup and pitched trough. Exposed surfaces shall be pitched to drain to collection cup. Filters/baffles shall be tested according to UL 1046, "Grease Filters for Exhaust Ducts," by an NRTL acceptable to authorities having jurisdiction.

F. Lighting Fixtures: Surface-mounted, incandescent fixtures and lamps with lenses sealed vaportight. Wiring shall be installed in conduit on hood exterior. Number and location of fixtures shall provide a minimum of 70 fc at 30 inches above finished floor.

1. Light switches shall be mounted on front panel of hood canopy, on wall adjacent to hood or in hood control panel.
2. Lighting Fixtures: Fluorescent or Incandescent complying with UL 1598.

G. Hood Controls:

1. The hood supply and exhaust fans shall be complete with disconnects, starters, and contactors. Standard control panel shall be complete with “ON/OFF” switch and fan “ON” light. Wiring shall meet local and national codes. Incandescent lights shall be furnished. Automatic energy shut-off shall be provided for cooking equipment located under hoods. See Control Sequence or Diagram on Drawings.

2.4 WET-CHEMICAL FIRE-SUPPRESSION SYSTEM

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ansul Incorporated; a Tyco International Ltd. Company.
2. Badger Fire Protection.
3. Kidde Fire Systems.
4. Pyro Chem.
5. Kalthoff Fabricators.

B. Description: Engineered distribution piping designed for automatic detection and release or manual release of fire-suppression agent by hood operator. Fire-suppression system shall be listed and labeled for complying with NFPA 17A, "Wet Chemical Extinguishing Systems," by a qualified testing agency acceptable to authorities having jurisdiction.

1. Steel Pipe, NPS 2 and Smaller: ASTM A 53/A 53M, Type S, Grade A, Schedule 40, plain ends.
2. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300.
3. Piping, fusible links and release mechanism, tank containing the suppression agent, and controls shall be factory installed. Controls shall be in stainless-steel control cabinet mounted on hood or wall. Furnish manual pull station for wall mounting. Exposed piping shall be covered with chrome-plated aluminum tubing. Exposed fittings shall be chrome plated.
4. Liquid Extinguishing Agent: Noncorrosive, low-pH liquid.
5. Furnish electric-operated gas shutoff valve with clearly marked open and closed indicator for field installation.
6. Fire-suppression system controls shall be integrated with controls for fans, lights, and fuel supply and located in a single cabinet for each group of hoods immediately adjacent.
7. Wiring shall have color-coded, numbered terminal blocks and grounding bar. Spare terminals for fire alarms, optional wiring to start fan with fire alarm, red pilot light to indicate fan operation, and control switches shall all be factory wired in control cabinet with relays or starters. Include spare terminals for fire alarm and wiring to start fan with fire alarm.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before equipment installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Complete field assembly of hoods where required.

1. Make closed butt and contact joints that do not require filler.
2. Grind field welds on stainless-steel equipment smooth and polish to match adjacent finish. Comply with welding requirements in Part 2 "General Hood Fabrication Requirements" Article.

B. Install hoods and associated services with clearances and access for maintaining, cleaning, and servicing hoods, filters/baffles, grease extractor, and fire-suppression systems according to manufacturer's written instructions and requirements of authorities having jurisdiction.

C. Make cutouts in hoods where required to run service lines and to make final connections, and seal openings according to UL 1978.

D. Securely anchor and attach items and accessories to walls, floors, or bases with stainless-steel fasteners, unless otherwise indicated.

E. Install hoods to operate free from vibration.

F. Install trim strips and similar items requiring fasteners in a bed of sealant. Fasten with stainless-steel fasteners at 48 inches o.c. maximum.

G. Install sealant in joints between equipment and abutting surfaces with continuous joint backing, unless otherwise indicated. Provide airtight, watertight, vermin-proof, sanitary joints.

H. Install lamps, with maximum recommended wattage, in equipment with integral lighting.

I. Set initial temperatures and calibrate sensors.

J. Set field-adjustable switches.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping with clearance to allow service and maintenance.

C. Connect ducts according to requirements in Division 23 Section "Air Duct Accessories." Install flexible connectors on makeup air supply duct. Weld exhaust-duct connections with continuous liquid tight joint.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Test each equipment item for proper operation. Repair or replace equipment that is defective, including units that operate below required capacity or that operate with excessive noise or vibration.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Test water, drain, gas, and liquid-carrying components for leaks. Repair or replace leaking components.
4. Perform hood performance tests required by authorities having jurisdiction.
5. Perform fire-suppression system performance tests required by authorities having jurisdiction.

E. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial kitchen hoods. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 23 38 13

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SECTION 23 74 13 - PACKAGE ROOFTOP UNIT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The work included under this section includes all work necessary for the installation of package rooftop units.

PART 2 - PRODUCTS

2.1 PACKAGE ROOFTOP UNITS

A. Furnish and install single zone rooftop units of size and capacity indicated on the drawings. Unit shall be low silhouette, completely assembled including piping and wiring, charged with refrigerant and fully run tested prior to shipment, see section 3.2 (sound). Approved manufacturer shall be Trane. However, the approved manufacturer must meet the requirements contained in this section of the specifications.

B. General - Units shall be downflow or horizontal airflow as indicated on drawings. Operating cooling range shall be between 0°F and 115°F. Cooling performance shall be rated in accordance with ARI testing procedures. All units shall be factory assembled, internally wired, fully charged with R-454B and 100 percent run-tested before leaving the factory. Wiring internal to the unit shall be colored and numbered for simplified identification. Wiring shall be secured to housing of unit in protective raceways or conduit. Units shall be UL listed and labeled. Gas heating unit to be AGA approved.

C. Casing - Unit casing shall be constructed of zinc coated, heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized and finished with a weather-resistant baked enamel finish. Cabinet construction shall allow for all maintenance on one side of the unit. All panels to be sealed and gasketed. The downflow unit's base pan shall have no penetrations within the perimeter of the curb other than the raised supply/return openings to provide an added water integrity precaution if the condensate drain backs up. The base of the unit shall have provisions for forklift and crane lifting. Insulate all interior surfaces with 1/2” thick foil faced fiberglass insulation. Insulate base of unit with 1/8” foil faced closed-cell insulation.

D. To insure rainwater integrity of the unit, there shall be no electrical wiring penetrating any panel in the evaporator section or any panel of the base of the unit. Provide adequate access for power wiring within curb. Coordinate with electrical contractor.

E. Unit Top - The top cover shall be one piece or where seams exist, it shall be double hemmed, and gasket sealed to prevent water leakage and sloped to prevent water standing.

F. Provide factory mounted hinged access doors to access filters, evaporator, supply fan, heat, compressor, and controls for all units. Doors shall have (2) quick release quarter turn door handles.

G. Filters - Provide 2" thick, UL Class 1, FARR 30-30 filters for all units unless otherwise specified. Provide filter rack sized for 2" filters access and to permit easy filter removal. The filters shall have non-creased radial pleat design with media support grip and enclosing frame. Filters shall have 30% efficiency based on ASHRAE Test Standard 52-76. Initial resistance shall be 0.08"WG at 250 FPM.

H. Compressors - All units shall be direct-drive hermetic scroll type compressor(s) with centrifugal oil pump providing positive lubrication to moving parts. Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent of unit nameplate voltage. Crankcase heater, internal temperature and current-sensitive motor overloads shall be included for maximum protection. Compressor shall have spring or neoprene isolation and sound muffling to minimize vibration transmission and noise. Units over 6 tons shall have dual compressors.

I. Refrigerant Circuits - Each refrigerant circuit shall have independent thermal expansion valve, service pressure ports and refrigerant line filter driers factory installed.

J. Hot Gas Reheat – this shall be factory-installed to provide demand dehumidification control independent from a call for cooling. This option shall consist of a hot-gas reheat coil located on the leaving airside of the evaporator coil pre-piped and circuited.

K. Evaporator and Condenser Coils - Coils shall be internally finned 5/16" copper tubes mechanically bonded to configured aluminum plate fin. Aluminum construction Microchannel condenser coils shall be acceptable. Coils shall be leak tested at the factory to ensure pressure integrity. The evaporator and condenser coil shall be leak tested to 600 psig.

L. Provide tooless condenser coil hail guards.

M. Gas Heating Section - The heating section shall have a progressive tubular heat exchanger design using stainless steel burners and corrosion resistant steel components. A forced combustion blower shall supply premixed fuel to a single burner ignited by a pilotless hot surface ignition system. A negative pressure gas valve shall be used that requires blower operation to initiate gas flow. On an initial call for heat, the combustion blower shall purge the heat exchanger 20 seconds before ignition. After three unsuccessful ignition attempts, the entire heating system shall be locked out until manually reset at the thermostat. Units shall be suitable for use with natural gas or propane (field installed kit).

N. Outdoor Fans - The outdoor fans shall be direct-drive, statically and dynamically balanced, draw through in the vertical discharge position. The fan motor(s) shall be permanently lubricated and have built-in thermal overload protection.

O. Indoor Fan - Units shall have a direct or belt drive, FC centrifugal or plenum fan. Belt driven fans shall have an adjustable idler-arm assembly for quick-adjustment to fan belts and motor sheaves. All motors shall be thermally protected. Electronically commutated motors shall be acceptable. Oversized motors shall be used where high external static pressure is noted on drawings.

P. Controls - Unit shall be completely factory wired with necessary controls and contact or pressure lugs or terminal block for power wiring. Units shall provide an external location for mounting fused disconnect device. Micro-processor controls shall be provided for all 24 volt control functions, to make all heating, cooling and/or ventilating decisions in response to electronic signals from sensors measuring indoor and outdoor temperatures. A centralized Micro-processor shall provide anti-short cycle timing and time delay between compressors. Provide 120V amp 2 plug powered convenience outlet.

Q. Phase Monitoring protection – Unit shall have factory mounted phase monitor to provide protection against phase loss, phase imbalance, and phase reversal.

R. Roof curbs: All roof curbs shall be of galvanized steel construction with flashings, roof fastenings, and 1" thick fiberglass anti-sweat thermal insulation. Provide sloped curb if required by roof pitch. Roof curbs shall be selected to match the roof conditions. As a minimum, the rooftop air unit base pan must be 12" above the roof, with height of the curb to compensate for roof insulation thickness. Contractor should determine exact height of curb required at each unit location and shall verify roof construction with the architectural drawings and specifications and existing conditions if warranted. Provide field fabricated sheet metal extension between duct from building thru curb to bottom of roof top unit. Do not use curb as plenum.

S. Economizer - The assembly to include fully modulating 0-100 percent motor and dampers, barometric relief, minimum position setting, preset linkage, wiring harness with plug. Solid state enthalpy and differential enthalpy or dry bulb control shall be provided as indicated on drawings and factory-supplied and installed.

PART 3 - EXECUTION

3.1 The manufacturer's authorized representative shall supervise the mounting, installation, power, start-up and control wiring (including interlocks) and upon job completion notify the Designer in writing that all are operating properly and are complete and satisfactory in every respect. He shall be responsible for complete start-up and checkout.

3.2 Rooftop units are selected and located by the Designer to produce minimal sound and vibration to the space. Manufacturer to review drawings prior to bidding and notify the Designer if design revisions should be made to accept this unit.

3.3 Provide full 12 months warranty on all parts and labor. Provide a four-year extended warranty (parts only) remainder of unit.

3.4 The weight of the unit shall be equal to or less than the unit scheduled on the drawing.

3.5 Verify prior to bidding that the units meet the electrical characteristics shown on the drawings. This includes voltage, full load amps and disconnect (as shown on electrical drawings). The successful manufacturer shall notify the contractor the size of his required disconnect.

3.6 FILTER MEDIA FILL

A. Provide initial filter media fill as described hereinbefore for each filter of each type installed for testing and adjusting AC system and left in place for Owner’s immediate use.

B. Provide one complete fill and each filter of each type for Owner’s future use. Store all media on premises in factory sealed containers, at a location as directed by the Owner’s authorized representative. Obtain a signed receipt for these filters and include in project close-out documents.

END OF SECTION 23 74 13

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SECTION 23 81 26.1 - DUCTLESS SPLIT SYSTEM UNITS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The work required under this section includes all work necessary for the complete installation of ductless split system units.

B. The work of this section is subject to the requirements of the Mechanical General Provisions and Basic Material Specifications.

1.2 SUBMITTALS

A. Provide drawings indicating dimensions, rough-in connections, electrical characteristics, unit performance, agency listings, and connection requirements.

B. Provide manufacturer's installation and start-up instructions.

C. Provide manufacturer's color selection charts.

D. At job closeout, provide manufacturer's installation, operation, and maintenance data along with product warranty certificate.

1.3 WARRANTY

A. Provide one year warranty on all unit parts and a five-year warranty for refrigeration compressors.

PART 2 - PRODUCTS

2.1 GENERAL

A. Furnish and install where shown on plans, ductless split system units of sizes and capacities shown on the schedule. The units shall include the indoor evaporator section and the outdoor condenser section. Approved manufacturers shall be EMI, Mitsubishi, and Lennox.

2.2 WALL HUNG EVAPORATOR SECTION

A. Provide wall hung heat pump units with back-up resistant heat as shown on schedule. Provide hanger brackets and or trim kits as applicable.

B. Cabinet shall be constructed of cold roll steel, with structural stiffeners and powder coated finish. Inlet panel construction of high impact polystyrene with perforated steel inlet grille.

C. Discharge grille shall be high temperature Noryl with adjustable vanes.

D. Condensate drain pan shall be galvanized steel with anti-corrosion coating.

E. Fan shall be tangential type, directly mounted to the motor shaft. Motor shall be PSC type with overload protection.

F. Filter shall be permanent, washable, and user accessible.

G. Coil shall be seamless copper tubing, arranged in staggered configuration, with enhanced aluminum fins, tested to 460 PSIG. Tubes shall be mechanically expanded for secure bonding to fin shoulder. Connections are sweat type.

H. Controls shall include relays and connections for condensing unit.

1. Unit mounted controls with thermostat, fan speed control, and heat/cool switch.

2.3 CONDENSER SECTION

A. Provide a single zone condensing unit with 4-way reversing valve, solenoid activated by 24V, energized for cooling operation. Provide unit with a TXV with internal check valve to provide proven operation through all temperature ranges in heat pump mode.

B. Cabinet shall be constructed of G-60 galvannealed steel, finished with corrosion inhibiting, high-gloss, powder coated. Fan guard shall be heavy-gauge, vinyl dipped wire, or stamped integral to cabinet.

C. Compressor shall be hermetically sealed, high efficiency type. Motor shall be PSC type with internal overload protection. Compressor shall be installed on resilient mountings. Minimum unit SEER shall be 10.0 and minimum COP = 2.8 in reverse cycle heating mode

D. The condensing unit and evaporator section shall be precharged with refrigerant. Unit refrigeration valves shall be solid brass for sweat connection.

E. The condenser coil shall be seamless, copper tubing, arranged in staggered configuration, with enhanced aluminum fins. The tubes shall be mechanically expanded for secure bonding to fin shoulder.

F. The condenser fan shall be a high efficiency propeller type, directly connected to the totally enclosed PSC motor. The motor shall be internally and thermally protected. The condensing unit shall be draw-through design.

G. System options shall include low ambient operation to 0 degrees F. Other system options shall be as noted on schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install unit in accordance with manufacturer's recommendations.

B. Verify prior to bidding that all units meet all electrical characteristics shown in the contract documents. This shall include voltage, phase, full load amps, and overcurrent protection. Coordinate exact electrical requirements with the electrical contractor prior to rough-in.

END OF SECTION 23 81 26.1

SECTION 26 00 00 - GENERAL ELECTRICAL

PART 1 - GENERAL

1.1 OTHER CONDITIONS

A. Applicable provisions of the General conditions, Supplementary Conditions, and Division 1, General Requirements, apply to the Work under this Section.

1.2 SCOPE OF WORK:

A. The work included under this specification consists of, but is not limited to, work as indicated on the drawings and hereinafter specified in Division 16. Without limiting the generality implied by the drawings an specifications, electrical consists of furnishing all materials, accessories, tools, and labor required and incidental thereto, to provide:
   1. A complete system of conduit and conductors to supply electricity throughout the building addition and renovation areas.
   2. Lighting fixtures, exit signs, emergency lighting.
   3. Panelboards, switchboard, wiring devices, and safety switches.
   4. Temporary wiring to be used during construction.
   5. Wiring in connection with heating, ventilating, plumbing, and air conditioning equipment.
   6. Raceways, backboxes, and 120-volt power supply wiring for the following systems: Fire alarm, voice/data, and intercom systems.

1.3 RELATED WORK:

A. See drawings and other sections for equipment requiring electrical service.

1.4 REFERENCE STANDARDS:

A. Make entire electrical installation in strict accordance with the requirements of all applicable city, county, state, or federal codes of law having jurisdiction, the requirements and recommendations of the Board of Fire Underwriters, including all amendments and/or additions to said codes, laws, requirements, and recommendations and the requirements and recommendations of the local utility company and the local telecommunications service providers. Applicable codes include but are not limited to, the following:
   1. NFPA 101 Life Safety Code.
   2. NFPA 72
   3. NFPA 70
   4. NFPA 90A
   5. NFPA 92A
   6. NFPA 13

7. NFPA 13R
8. NFPA 13D
9. NFPA 14
10. International Building Code
11. International Fire Code
12. International Mechanical Code

B. Should any work shown on the drawings or herein specified be construed a being contrary to or not conforming to the previously mentioned Codes, etc., bring it to the attention of the Architect before executing the work in conformity with the various codes, etc., without additional cost to the Owner, but not until the matter in question has been reviewed by the Architect.

C. Should any work shown on the drawings or herein specified be more rigid as to requirements than the requirements of the various codes, the drawings and specifications shall be used in executing the work.

D. File with proper authorities all necessary drawings as required by various codes, laws, ordinances, or other requirements.

E. Obtain and pay for all permits and for all required inspection certificates. Pay necessary fees.

1.5 WARRANTY-GUARANTEE

A. Warrant and guarantee that all work executed under this section of the specifications will be free from defects of materials and workmanship for a period of one year from the date of final acceptance of the building. The above parties further agree that they will, at their own expense, repair and replace all such defective work and all other work damaged thereby which defective during the term of the warranty-guarantee.

1.6 ARCHITECTURAL DRAWINGS:

A. Refer to architectural drawings for details such as finishes, dimensions, materials, etc. Refer to drawings for door locations, door swings, partitions location, cabinet and counters, making proper allowances therefore. Refer to equipment plans for exact location of electrical connections which are dimensioned.

PART 2 - PRODUCTS

2.1 SUBMITTALS:

A. Manufacturer's Data: Submit copies of manufacturer's specifications, descriptions, illustrations, and installation instructions for each type of manufactured product to include: Lighting, switchgear, wiring devices, lighting controls, and natural gas generator intended for use on this project. The submittal shall consist of one or more brochures each containing only "one" copy of material describing the product. Several products may be included in each brochure.

B. Include manufacturer's certification as may be required to show compliance with these specifications. Indicate by transmittal form that a copy of each instruction has been distributed to the installer.

C. Provide complete sets of electrical operating and maintenance instructions applying to equipment installed in conjunction with this contract; include parts lists, wiring diagrams, catalog data, stamped approval submittal data, and operational checkout data as called for elsewhere in Project Manual.

2.2 PRODUCTS

A. Materials shall not be ordered until architect's review of submittal material has been made. They shall be new and unused and the manufacturers standard product and the latest designs.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The electrical drawings which show the work included are diagrammatic only; the locations, routing, etc., of the various fixtures, items of equipment, wiring, etc., are approximate only. The entire installation is subject to such deviations, modifications, rerouting, etc., as may be necessary to meet the requirements of the architectural, structural, and other drawings; and also as necessary to obtain a proper coordination of the work with that of all other trades.

B. Carefully check and become familiar with the above-mentioned drawings, and frequently consult with all other trades so that the work may proceed as a harmonious whole.

C. Install concealed all wiring except where the Architect grants specified permission to run same exposed.

D. Installer shall defer the installation of all electrical fixtures liable to damage. After fixtures are permanently installed, completely protect against breaking, damage, or the depositing of any waste material therein until the system is accepted.

3.2 COORDINATION

A. Carefully check locations, layouts, and dimensions of all items to be installed under this section with the above-mentioned drawings, and coordinate with all trades affected.

B. Any work installed without properly checking and coordinating same as above provided, which as a result interferes with the proper installation of the work of other trades, is to be removed and properly reinstalled without additional cost to the owner.

C. It is the installer's responsibility to notify well in advance, all trades affected, or any chases, recesses, etc., which may be required for the installation of the electrical work. Should this be neglected, any cutting and/or patching required for such chases, recesses, etc., to be done at this contractor's expense.

D. Carefully examine all architectural, structural, plumbing, heating, electrical, and other drawings; and all other sections of the specifications for items, equipment, etc., not a part of the electrical contract which may require electrical connections. Unless explicitly indicated to the contrary, furnish and install all necessary electrical lines, boxes, etc., and make final connections to all such items, equipment, etc.

3.3 PROTECTION AND CLEANING

A. Protect work, fixtures, and materials at all times. Tightly cover and protect equipment against dirt, water, chemical, or mechanical injury. At final completion of all work to be thoroughly cleaned and delivered in a perfect unblemished condition.

B. Touch-up all damaged paint surfaces on equipment to match original paint.

3.4 TEMPORARY WIRING

A. As soon as practicable, install temporary wiring and lighting throughout the building addition. There shall be one pigtail lampholder for each 600 square feet of floor space or fraction thereof and in addition install a plug receptacle for each room having at least 200 square feet of space. There shall be one light in each room of 50 square feet or larger. Each pigtail outlet shall be equipped with a 100-watt lamp and replacement made immediately upon burnout or theft. Locate lights, as per above, on 25 feet center; install a temporary panelboard with not more than eight outlets, lights or receptacles on a circuit. Temporary wire shall consist of plastic type non-metallic sheathed cable having a ground wire to which all the receptacle ground poles shall be connected. Receptacles shall have "ground-fault" protection.

3.5 WORK IN CONNECTION WITH MOTORS

A. Check rotation and connect for proper rotation. Check overload heater element furnished with starters against nameplate rating or motor and code, call attention to improper sizes to mechanical contractor and architect. Connect all motors with short length of flexible conduit. Connect all pump motors with "UA" type flexible conduit as manufactured by American Brass Co. Use proper type connector with the type conduit. Connect all motors and controls completely, neatly, orderly, and properly tagged to proper operation of system involved. Motor connection not required unless specifically shown.

3.6 WORK IN CONNECTION WITH THE MECHANICAL AND PLUMBING EQUIPMENT

A. Furnish and install all conduit and wiring necessary for the line-voltage power supply (120-volts and above) of plumbing and heating, ventilating and air conditioning equipment. Furnish and install disconnect switches with the motors where required by the Code. Refer to the plumbing, heating, and air conditioning drawings and specifications. Control wiring for HVAC equipment shall be a part of Division 15.

3.7 SERVICE TO EQUIPMENT

A. Check service required by equipment prior to making final connections. Call differences to attention of Architect. Check equipment for proper protective devices and safety devices to allow proper operation of equipment and prevent burnout. Assist Owner in initial operation of equipment and make necessary adjustment for proper operation.

3.8 INITIAL OPERATION OF EQUIPMENT

A. Give all equipment furnished in the contract an operational test prior to final acceptance. Assist the Owner in the initial operation when the owner operates the building and equipment. Instruct the owner's personnel in the proper operation and maintenance of all the equipment furnished under this section of the specifications.

3.9 PROTECTION OF ROOF

A. Coordinate electrical work with roofing work in regard to any electrical items which may pierce or otherwise affect the roof. Hold consultation well in advance of the installation of the final roofing and allow sufficient time for the roofing work to be prepared for the electrical work.

B. Arrange for any cutting or repairing to roofing which might already be installed when an electrical installation is made. See roofing specification for roofing with relation to work of other trades piercing the roof. If necessary consultation is not held, any roof repairs necessitated by the electrical installation shall come under the scope of the work under this section.

3.10 FIRE-RATED WALL PENETRATIONS

A. Where conduit penetrates fire-rated walls, the space between the penetration item and the fire barrier wall shall be properly protected. The space adjoining the conduit penetration shall be filled with a material capable of maintaining the fire rating of the fire barrier, or it shall be protected by an approved device designed for this specific purpose. Where penetrating sleeves are used, the sleeves shall be solidly set in this fire barrier wall, and the space between the conduit and the sleeve shall be filled with a material capable of maintaining the fire resistance of the fire-rated wall. Refer to details on drawings.

3.11 ELECTRICAL DEMOLITION AND CONSTRUCTION PHASING

A. Refer to electrical drawings for electrical demolition requirements. Refer to architectural drawings and specifications for construction phasing requirements. Electrical demolition shall include complete removal of all abandoned wiring, devices, equipment, accessible exposed conduits, etc. and replacement with new electrical arrangement as shown on drawings.

END OF SECTION 26 00 00

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SECTION 26 01 00 - EQUIPMENT IDENTIFICATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide identification for electrical equipment as set forth hereinafter.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Products shall be as set forth in other sections of specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Furnish and install engraved, laminated phenolic nameplates for all safety switches, panelboards, switchboards, disconnect switches, and other electrical equipment supplied for the project for identification of equipment, controlled, served, phase, voltage, etc. Nameplates shall be securely attached to equipment with self-tapping, stainless steel screws and shall identify equipment controlled, attached, etc. Letters shall be approximately ½" high, minimum. Embossed, self-adhesive plastic tape is not acceptable for marking equipment.

B. All empty conduit runs in conduit with conductors for future use shall be identified for use and shall indicate where they terminate. Identification shall be tags, string, or wire attached to conduit or outlet.

C. All outlet boxes, junction boxes, and pullboxes shall have their covers and exterior visible surfaces painted with colors painted to match the surface color scheme outlined above. This includes covers on boxes above lift-out and other type accessible ceilings.

END OF SECTION 26 01 00

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SECTION 26 02 00 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide supports for raceway systems as described hereinafter.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Products shall be as set forth elsewhere in these specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Conduit shall be supported in a method and at a spacing as approved by the NEC, except as described herein.

B. Conduit shall be supported by approved pipe straps or clamps.
   1. Conduit installed on the interior of exterior building walls shall be spaced off the wall surface a minimum of ¼" using "clamp backs" or strut.
   2. Pipe straps or clamps shall be secured by means of:
      a. Toggle bolts on hollow masonry.
      b. Metal expansion shields and machine screws, or standard preset inserts on concrete or solid masonry.
      c. Machine screws or bolts on metal surfaces.
      d. Wood screws on wood construction.

END OF SECTION 26 02 00

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SECTION 26 03 00 - POWER SERVICE AND GROUNDING

PART 1 - GENERAL

1.1 SUMMARY

A. Power service to the building shall be taken underground at 120/208-volts, 3-phase, 4-wire, wye, from new utility company padmounted transformer, as illustrated on drawings and called for hereinafter.

B. Carefully coordinate all aspects of new power service with utility company prior to commencing with the work. Electrical contract work shall include providing concrete pad for padmounted transformer in accordance with utility company specifications, empty conduit and associated trenching, backfilling, etc., for utility company underground primary power line to padmounted transformer as required by utility company and all secondary wiring from padmounted transformer to building main switchboard.

C. Arrange and provide for metering of new service with local utility company.

D. Electrical subcontractor shall pay all required utility company "Aid to Construction" charges. Contact Appalachian Electric Cooperative to determine "Aid to Construction" charges.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Products for power service shall be covered under other sections of the specification.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide grounding of service as set forth hereinafter. Provide two sets of four driven 3/4" x 10' long copperweld ground rods, each group separated from one another by a minimum distance of 15'. Each ground rod shall also be separated by a minimum distance of 15 feet. From each group of rods, extend a #3/0 AWG bare copper grounding conductor to main service entrance disconnect switch and bond to neutral and ground bus. Bonding connections at ground rods shall be by Cadweld process. In addition, extend a #3/0 AWG bare copper grounding conductor and bond to main metallic cold-water pipe where it enters building. Ground by direct connection all interior metal piping systems. Ground structural steel in building foundation to main electrical ground with a #3/0 AWG copper grounding conductor. Ground main telecommunications service equipment to main electrical service ground with a #3/0 AWG copper grounding conductor.

B. Furnish and install a code-sized equipment grounding conductor in all feeder and branch circuit conduit runs. Code-sized grounding conductor is generally not indicated on drawings but shall be required. Ground equipment and lighting fixtures in accordance with the National Electrical Code.

END OF SECTION 26 03 00

SECTION 26 05 19 - LOW VOLTAGE, 600 VOLT CONDUCTORS

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install conductors throughout the raceway system and distribution of electrical energy for the lighting, and power, and control needs.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use stranded conductors with spade type terminal ends. Minimum size shall be No.12 AWG. Insulate conductors with Type "THHN/THWN" insulation unless specifically indicated otherwise on the drawings. Rating shall be 600-volts, AC.

B. Connectors for conductors size No. 10 and 12 shall be approved type insulated twist-on wire nuts. Use hydraulic compression type connectors for conductors No. 8 and larger.

C. All conductors are to be copper.

D. Metal clad (MC) cable shall be permissible for use for final connection to lay-in lighting fixtures from junction box, provided that length of each respective run of MC cable does not exceed six (6) feet. Otherwise, MC cable shall not be utilized.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Conform to manufacturer's recommendations and latest standard practice of industry. Color code all conductor for phase, neutral, and ground reference, as follows:

PHASE	208/120v.
A	Black
B	Red
C	Blue
Neutral	White
Ground	Green

END OF SECTION 26 05 19

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SECTION 26 05 33 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install a system of raceways and boxes for installation of conductors for distribution of power and controls throughout building. Conduit shall be concealed except where specifically called for to be exposed, such as in mechanical/electrical equipment rooms.

B. Furnish outlet boxes for lighting fixtures, wall receptacles, switches, and other boxes as required. Also, pull boxes and junction boxes shall be furnished as required.

PART 2 - PRODUCTS

2.1 RACEWAYS

A. Underground wiring on exterior of building shall be Schedule 40 polyvinyl chloride (PVC). Schedule 40 PVC shall also be permissible for underground wiring runs inside the building on lower level of building, with galvanized rigid steel elbows utilized where conduit turns up through floor slab.

B. Galvanized rigid steel conduit shall be utilized for all exposed conduit on the exterior of the building.

C. All overhead conduit lines inside building shall be in metal raceway. Electric-metallic tubing (EMT) shall be used for all overhead wiring inside the building, unless specifically prohibited by NEC.

D. Minimum size conduit on project shall be 1/2".

2.2 BUSHINGS

A. Bushings for conduit 2" in size and smaller shall be plastic. Conduit size 2-1/2" and larger shall be OZ Company type "B" Appleton Co. Efcor Series NO. 55 or approved equal with metal ring and insulator as an integral part of bushing.

2.3 CONDUIT COUPLINGS

A. Conduit couplings (EMT) shall be compression type. Set-screw couplings shall not be permitted.

2.4 FLEXIBLE CONDUIT

A. Flexible metal conduit shall be used for final connections for all motors, transformers, unit heaters, lighting fixtures, and other permanently connected equipment. Maximum length of flexible conduit shall be 24" except for connection of light fixtures, which may have a length of up to 72". The flexible conduit shall be constructed of hot-dipped galvanized, interlocked spirally wound steel strip. All connectors shall be galvanized and shall be listed for connection to the conduit and boxes. Provide a ground conductor in each length of flexible conduit. Flexible conduit used in mechanical rooms, kitchen areas, and damp or wet locations shall be liquid tight. Other than the uses listed above, the use of flexible conduit will not be permitted.

2.5 MANUFACTURER

A. Conduit shall be as manufactured by Pittsburgh, National, Republic Steel Companies, General Electric Company, or approved equal.

2.6 CEILING BOXES

A. Ceiling outlet boxes shall be 4-inch octagon and 2-1/8 inch deep. Provide extension rings where additional volume is required. All ceiling outlet boxes shall have fixture stud of no-bolt, self-locking type installed if required to hang fixture specified at that outlet.

B. Where ceiling outlets occur in reinforced concrete, provide rings with removable back plate and fixture stud specifically designed for this purpose.

2.7 WALL BOXES

A. Light wall switch boxes shall be a minimum size of 4" high by 2-1/8" wide by 2-1/8" deep. Where more than one gang occurs, 4" square boxes or additional larger boxes shall be used with device ring attached. Boxes in masonry shall be 4" high and 2-1/2" deep with the number of gangs necessary. An example of the masonry box shall be Raco Co. No. 692 for 3-gang, No. 693 for 4-gang, etc.

B. Plug receptacle boxes shall be 4" square by 2-1/8" deep with a 4" square device cover, either one or two-gang as required. Covers shall be square cut, with a depth to accommodate the wall finish material with a minimum raised cut of 1/2".

2.8 MANUFACTURER

A. Boxes and fittings shall be Appleton, Steel City, Raco, Efcor, Crouse-Hinds, or equal.

2.9 FABRICATION

A. Pull and junction boxes shall be galvanized or sherardized sheet metal or code thickness with lapped and welded joints and with 3/4" flange. They shall be rigidly supported on ceiling or wall. Conduit runs entering a box shall not be considered as adequate support.

PART 3 - EXECUTION

3.1 ROUTING REQUIREMENTS

A. Drawings illustrate diagrammatic wiring routings. It shall be the responsibility of the electrical subcontractor, working in conjunction with the general contractor, to coordinate routings of all wiring runs with other trades.

B. Drawings specifically illustrate where wiring is to be run overhead and underground. While the routings shown are diagrammatic, contractor shall adhere to running wiring overhead where shown run overhead inside building on drawings, unless specific permission is granted otherwise.

3.2 INSTALLATION

A. Protect threads on rigid conduit during storage. To prevent entry of moisture and foreign matter in conduit during construction, install factory made conduit caps on conduit stubs. Swab conduit runs clean and dry prior to pulling wire.

B. Cut conduit square, ream smooth, and thread properly and fully. Paint job cut male threads with conductive lead paint prior to making up a threaded conduit joint.

C. Conduits shall be continuous from outlet to outlet and from outlet to panel or pull box. Connect conduit in building construction except as indicated. Secure conduit to all boxes and bushings with double locknuts so that system will be electrically continuous.

D. In concrete slabs, block up conduit from forms and securely fasten in place. All conduits in slabs shall have a minimum of 2 inch concrete coverage above and below.

E. Where conduit is installed in poured concrete slabs and it crosses an expansion joint, an expansion fitting equal to OZ type "AX" with a bonding jumper type "AL" shall be installed. Use Crouse-Hinds, Appleton, or approved equal.

F. Install all conduit in a workmanlike manner with bends made using tools specifically designed for purpose to prevent kinks and flattened areas. Where electric metallic tubing is connected to an outlet box or panel, terminate tubing in an approved type connector and couple together with approved type connectors in order to insure adequate bonding.

G. Where conduit is installed above ceilings, secure it in place by attachment to building structural framing system with appropriate clamps manufactured for purpose of making conduit attachment.

H. Where conduit pierces a rated wall, provide a suitable seal to close openings. Refer to drawings for details.

I. Provide junction or pull boxes in conduit lines which have greater than 360-degrees in total bends.

J. Install pull and/or junction boxes in conduit lines wherever necessary to avoid excessive length of runs or number of bends in run. No run shall exceed 100 feet without a pull box.

K. Pull and junction boxes shall be accessible and sized in accordance with provisions of Article No. 370-18 of latest edition of National Electrical Code.

L. Pull and junction boxes shall be installed so that cover shall be accessible at all times.

END OF SECTION 26 05 33

SECTION 26 05 35 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install wall switches, plug receptacles, etc. as specified hereafter and shown on the drawings. Devices offered as a substitute to those specified will be carefully checked to see that quality such as grounding continuity, retention force for insertion devices, are equal to those specified.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The plug receptacles shall have a minimum rating of 20 amperes for the voltage service applied. Unless not required by NEC, all 120-volt, 20 ampere receptacles shall be “tamper resistant” type.

B. Wall switches shall be 20-ampere, minimum capacity and single pole, 3-way or 4-way as required. Other variations of the devices shall be as called for on the drawings. Where pilot lights are required, they shall be separately ganged.

C. Special colors may be required by the Architect and request for color variation must be made well in advance of product procurement. For the basis of the specification, it shall be assumed that the switch device handles and plug receptacle bodies are white, grey, or ivory.

D. Coverplates: Stainless steel coverplates shall be used.

E. The manufacturer shall be Hubbell, General Electric, Bryant, P & S, Leviton, or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation of devices shall be in accord with the manufacturer's recommendations. Grounding devices such as jumper straps between the device grounding pole and the junction box, or the connection of a grounding conductor will be required at each plug receptacle. Where metal conduit serves the outlet box, a device using a "UL" approved grounding arrangement making use of the contact between the yoke and the device box is approved for use.

END OF SECTION 26 05 35

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SECTION 26 05 36 - FLOOR BOXES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish and install flush floor boxes where indicated on drawings and as set forth hereinafter.

PART 2 - PRODUCTS

2.1 MATERIALS

A. In all "slab on grade" applications, flush floor boxes shall be similar and equal to Wiremold/Walker Company catalog No. RFB4A, 4-compartment combination box. Each floor box shall contain two duplex plug receptacle brackets (RFB-RB-SS) and two quad RJ45 brackets (RFB-4TKO-SS). Activation covers for floor boxes shall be Walker catalog No. S39CCTCXX complete with wire management seals. Cover shall be suitable for use in carpet, tile, terrazzo, and wood-covered concrete floors. Activation covers shall be U.L. evaluated and approved to meet applicable U.S. and Canadian safety standards for scrub water exclusion. Activation covers shall be die cast aluminum with powder coat paint finish. Color shall be aluminum, brass, or black as selected by architect. Provide floor insert in covered doors to match floor finish. In each flush floor box indicated, provide two 120-volt, 20-ampere duplex plug receptacles.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify all locations of floor boxes with architect prior to installation. Do not scale floor box location from electrical drawings.

B. Installation of flush floor boxes shall be in strict accordance with manufacturer's written recommendations.

END OF SECTION 26 05 36

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SECTION 26 05 37 - SURFACE NON-METALLIC RACEWAY

PART 1 GENERAL

1.1 DESCRIPTION

A. Furnish and install surface non-metallic raceway for new wiring required in the existing building as illustrated on the drawings.

PART 2 PRODUCTS

2.1 MATERIALS

A. Where two compartment raceway is shown on drawings, surface non-metallic raceway shall have built-in divider for separation of power and communications wiring. Surface non-metallic raceway shall be similar and equal to Panduit Company T-70 raceway series with built-in divider or equal products by Wiremold Legrand or Hubbell. Surface metal raceway in classrooms shall be 4-3/4" wide by 1-1/4" deep. Provide duplex plug receptacles and data outlets in raceway as illustrated on drawings. Provide all necessary accessories, including device faceplates, boxes, tee connections, etc., for complete installation.

B. Elsewhere, where new wiring is shown on existing walls on drawings, provide surface non-metallic raceway, Panduit “LDP” Series or equal products by Wiremold Legrand or Hubbell. Provide all necessary accessories including surface mounted wiremold boxes, and covers for complete installation.

PART 3 EXECUTION

3.1 INSTALLATION

A. The raceway shall be secured to the wall by the use of toggle bolts. There shall be an anchor at each end of a run.

B. Actual location of raceway shall be approved in advance of installation and a model installation made for approval prior to continuing work.

C. Furnish the necessary fittings, accessories, couplings, wire clips, transition elements, etc., necessary for and reasonably incidental to the proper installation of the raceway system.

END OF SECTION 26 05 37

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SECTION 26 05 38 - COMMUNICATION TERMINAL SPACES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish and install communications terminal spaces as indicated on drawings and as called for hereinafter.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The communications terminal spaces shall consist of 3/4" AC grade plywood bolted to the wall with the top 6' above floor and the bottom 24" above floor, the width as shown to scale on the drawings. Provide Unistrut channel above and below the plywood to secure inbound and outbound conduit. Conduit at that location shall be fitted with bushings. Conduit shall be terminated in a horizontal position within 6" of the terminal mounting board. Paint plywood with two coats of fire resistant paint. Fire resistant paint shall be Benjamin Moore M59-220 (white), with up to 2 ounces of tint allowed per gallon.

B. At each CTS Room location, furnish and install a grounding bus bar. Grounding bus bar shall be Homaco WMBB-12.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Furnish and install at CTS location a #3/0 AWG grounding conductor from main electrical service ground, bonded to ground bar referenced above in paragraph 2.1B of this section. Grounding conductors shall be copper, with “THHN/THWN” insulation, with green tape marking to indicate grounding conductor.

END OF SECTION 26 05 38

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SECTION 26 09 23 - OCCUPANCY SENSORS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Furnish and install occupancy sensors and related equipment for control of lighting as indicated on drawings and as called for hereinafter.

PART 2 - PRODUCTS

2.1 MATERIALS

A. See details on drawings for occupancy sensor requirements. All occupancy sensors shall be Lutron or equal product by other manufacturers. Proposed equal products by other manufacturers will be acceptable for use, provided that they meet all requirements of specified equipment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to wiring diagrams on drawings for wiring requirements of occupancy sensors. Occupancy sensor installation shall be in accordance with manufacturer's recommendations.

END OF SECTION 26 09 23

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SECTION 26 24 13 - SWITCHBOARD (208-VOLTS)

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish and install a free-standing main switchboard as illustrated on the drawings and called for hereinafter.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The switchboard shall be dead-front, free-standing, having cable and conduit, incoming feed, copper bus, grounded neutral.

B. The equipment shall be UL approved for service entrance equipment and labeled accordingly.

C. Provide conduit area for entry from the bottom and departure from the bottom.

D. The switchboard shall contain integrated equipment with short circuit ratings that will certify that all equipment can withstand a fault equal to that of the least overcurrent protective device contained therein. Test ratings shall be established by actual test by the manufacturer on similar equipment construction as the subject switchboard. The test data shall be available and shall be furnished to the engineer at the time of submittal of drawings for approval.

E. Laminated plastic nameplates shall be provided for each circuit breaker identifying the loads being served by the particular circuit breaker.

F. Equip switchboard with built-in digital meter. Meter shall monitor the following: Voltage (L-L, L-N), current, KW, KWH, power factor, voltage THD per phase, and current THD per phase. The Meter shall be similar and equal to Square D Power Logic Meter with optimal enhanced package, with communications ports to allow central energy management system monitoring by Modbus or Bacnet protocol.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Conform to manufacturer's recommendations. Submit shop drawings illustrating the equipment. Shop drawings shall be to scale and dimensioned, showing the outline of the equipment. Switchboard shall contain both a neutral and a ground bus.

END OF SECTION 26 24 13

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SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install panelboards with circuit breaker equipment as indicated on drawings and specified hereinafter.

1.2 SHOP DRAWINGS

A. Shop drawings shall be submitted for approval. Shop drawings shall be specific indicating busing, breaker dimensions, gutter dimension, number size, trip, and interrupting capacity of all circuits.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Equipment shall be product of Square D Company, G.E., Siemens, or Eaton. Branch circuit panelboards shall be of the circuit breaker, dead-front safety type Square D types "NQ" Series with contents, as indicated on panel scheduled, shall bear approved device label of UL, and shall meet all applicable requirements of National Electrical Manufacturers Association. Use bolt-on circuit breakers. Panelboard busing shall be copper.

B. Number of branch circuits, their rating, number of poles arrangements, etc., are indicated on drawings.

C. Panelboards shall have lugs (both main lugs and branch circuit lugs) suitable and UL approved for both aluminum and copper conductors. Such panelboards shall have their breakers labeled and approved by UL.

D. Provide neutral bars for all 4-wire system feeders. Isolate such neutral bars from the panel box.

E. Panels shall have a separate "ground bar" installed with lugs or connectors on bar. Such bar shall be grounded to panel box.

F. Bus bars shall be of sequence-phase type arranged for 120/208-volts, 3-phase, 4-wire mains. All circuits shown as common neutral shall be installed in accordance with National Electrical Code. All bus bars shall be copper (including ground bus).

G. Multiple breakers shall have common trip. Trip indication shall be as indicated by breaker handle moving to a position other than ON or OFF. Equip doors on panels with chrome-plated lock and a catch with two keys supplied for each lock concealed hinges and attachment means. Panelboards shall be flush or surface mounted as required.

H. Furnish six handle "lock-on" devices for each panel for installation on circuits as directed by Owner to prevent unauthorized personnel from turning off circuits to controls, unit heaters,

clocks, night lights, etc. Any spare lock-ons remaining shall be turned over to Owner for his use.

I. Provide typed or printed directory cards under plastic on doors. Submit detailed drawings for approval showing size of cabinets, trim, detail for busing, locks, method of numbering, voltage, phase, etc., and obtain approval from Architect before manufacture is commenced.

J. Distribution or power panels shall be similar and equal to Square D I-line type, or Eaton Type CDP circuit breaker distribution panelboard. This shall include all panels rated greater than 225-amperes.

K. Circuit breakers shall be fully rated and temperature rated for a 40 degrees C. ambient. All panelboards shall have lugs (both main lugs and branch circuit lugs) suitable and UL approved for aluminum and copper conductors. Such panelboards shall have their breakers labeled and approved by UL.

L. Breakers shall be of thermal magnetic type, sized and numbered as indicated on schedule on drawings, and shall be quick-make, with trip indication shown by a handle position other than ON or OFF with trip on all multipole breakers.

M. Minimum short circuit interrupting capacity shall be as indicated on panel schedule.

N. Panelboard fronts shall have concealed hinges and attachment bolts, be complete with door cylinder lock and catch, all keyed alike. Fronts shall have adjusting indicating trim clamps and Bakelite nameplates engraved to indicate device, panel, or motor being served. Spare breakers and spaces only shall have nameplates with no engraving. Secure all nameplates to panelboard trim with two round head sheet metal screws.

O. Panelboards shall be UL approved. Panelboard main sizes, branch circuit rating, and mounting shall be as indicated on plans. Shop drawings shall be submitted for approval. Shop drawings shall be specific showing busing, breaker dimensions, gutter dimensions, spare space dimensions, number, size, trip, and interrupting capacity on all circuits. Standard factory work sheets will not be acceptable as shop drawings.

P. Circuit breakers shall not be restricted to any mounting location due to their physical size. All branch circuit breakers rated 15 through 100 amperes shall be capable of mounting in any and all interior positions without space penalty, except it is allowable to limit any connection point to 100-amperes. All branch circuit breaker connections shall be copper to copper, with all terminations being fully rated at 100-amperes.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Secure surface mounted panelboards to wall using 1/4" toggle bolts, bolted to masonry wall. Where hollow block walls do not occur, suitable expansion shields and anchor bolts shall be utilized. Unless directed otherwise, panelboards shall be mounted to have the top 6 feet clear above finished floor.

B. The directories within each panelboard shall be properly filled out, so as to have a comprehensive understanding of the loads to which each circuit breaker is connected. They shall be filled out by use of a typewriter. This shall include room number served.

C. Panelboards shall be painted to match adjacent walls and labeled inside with a suitable engraved, laminated plastic plate to identify the panelboard designation and its voltage.

D. Balance all circuits in a panel to achieve not more than 10 percent unbalanced neutral current in panel feeder. Panel circuit numbering shall be revised as necessary and arranged to facilitate above.

END OF SECTION 26 24 16

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SECTION 26 28 16 - SAFETY SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install fuse safety switches and/or disconnect switches as called for on the drawings and as may be otherwise required by the Codes.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Safety switches shall be heavy-duty, horsepower rated, quick-make, quick-break with arc shields with enclosed construction.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install where called for on the drawings and/or as required by the National Electrical Code.

B. Where disconnect or safety switches are called for away from walls, suitable support shall be provided to allow the switch to be in a position of approximately 4-1/2 feet above floor. Where necessary, provide a steel frame attached to the floor or overhead structural system or both. Switches may be mounted on equipment where specific approval is realized from the supplier of the equipment, so as not to interfere with normal and ready maintenance of the equipment.

END OF SECTION 26 28 16

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SECTION 26 29 13 - MANUAL MOTOR STARTERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish and install manual motor starters for 120-volt equipment as shown on drawings and called for hereinafter.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manual motor starters shall be equipped with melting alloy type thermal overload relay. Manual motor starters shall be provided with pilot lights. Unit shall be similar and equal to Square D Company 2510 Series, catalog No. FF-1P.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Manual motor starters shall be installed at HVAC equipment in accordance with NEC requirements for disconnecting means. Install in accordance with manufacturer's recommendations.

END OF SECTION 26 29 13

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SECTION 26 32 13 – NATURAL GAS GENERATOR

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish and install a natural gas standby generator and associated wiring to furnish standby power to the fire pump as indicated on the drawings, and as called for hereinafter. Generator shall be for outdoor use. Unit shall be capable of restoring power to critical systems within 10 seconds of failure of commercial power.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The natural gas driven standby electric system shall be provided having standby rating as noted on drawings, 120/208-volts, 3-phase, 4-wire, wye. The systems shall be a package of new and current equipment consisting of:

1. A natural gas engine driven electric generating set to standby power.

2. An engine start-stop control system mounted on the generating set.

3. An automatic load transfer control to provide automatic starting and stopping of the engine and switching of the load.

4. A remote annunciator.

5. A weather-protective sound attenuated housing (Level III, 68 to 70 dbA at seven (7) meters).

B. The standby electric power system furnished completely by the manufacturer, shall be warranted for a period of five years from the date of installation.

C. The engine shall be natural gas-fueled, water cooled with mounted radiator, fan, and water pump. Engine speed shall be governed to maintain alternator frequency within 5 percent from no-load to full-load alternate output. The engines shall have a 24-volt battery charging DC alternator with a transistorized voltage regulator. Remote, 2-wire, starting shall be by a 24-volt electric starter. The engine shall have air cleaner, fuel and oil filters with replaceable elements, water jacket heater, and a fuel transfer pump. Full pressure lubrication shall be supplied by a positive displacement lube oil pump. Exhaust valve seat inserts shall be provided. Intake and exhaust valves shall be heat resisting alloy steel with free rotating exhaust valve.

D. Engine Instruments: The engine instrument panel shall contain an oil pressure gauge, coolant temperature gauge, and battery charge rate ammeter.

E. Engine Controls: The generating set shall contain a complete engine start-stop control which starts engine on closing contact and stops engine on opening contact. A cranking limiter shall be provided to open the starting circuit approximately 45 to 90 seconds if the engine is not started

within that time. The engine controls shall also include a 3-position selector switch with the following positions: RUN-STOP-REMOTE, high engine temperature, low oil pressure, and overspeed shutdown with individual signal lights and common alarm shall also be provided.

F. Unit Performance: Unit shall have isochronous governor for +/-0.5 percent frequency regulation. Voltage regulation shall be within plus or minus 2 percent of rated voltage, from no load to full rated load. The instantaneous voltage dip shall be less than 18 percent of rated voltage when full, 3-phase, load and rated power factor is applied to the alternator. Recovery to stable operation shall occur with 2 seconds. Stable or steady operation is defined as operation with terminal voltage remaining constant within plus or minus 1 percent of rated voltage. A rheostat shall provide a minimum of plus or minus 5 percent voltage adjustment from rated value. Temperature rise shall be within NEMA MG1-22.40 definition.

G. Alternator Instrument Panel: The alternator instrument panel shall be wired, tested, and shock mounted on the generating set by the manufacturer. It shall contain panel lighting; manual reset circuit breaker; frequency meter; running time meter; voltage adjusting rheostat; AC voltmeter; AC ammeter; and voltmeter-ammeter phase selector with OFF position.

H. Generating Set Mounting: The electric generating set shall be equipped with vibration isolators and mounted on a welded steel base which shall provide suitable mounting to any level surface.

I. Accessories: All accessories needed for the proper operation of the generating sets shall be furnished. These shall include residential silencing muffler, weather protective housings rated for Level Two sound attenuation, flexible exhaust connection, starting batteries, battery cables, battery racks, fuel lines, fill and vent lines, and detailed operation and maintenance manuals with parts list. Provide rain caps for exhaust lines. Install one battery charger at genset. Battery charger shall be 10-ampere full float SCR type. It is acceptable for battery charger to be included as an accessory of the automatic transfer switches.

J. Annunciator: Furnish and install a remote annunciator. Annunciator panel shall be equipped with both audible and visible signal devices to monitor and warn of malfunction or alarm conditions. Conditions monitored shall include those listed for Level One installation in NFPA 110.

K. Engine shall be equipped with water jacket manifold heater to insure starting in low temperatures.

L. Generator shall be Onan Company, Caterpillar Company, Kohler Company, or Generac Company.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount generating set with spring vibration isolators directly to new concrete pad. Bolt directly to pad.

B. Provide factory authorized technicians for initial start-up of system.

C. Provide on-site testing and start-up per code requirements.

END OF SECTION 26 32 13

SECTION 26 43 13 - SURGE PROTECTION DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes the materials and installation requirements for Surge Suppression Devices (SPDs) for the protection of all AC electrical circuits.

1.2 STANDARDS - Most Recent Editions of:

A. IEEE C62.41.1-2002, C62.41.2-2002, C62.45-2002
B. National Electrical Code: Article 285
C. Underwriters Laboratories: UL1449 & UL1283

1.3 SUBMITTALS

A. Submit Shop Drawings:

1. SPD manufacturer installation instruction and line drawings detailing dimensions and weight of enclosure.
2. Internal wiring diagram illustrating all modes of protection in each type of SPD required.
3. Wiring diagram showing all field connections and manufacturer's recommended wire and breaker sizes.

B. Submit Product Data:

1. SPD manufacturer cut sheet.
2. A copy of the UL file card, "Notice of Authorization" on UL letterhead, or other proof of listing under UL 1449 (most recent edition) "Manufactured in accordance with" is not equivalent to UL listing and does not meet the intent of this specification.
3. A screen capture of UL.com, Category Code VZCA verifying VPR and MCOV listed on the cut sheet of submitted unit(s).
4. UL documentation verifying Short Circuit Current Rating (SCCR) as required by NEC 285.6.
5. Proof of UL 1283 listing for EMI filters.
6. If Type 2 device(s) are submitted, the submittal shall identify any required external overcurrent protection.
7. Upon request, unencapsulated but complete SPD shall be presented for visual inspection; proprietary technology included. MOV type & quantity shall reflect kA ratings on cutsheets, verification of monitoring, thermal & OCP, etc.
8. These specifications are based on the Emerson Network Power 500 Series. All other manufacturers shall submit for 10-day pre-approval, a detailed compliance or exception statements to all provisions of this specification to allow consideration. Additionally, manufacturers shall submit test data verifying the following: life cycle testing, overcurrent protection, UL1449 Third edition, noise attenuation and surge current capacity. Failure to do so will result in product disapproval. Any deviation from the published specification will result in an applicable deduct applied.

PART 2 - PRODUCTS

2.1 SURGE PROTECTIVE DEVICE (SPD)

A. Quality Assurance

1. SPD shall bear the UL Mark and be Listed to most recent edition of UL 1449 and UL 1283.
2. SPD shall be UL labeled with 200kA Short Circuit Current Rating (SCCR).
3. The system shall be constructed using multiple surge current diversion modules utilizing metal oxide varistors (MOV) computer matched to a variance of ±1 volt and tested for manufacturing defects. The modules shall be designed and constructed in a manner that ensures surge current sharing. Use of gas tubes, silicon avalanche diodes or selenium cells are unacceptable unless documentation from a nationally recognized laboratory demonstrates current sharing of all dissimilar components at all surge current levels.
4. All suppression components shall be individually fused and rated to allow maximum specified surge current capacity.
5. SPD shall provide surge current paths for all modes of protection; L-N, L-G, N-G in Wye systems, and L-L, L-G in Delta and impedance grounded Wye systems.
6. Life cycle testing using 10kA (8x20µs), 20kV (1.2x50µs), Category C surge current with less than 5% degradation of let through voltage shall equal or exceed 15,000 surges per mode.
7. UL 1449 Listed Voltage Protection Ratings (VPRs) shall not exceed the following:

VOLTAGE	L-N	L-G	N-G	MCOV
208Y/120	700V	700V	700V	150V
480Y/277	1200V	1200V	1200V	320V

8. Every suppression component of every mode, including N-G, shall be monitored.
9. SPD shall have minimum EMI/RFI filtering of -50dB at 100kHZ.
10. The SPD monitoring circuitry must continually verify the protection status during operation and display this information on the front cover status panel. The SPD must also contain a built-in-test circuit that will verify the integrity of all fuse links and each associated MOV. The built-in-test circuit must cycle through all phase banks and the neutral-ground bank sending test signals to all modules. The integrity of all fuses in test must be indicated on the status panel. All testing must be able to be performed without disconnecting power to the SPD. Units that require external test sets or equipment are unacceptable.
11. SPD shall be equipped with red and green solid state indicators for each phase and N-G (where applicable). Indicators must be mounted within the enclosure and must be externally visible.
12. SPD must have a minimum of 2 sets of electrically isolated Form C dry contacts, one normally open and one normally closed.
13. SPD shall be equipped with 70% undervoltage detection, phase loss monitoring and power loss monitoring.
14. The specified system shall be equipped with an audible alarm that is activated during a fault condition. In conjunction with alarm, an alarm on/off switch shall be provided to silence the alarm, and an alarm push-to-test switch shall be provided to test the alarm's function. A visible LED will confirm whether alarm is on or disabled. Both switches shall be located on the unit's hinged front cover.

15. SPD shall have a ten-year warranty.

B. Service Entrance/Transfer Switch SPDs:

1. SPD shall be UL 1449 listed and labeled as a Type 1 device.
2. SPD shall be UL 1449 listed and labeled with an I_n rating of 20kA.
3. A UL approved disconnect switch shall be provided as a means of servicing disconnect if a 60A breaker is not available.
4. Minimum Surge Current Rating per phase: 300kA

C. Distribution Panelboards/MCC SPDs:

1. SPD shall be UL 1449 listed and labeled as a Type 1 or Type 2 device.
2. SPD shall be UL 1449 listed and labeled with a minimum I_n rating of 20kA.
3. SPD shall be connected using the manufacturer's breaker/wire recommendations. If recommendations are not available a 60 A breaker and #6 AWG will be used.
4. Minimum Surge Current Rating per phase: 200kA

D. Branch Panel SPDs:

1. SPD shall be UL 1449 listed and labeled as a Type 1 or Type 2 device.
2. SPD shall be UL 1449 listed and labeled with a minimum I_n rating of 20kA.
3. SPD shall be connected using the manufacturer's breaker/wire recommendations. If recommendations are not available a 60 A breaker and #6 AWG will be used.
4. Minimum Surge Current Rating per phase: 100kA

E. Options (select per project)
1. SPD shall be provided with 1 set of NO/NC dry contacts.
2. SPD shall be provided with surge event counter.
3. NEMA enclosures

PART 3 - EXECUTION

3.1 INSTALLATION

A. SPD shall be installed per manufacturer's installation instructions with lead lengths as short (less than 24") and straight as possible. Gently twist conductors together.

B. SPD shall be installed on the load side of the main disconnect.

C. Before energizing, installer shall verify service and separately derived system Neutral to Ground bonding jumpers per NEC.

3.2 MANUFACTURERS

A. Listed manufacturers are subject to compliance with requirements, provide products by one of the following:
   1. Emerson Network Power
   2. Current Technologies
   3. Erico Products

END OF SECTION 26 43 13

SECTION 26 51 19 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories and finishes.
3. Include physical description and dimensions of luminaires.
4. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
5. Photometric data and adjustment factors based on laboratory tests IES LM-79 and IES LM-80.

   a. Manufacturer's Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Product Schedule: For luminaires and lamps, use same designations indicated on Drawings.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals. Provide a list of all lamp types used on Project; use ANSI and manufacturer's codes.

1.4 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.6 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified."

2.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. Recessed fixtures: Comply with NEMA LE 4.

D. CRI of 80 CCT of 3500 K.

E. Rated lamp life of 50,000 hours or more.

F. Where dimming is indicated, lamps dimmable from 100 percent to 0 percent of maximum light output.

G. Internal driver.

H. Nominal Operating Voltage: As indicated.

I. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

J. Housings:

1. Extruded-aluminum housing and heat sink.
2. Finish as indicated.

2.3 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating positions.

C. Diffusers and Globes:

1. Prismatic acrylic clear, UV-stabilized acrylic.
2. Acrylic Diffusers: One hundred percent virgin acrylic plastic with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

D. Housings: Extruded-aluminum housing and heat sink. Finish as indicated.

E. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place. Label shall include the following lamp characteristics:

1. “USE ONLY” and include specific lamp type.
2. Lamp diameter, shape, size, wattage, and coating.
3. CCT and CRI for all luminaires.

2.4 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.5 LUMINAIRE FIXTURE SUPPORT COMPOENTS

A. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc coated steel, 12 gage.

B. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfacto5ry conditions have been corrected.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire positions after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaire Support:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

G. Ceiling-Mounted Luminaire Support:

1. Ceiling mount with two 5/32-inch diameter aircraft cable supports adjustable to 120 inches in length.
2. Ceiling mount with two-point pendant mount with 5/32-inch diameter aircraft cable supports adjustable to 120 inches in length.

H. Suspended Luminaire Support

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
2. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point (unless indicated otherwise) and wire support for suspension for each unit length of luminaire classis, including one at each end.
3. Do not use ceiling grid as support for pendent luminaires. Connect support wires or rods to building structure.

I. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

J. Comply with requirements in Sections 16301 and 16302 for wiring connections.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to emergency power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 26 51 19

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SECTION 26 53 00 - EXIT SIGNS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish and install exit signs where illustrated on the drawings. They shall have built-in battery packs to maintain their self-illumination on the occasion of normal power interruption. Mounting configuration shall be as set forth on the drawings and described hereinafter.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The unit shall be of polycarbonate construction. Lamps shall be LED. Housing shall be matte white and letters shall be red. The units shall have built-in nickel cadmium battery which shall energize the exit sign on the occasion of normal power interruption. They shall be equipped with a device to prevent deep draw down of the battery unit after approximately 1-1/2 to 2 hours of operation. The equipment shall be similar and equal to Beghelli No. VA4R-SA-AT. The units mounted on a lay-in type ceiling shall be supported by use of a Caddy Co. acoustical "Tee Bar" box hanger, catalog No. 512 or similar product. Ceiling surface mounted units shall have a "recessed" battery unit so as to minimize the projection down from the ceiling.

B. Where combination exit sign/twin head emergency lighting units are indicated, unit shall be similar and equal to Beghelli No. PCH-R-AT.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The unit shall be configured for the mounting called for on the drawings, either single face or double face or either ceiling mounting or wall mounting. Directional arrows shall be provided as indicated. Where ceilings above 9' are involved, the ceiling mounted units are to be pendant mounted to where the bottom of the sign is approximately 8'6" above floor. Conform to the manufacturers recommendations.

END OF SECTION 26 53 00

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SECTION 26 54 00 - TWIN HEAD EMERGENCY LIGHTING UNIT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish and install twin-head emergency lighting units where shown. Unit shall be wall mounted as indicated on drawings. The unit shall have built-in cadmium battery, self chargeable and twin adjustable LED lamps. It shall be used to furnish emergency lighting in case of interruption of normal power. It shall automatically switch the lights on when normal power is interrupted.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Emergency lighting units shall be twin-head LED type, similar and equal to Beghelli No. PEH-1, utilizing nickel cadmium battery backup.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Conform to the manufacturer's recommendations. Emergency lighting battery units shall be hardwired to unswitched lighting circuit(s) serving area where units are located.

END OF SECTION 26 54 00

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SECTION 27 00 00 – GENERAL COMMUNICATIONS

PART 1 - GENERAL

1.1 OTHER CONDITIONS

A. Applicable provisions of the General conditions, Supplementary Conditions, and Division 1, General Requirements, apply to the Work under this Section.

1.2 SCOPE OF WORK:

A. The work included under this specification consists of, but is not limited to, work as indicated on the drawings and hereinafter specified in Division 27. Without limiting the generality implied by the drawings an specifications, communications consists of furnishing all materials, accessories, tools, and labor required and incidental thereto, to provide:
   1. Low voltage cabling support system.
   2. Data/voice structured cabling system.
   3. Intercom system VOIP.

B. All Division 27 work will be contracted directly with owner. All labor and materials by Division 27 contractor(s) will be quoted directly to owner. Division 26 (electrical) contractor and general contractor shall work with Division 27 contractor(s) to coordinate scheduling and installation of all Division 27 work.

1.3 RELATED WORK:

A. Division 21: Fire Suppression, Division 22: Plumbing; Division 23: Mechanical; Division 26: Electrical; Division 28: Electronic Safety and Security.

B. See drawings and other sections for equipment requiring electrical service.

C. Painting (except factory-applied finishes on equipment) is specified elsewhere.

1.4 REFERENCE STANDARDS:

A. Make entire electrical installation in strict accordance with the requirements of all city, county, state, or federal codes of law having jurisdiction, the requirements and recommendations of the Board of Fire Underwriters, including all amendments and/or additions to said codes, laws, requirements, and recommendations and the requirements and recommendations of the Power Company. Applicable codes are as follows:
   1. NFPA 101 Life Safety Code.
   2. NFPA 72
   3. NFPA 70
   4. NFPA 90A
   5. NFPA 92A
   6. NFPA 13
   7. NFPA 13R
   8. NFPA 13D
   9. NFPA 14

10. International Building Code
11. International Fire Code
12. International Mechanical Code
13. NFPA 20

B. Should any work shown on the drawings or herein specified be construed a being contrary to or not conforming to the previously mentioned Codes, etc., bring it to the attention of the Architect before executing the work in conformity with the various codes, etc., without additional cost to the Owner, but not until the matter in question has been reviewed by the Architect.

C. Should any work shown on the drawings or herein specified be more rigid as to requirements than the requirements of the various codes, the drawings and specifications shall be used in executing the work.

D. File with proper authorities all necessary drawings as required by various codes, laws, ordinances, or other requirements.

E. Obtain and pay for all permits and for all required inspection certificates. Pay necessary fees.

1.5 WARRANTY-GUARANTEE

A. Warrant and guarantee that all work executed under this section of the specifications will be free from defects of materials and workmanship for a period of one year from the date of final acceptance of the building. The above parties further agree that they will, at their own expense, repair and replace all such defective work and all other work damaged thereby which defective during the term of the warranty-guarantee.

1.6 ARCHITECTURAL DRAWINGS:

A. Refer to architectural drawings for details such as finishes, dimensions, materials, etc. Refer to drawings for door locations, door swings, partitions location, cabinet and counters, making proper allowances therefore. Refer to equipment plans for exact location of electrical connections which are dimensioned.

PART 2 - PRODUCTS

2.1 SUBMITTALS:

A. Manufacturer's Data: Submit manufacturer's specifications, descriptions, illustrations, and installation instructions for each type of manufactured product to include: Low voltage cabling support, data/voice structured cabling, and intercom system VOIP. The submittal shall consist of one or more brochures each containing only "one" copy of material describing the product. Several products may be included in each brochure. Submittals shall be provided by contractor in electronic PDF file format. Submittal shall be neatly organized with descriptive file names.

B. Include manufacturer's certification as may be required to show compliance with these specifications. Indicate by transmittal form that a copy of each instruction has been distributed to the installer.

C. Furnish operating and maintenance instructions applying to equipment installed in conjunction with this contract; include parts lists, wiring diagrams, catalog data, stamped approval submittal data, and operational checkout data as called for in these specifications, bound in hardback binders. Instructions shall be submitted to the Architect for approval at least one month in advance of initial system start-up.

2.2 PRODUCTS

A. Materials shall not be ordered until architect's review of submittal material has been made. They shall be new and unused and the manufacturers standard product and the latest designs.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The drawings which show the work included are diagrammatic only; the locations, routing, etc., of the various fixtures, items of equipment, wiring, etc., are approximate only. The entire installation is subject to such deviations, modifications, rerouting, etc., as may be necessary to meet the requirements of the architectural, structural, and other drawings; and also as necessary to obtain a proper coordination of the work with that of all other trades.

B. Carefully check and become familiar with the above-mentioned drawings, and frequently consult with all other trades so that the work may proceed as a harmonious whole.

C. Install concealed all wiring except where the Architect grants specified permission to run same exposed.

D. Installer shall defer the installation of all electrical fixtures liable to damage. After fixtures are permanently installed, completely protect against breaking, damage, or the depositing of any waste material therein until the system is accepted.

3.2 COORDINATION

A. Carefully check locations, layouts, and dimensions of all items to be installed under this section with the above-mentioned drawings, and coordinate with all trades affected.

B. Any work installed without properly checking and coordinating same as above provided, which as a result interferes with the proper installation of the work of other trades, is to be removed and properly reinstalled at contractor’s expense.

C. It is the installer's responsibility to notify well in advance, all trades affected, or any chases, recesses, etc., which may be required for the installation of the work. Should this be neglected, any cutting and/or patching required for such chases, recesses, etc., to be done at this contractor's expense.

3.3 PROTECTION AND CLEANING

A. Protect work, equipment, and materials at all times. Tightly cover and protect equipment against dirt, water, chemical, or mechanical injury. At final completion of all work to be thoroughly cleaned and delivered in a perfect unblemished condition.

B. Touch-up all damaged paint surfaces on equipment to match original paint.

3.4 INITIAL OPERATION OF EQUIPMENT

A. Give all equipment furnished in the contract an operational test prior to final acceptance. Assist the Owner in the initial operation when the owner operates the building and equipment. Instruct the owner's personnel in the proper operation and maintenance of all the equipment furnished under this section of the specifications.

3.5 FIRE-RATED WALL PENETRATIONS

A. Where conduit penetrates fire-rated walls, the space between the penetration item and the fire barrier wall shall be properly protected. The space adjoining the conduit penetration shall be filled with a material capable of maintaining the fire rating of the fire barrier, or it shall be protected by an approved device designed for this specific purpose. Where penetrating sleeves are used, the sleeves shall be solidly set in this fire barrier wall, and the space between the conduit and the sleeve shall be filled with a material capable of maintaining the fire resistance of the fire-rated wall.

END OF SECTION 27 00 00

SECTION 27 05 29 - LOW-VOLTAGE CABLING SUPPORT SYSTEM

PART 1 – GENERAL

1.1 DESCRIPTION

A. Furnish and install a system of cabling supports above lay-in ceilings for low-voltage (data wiring, integrated communications, sound reinforcement) wiring.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Low-voltage cable support system shall be J-hook system, similar and equal to Steel Cooper BCH Series. Non-metallic J-hook system by Panduit or equal will also be approved for use.

B. Provide separate J-hook systems for data network, integrated communications, and sound reinforcement systems.

C. Provide all necessary supports and attachments to allow connection to structure for these supports. Where wall mounted above ceiling, J-hook supports shall be secured directly to metal studs or masonry walls. J-hooks shall not be permitted to be attached directly to gypboard walls.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Low voltage cabling shall only be permitted to be run exposed in low voltage cabling support system above accessible lay-in ceilings in communications rooms and in mechanical mezzanine spaces. Otherwise, all low voltage cabling shall be run in conduit in areas where there is no lay-in ceiling (i.e., gymnasium, etc.)

B. Cabling supports shall be located minimum 4’ to 5’ on center throughout entire length of low-voltage cabling runs above ceiling. Locate supports well clear of acoustical lay-in ceiling tiles. Supports shall be located such that tiles can be removed without interfering with support system.

C. Maximum number of data network cables to be installed per J-hook shall be forty (40). Provide additional sets of J-hook support systems as needed to support data network cables.

C. Coordinate installation of low-voltage supports with other trades as required.

E. Entire installation shall be in accordance with manufacturer's recommendations.

END OF SECTION 27 05 29

SECTION 27 05 53 - ADMINISTRATION AND LABELING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide administration and labeling of entire communications infrastructure as set forth hereinafter. Administration and labeling shall include but not be limited to all work area outlets (WAO's), patch panels, 110 blocks, conduits, J-hooks, backbone cables, etc.

1.2 REFERENCE STANDARDS

A. BICSI TDMM 11th Current Edition (Telecommunications Distribution Methods Manual).
B. ANSI/NECA/BICSCI-568-2006, Standard for Installing Commercial Building Telecommunications Cable.
C. ANSI/TIA 568-2006, Building Standards for Telecommunications Cabling.
D. ANSI/TIA 569-C, Pathways and Spaces.
E. ANSI/TIA 606-B, Administration Standard for Commercial Telecommunications Cabling.
F. ANSI/TIA-607-B, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
G. ANSI/TIA-526, 7 & 14, Telecommunications Measurements of Optical Fiber Single and Multi Mode Power Loss.
H. ANSI/EIA 310-E, Cabinets, Racks, Panels and associated equipment.
I. ANSI/TIA/EIA 862, Building Automation Systems Cabling Standard for Commercial Buildings.
J. FCC Part 68, Connection of Terminal Equipment to the Telephone Network.
K. ADA of 2010 and Telecommunications Act of 1996, Physically Impaired and Accessibility.
L. IEEE 802 – 2002, Standard for Local and Metropolitan Area Networks: Overview and Architecture.
M. IEEE 802.3.xx, Physical and Data Link layer standards for LAN's, includes Ethernet, Fast Ethernet, Gigabit Ethernet and 10 Gigabit Ethernet.
N. IEEE 802.11.xx, Wireless LANs.
O. IEEE 802.16, Broadband Wireless Metropolitan Area Networks.
P. IEEE C2-2002, NESC (National Electrical Safety Code).
Q. (NFPA-70) NEC adopted edition.
R. NFPA-76, Recommended Practice for Fire Protection of Telecommunications Facilities.
S. NFPA 101, Life Safety Code.
T. BICSI ITS 1 MM current edition (Information Technology Systems Installation Methods Manual).
U. ETA-Electronic Technician Association Fiber Optics Installer.
V. FOA – Fiber Optic Association Certified Fiber Optics Technician.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Products shall be as set forth elsewhere in these specifications.

2.2 MATERIALS

A. Products shall be as set forth elsewhere in these specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All WAO's, patch panels, 110 blocks, conduits, J-hooks, backbone cabling, etc., shall be labeled according to ANSI/TIA Standards. Labeling is also to include the following:

1. "Caution Fiber Optic" adhesive marker every 50' of exposed fiber in building. Label to include MM fiber count and "to and from" information.

END OF SECTION 27 05 53

SECTION 27 15 00 – DATA/VOICE STRUCTURED COMMUNICATION CABLING SYSTEM

PART 1 - GENERAL

1.1 PURPOSE

A. This document defines the products and the execution requirements required to furnish and install a new structured cabling system at Jefferson Elementary School.

B. All cables and related terminations, support and grounding hardware shall be furnished, installed, tested, and documented by the structured cabling installer as detailed in this document. All installation work shall be done in accordance with applicable national, state, and local building and fire codes. In addition, all work shall meet the requirements and standards of the National Fire Protection Association Life Safety Code (NFPA-LSC).

C. The distribution system shall be all inclusive and represent a complete installation at the sites shown on the attached drawings and in the attached specifications. The structured cabling installer shall be responsible for all parts, labor, and all other associated apparatus necessary to completely install, test and turnover for acceptance to the Customer the cabling system detailed herein.

D. Product specifications and general design considerations are provided in this document. Quantities of telecommunication outlets, typical installation details, cable routing and outlet types will be provided in the contract drawings. The successful structured cabling installer shall meet or exceed all requirements for the cable system described in this document and as indicated in the contract drawings.

E. Include color coding of faceplates, jacks and cables, labeling, installation, etc. per Jefferson County Schools IT Standards.

1.2 REFERENCE CODES AND STANDARDS

Use the latest ratified codes and standards for the following:

A. BICSI TDMM Current Edition (Telecommunications Distribution Methods Manual).

B. ANSI/NECA/BICSCI-568-2006, Standard for Installing Commercial Building Telecommunications Cable.

C. ANSI/TIA-569-C, Pathways and Spaces.

D. ANSI/TIA-568-2006, Standard for Installing Commercial Building Telecommunications Cabling.

E. ANSI/TIA-606-B, Administration Standard for Commercial Telecommunications Infrastructure.

F. ANSI/TIA-607-B, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.

G. ANSI/TIA-526, 7 and 14, Telecommunications Measurements of Optical Fiber Single and Multi

Mode Power Loss.

H. ANSI/EIA-310-E, Cabinets, Racks, Panels and associated equipment.

I. ANSI/TIA/EIA 862, Building Automation Systems Cabling Standard for Commercial Buildings.

J. FCC Part 68, Connection of Terminal Equipment to the Telephone Network.

K. ADA of 2010 and Telecommunications Act of 1996, Physically Impaired and Accessibility.

L. ANSI/TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises Standard Series.

M. 568-C.1 Commercial Building Cabling

N. 568-C.2 Copper Cabling Components

O. 568-C.3 Fiber Cabling Components

P. IEEE 802 – 2002, Standard for Local and Metropolitan Area Networks: Overview and Architecture.

Q. IEEE 802.3.xx, Physical and Data Link layer standards for LAN's, includes Ethernet, Fast Ethernet, Gigabit Ethernet and 10 Gigabit Ethernet.

R. IEEE 802.11.xx, Wireless LANs.

S. IEEE 802.16, Broadband Wireless Metropolitan Area Networks.

T. IEEE C2-2002, NESC (National Electrical Safety Code).

U. (NFPA-70) NEC adopted edition.

V. NFPA-76, Recommended Practice for Fire Protection of Telecommunications Facilities.

W. NFPA 101, Life Safety Code.

X. BICSI ITS 1MM Current Edition (Information Technology Systems Installation Methods Manual).

Y. ETA Electronic Technician Association Fiber Optics Installer.

Z. FOA Fiber Optic Association Certified Fiber Optics Technician.

AA. International Building Code.

BB. All material shall be listed by UL or other national independent testing standard shall apply.

CC. If this document and any of the documents listed above are in conflict, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The structured cabling installer has the responsibility to determine and adhere to the most recent release when developing the proposal for installation.

DD. This document does not replace any code, either partially or wholly. The structured cabling installer must be aware of local codes that may impact this project.

1.03 INSTALLER QUALIFICATIONS

A. The structured cabling installer is responsible for workmanship and installation practices in accordance with the manufacturer's written policies.

B. The cable and connectivity manufacturer will extend a manufacturer's warranty for all products installed in this project to the end user once the structured cabling contractor fulfills all requirements under these specifications.

C. The structured cabling installer must have an office with qualified service and installation personnel within 100 miles of the project site.

D. The structured cabling installer must provide a reference list with contact names and phone numbers for three (3) projects of similar scope.

E. Structured cabling installer must have a current Registered Communications Distribution Designer (RCDD) on staff and be responsible for this project. RCDD credentials shall be submitted as part of submittal process.

F. All clean up activity related to work performed will be the responsibility of the structured cabling installer and must be completed daily before leaving the site.

G. As part of submittals, the structured cabling installer shall provide a statement of qualifications such as RCDD, Category 5e/6/6a certifications, BICSI, etc., with specific references in regards to installation of premise wiring systems and installing the modular jacks, patch panels or BICSI equivalents. Structured cabling installer shall also include documentation of authorized training in installation of fiber products along with documentation of continuing education.

1.4 SUBMITTALS

A. Submit shop drawings, product data (including cut sheets and catalog information), and samples required by the contract documents. Submit shop drawings, product data, and samples with such promptness and in such sequence as to cause no delay in the work or in the activities of other contractors. Submitted shop drawings shall be initialed or signed by the structured cabling installer’s legitimate firm name.

1. By submitting shop drawings, product data, and samples, the structured cabling installer acknowledges that he/she carefully reviewed and verified materials, quantities, field measurements, and field construction criteria related thereto. It also demonstrates that the structured cabling installer has checked, coordinated, and verified that information contained within shop drawings, product data, and samples conform to the requirements of the work and of the contract documents.
2. The engineer's/designer's review of shop drawings, product data, and samples submitted by the structured cabling installer shall not relieve the structured cabling installer of responsibility for deviations from requirements of the contract documents, unless the structured cabling installer has specifically informed the architect in writing of such deviation at time of submittal, and the architect has given written approval of the specific deviation. The structured cabling installer shall continue to be responsible for deviations

from requirements of the contract documents not specifically noted by the structured cabling installer in writing, and specifically approved by the engineer in writing.

3. The engineer's/designer's approval of shop drawings, product data, and samples shall not relieve the structured cabling installer of responsibility for errors or omissions in such shop drawings, product data, and samples.
4. Storage and handling requirements and recommendations.
5. Installation method.

B. Submit copy of structured cabling installer's RCDD certification.

C. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least ten (10) days prior to intended test date.

D. At completion of project, structured cabling installer shall submit the following

1. Copper certification test results, computer generated hard copy and diskettes.
2. Optical fiber power meter/light source certification test results in computer generated hard copy and in diskettes.
3. Project Record Documents: Prepared and approved by RCDD. Include the following:
   a. Copper certification test results printouts and CD's.
   b. Optical fiber power meter/light source test results.
   c. Labeling and administration documentation.

E. Work shall not proceed without the engineer's approval of the submitted items.

1.5 QUALITY ASSURANCE

A. The structured cabling installer shall be fully capable and experienced in the structured cabling system specified. The installer shall have at least 3 years experience in structured cabling. The installer shall have a State of Tennessee Contractor License within the electrical trade and show proof of low voltage certification.

B. The structured cabling installer shall employ a project manager who is a RCDD.

C. Equipment and materials of the type for which are independent standard testing requirements, listings, and labels, shall be listed and labeled by the Independent testing laboratory.

D. Material and equipment shall be new, and conform to grade, quality, and standards specified. Equipment and materials of the same type shall be a product of the same manufacturer throughout installation.

E. All cable and equipment shall be installed per industry standards. Equipment and materials shall be of the quality and manufacturer indicated.

F. Strictly adhere to all proposed - current draft Category 6 (BICSI and TIA) installation practices when installing UTP data cabling.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Products must be stored according manufacturer's recommendations as a minimum.

B. Keep stored products clean and dry.

1.7 DRAWINGS

A. It shall be understood that the electrical details and drawings provided with the specification package are diagrammatic. The structured cabling installer shall make allowance in bid proposal to cover all work is required to comply with the intent of the plans and specifications.

1.8 WARRANTY

A. The structured cabling installer shall provide a manufacturer's warranty to guarantee end-to-end high performance cabling systems that meet current and future application requirements. The guarantee shall include all labor, workmanship, horizontal and backbone cable and connectivity components, and have one point of contact for all cabling system issues.

B. The warranty will be issued by the connectivity manufacturer only.

1.9 CLIMATIC CONDITIONS

A. The Contractor shall suspend any work that may be subject to damage by climatic conditions. The Contractor shall, at all times, provide protection against weather to prevent all work, materials, apparatus, and fixtures from injury or damage. At the end of each day's work, all new work, likely to be damaged, must be covered, or otherwise protected. It is the responsibility of the Contractor to remain aware of weather and other climatic conditions.

1.10 TEMPORARY COVERINGS

A. Finished Surfaces: The Contractor shall protect the finished surfaces against possible damage during the course of work, including jambs and soffits of openings used as passageways, or through which materials are handled.

B. Cleaning of finished Surfaces: Finished surfaces, including factory-finished items, shall be clean and not marred upon delivery to the Owner. The Contractor shall, without extra compensation, refinish such spaces where surfaces prove to have been inadequately protected, resulting in damage.

C. Debris Removal: Debris shall be removed promptly from normal traffic areas, particularly in rooms and areas having finished floors of wood, resilient tile, or carpet. Further, the debris removed must not create or present a hazard or code violation in another area. The contractor shall ensure timely cleanup related to this project, during construction and at completion.

1.11 PROTECTION OF PERSONS AND PROPERTY

A. Safety Responsibility: The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the work.

B. Collateral Damage: The Contractor shall continuously maintain adequate protection of all work from damage and shall protect the Owner's property from damage or loss arising in connection with the project. The Contractor shall restore any such damage, injury, or loss, except such as may be caused by agents or employees of the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. As noted on drawings and in this document.

B. The materials shall be new and without any indication of damage, defect, or overage. If usually packaged, materials should be brought to the job site in the original unbroken labeled containers. The materials not specified, but required, shall be of equal or superior quality to the related parts of the work.

C. Modular Jack manufacturer: Hubbell Premise Wiring

1. Cat 6 Modular 568-B Jacks: HXJ6xx

a. Cat 6 Jack – Standard Data Jack HXJ6OR
b. Equal product by other manufacturer.

D. Cable Manufacturers

1. Cat 6 Copper:

a. Mohawk AdvanceNet M57202
b. Hubbell Nextspeed C6RRB
c. Belden Datatwist 4800, 4812 006 A 1000
d. Equal product by an alternative manufacturer.

2. Fiber:

a. All inside fiber shall be Corning Freedm, or equal.

2.2 WORK AREA OUTLETS

A. Work area outlets shall each be terminated at their designated work area location in the connector types described below.

B. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation. Prior to installation, the structured cabling contractor shall submit the proposed configuration for each outlet assembly, with labeling, for review by owner.

C. The wiring scheme for this project shall be T568A unless otherwise directed by customer.

D. Modular Jack:

1. Shall meet or exceed the category TIA standard of jack category required.
2. Where color is not indicated coordinate with engineer prior to installation.

E. Modular Jack for Wireless Access Points and Cameras:

1. Contractor shall install one (1) Category 6 cable and one (1) Category 6 orange jack for each wireless access point and camera location shown on drawings.
2. All wireless access point and camera locations will be terminated in a single gang box and supplied with a 3' ft patch cord.

   a. Hubbell part number AFP14EI.
   b. Patch Cord - Hubbell part number HC6B3.

F. UTP Patch Cords:

1. Category rated patch cords shall be factory terminated with modular plugs featuring a tangle-free latch design and clear strain-relief boots to support easy moves, adds and changes (MACs). Each patch cord shall be 100% performance tested at the factory to the TIA Category required standard.
2. Structured cabling contractor shall provide to customer at end of project:

   a. One (1) patch cord for each data cable installed in each telecommunications room. Patch cord length shall be capable of being installed from patch panel to customer equipment.
   b. One (1) 15 ft patch cord for each data cable installed in outying rooms.
   c. One (1) 3 ft patch cord for each wireless access point cable in addition/renovation
   d. Patch cord color shall match the color of jack and cable.
   e. Hubbell part number - HC6xxyy (xx=color yy=length)

2.3 FIBER OPTIC PATCH CORDS

A. Structured cabling contractor shall provide six (6) SC to SC 3-meter multimode OM3 fiber optic patch cords at telecommunications rooms shown.

B. Hubbell part number - DFPCSCSCE3MM

2.4 HORIZONTAL PATCH PANELS

A. All patch panels shall be 48-port design.

B. All data patch panels shall be 48-port integrated design black in color.

1. Product:
   a. Hubbell part number : Cat 6 - HP648AU

2.5 FACEPLATES

A. All data and voice faceplates shall be plastic, 4 port or as indicated on drawings.

B. Product:

1. Hubbell AFP Series or equal.

2.6 FIBER PATCH PANEL

A. Shall mount in standard 19" EIA rack or cabinet. Shall have front and rear access on all modules via molded-hinged doors. Must have radius control and cable management for fiber patch cords.

Shall have multiple cable entry locations. Include fiber optic cable routing kit (grommets, cable ties, saddle clips, strain relief bracket and ID/caution labels for various cable management solutions.

B. Product:

1. Inside: Hubbell Part Number FCR series- Note: size each fiber patch panel per application with room for 20% spare for future use.

2. Equal product by other manufacturer.

2.7 MULTIMODE FIBER ADAPTER PANELS

A. All adapter panels shall use zirconia ceramic split sleeves. Use blank adapters in each empty port.

B. All ports shall be duplex SC. Coordinate with Owner equipment. Notify Owner/Engineer of discrepancy.

C. Inside data multimode fiber panel shall be 50/125 um 0M3 aqua in color.

1. Product

a. Hubbell B part # HUBFSPSCDS3AQ (6-fiber)
b. Hubbell B part # HUBFSPSCDS6AQ (12-fiber)
c. Equal products by other manufacturer.

2.8 FIBER OPTIC CONNECTORS

A. Multimode fiber optic connectors shall be SC-type; 50/125.

2.9 EQUIPMENT RACKS

A. Furnish and install equipment racks as needed in new main telecommunications room.

B. Secure racks to floor per manufacturer=s instructions and install 18" equipment tray from top of each rack to wall.

C. Ground each rack per ANSI/TIA-607-B requirements.

D. Maintain 36" clearance from the front and rear of rack and on one side.

E. If more than one (1) rack is installed, install in a line side to side, with appropriate vertical cable management on each side and between racks but should be placed adjacent to each other with no space other than the vertical management channel.

1. Hubbell vertical wire manager part number - VS76H
2. Equal product by other manufacturer.

F. All rack systems will contain one two unit (2U) horizontal wire manager for each copper and fiber patch panel.

1. Hubbell horizontal wire manager - HM24C
2. Equal product by other manufacturer.

G. Wall-Mounted Cabinets:

1. Due to space constraints, wall-mounted cabinets shall be utilized for patch panels and related equipment in all outlying "IDF" rooms located "downstream" from main MDF closet.

2. Wall-mounted cabinets shall be Hubbell HPW Series.

2.10 RACK BASE INSULATOR KITS

A. Provide a CPI 10605-019 rack insulator kit for each rack.

2.11 RACK-MOUNT POWER STRIP

A. Structured cabling contractor shall install one (1) rack-mount 20 amp power strip with circuit breaker in each floor mount or wall mount rack that is served with 120 volt power.

1. Product:

a. Hubbell - part #HUBPR10120
b. Equal product by other manufacturer.

B. Telecommunications Grounding Busbar and Accessories.

1. Product:

a. Hubbell - part # HBBB14210A(TGB), part # HBBB14416H (TMGB)
b. Hubbell - part # HBBBHR19KT (rack mounted grounding bus-one for each rack)

2. Other Products as required to meet all codes and standards.

2.12 HORIZONTAL DISTRIBUTION CABLE

A. All horizontal cables shall terminate on a jack and connected in a patch panels in their respective telecommunication room or equipment room as specified on the drawings.

B. All cable, workstation jack modules and patch panel jack modules shall be the color as requested by owner.

1. UTP cabling - Horizontal Copper Cable; Category 6 Cable
2. Cable construction shall be four (4) twisted pairs of 23 American Wire Gauge (AWG) insulated solid bare annealed copper conductors.
3. Outer jacket shall meet National Electrical Code (NEC) requirements and have a nominal cable diameter not to exceed 0.235" for communications riser (CMR) and 0.225" for communications plenum (CMP).
4. Cable shall have a minimum 1.0" bend radius.
5. Delay Skew (max) 38ns/100m.
6. Must have positive power sum attenuation-to-crosstalk ratio (PSACR) beyond 250 MHz.

7. Application assurance warranty.

    a. All transmission performance parameters shall be independently verified by UL or ETL third party testing organization.
8. Product:
    a. Belden
    b. Hubbell
    c. Mohawk
    d. Equal product by other manufacturer.

2.13 BACKBONE FIBER CABLING SYSTEM

A. Furnish and install multimode fiber from main telecommunications closet location to each outlying "IDF" room location in respective classroom wiring closets.

B. All indoor fiber shall be tight buffered interlock armored fiber.

C. Indoor multimode fiber shall be 50/125 OM3.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION SITE SURVEY

A. Prior to start of system, meet at the project site with owner's representative and representatives of trades performing related work to coordinate efforts. Review areas of potential interference and resolve conflicts before proceeding with the work. Facilitation with the general contractor will be necessary to plan the crucial schedule completions of the equipment room and telecommunication closet.

B. Examine areas and conditions under which the system is to be installed. Do not proceed with work until satisfactory conditions have been achieved.

3.2 INSTALLATION GUIDELINES

A. The work included under this specification, consist of furnishing all labor, equipment, material, and supplies and performing all operations necessary to complete the installation of this structured cabling system in compliance with the specifications and drawings. The structured cabling installer will provide and install all of the required material to form a complete system whether specifically addressed in the technical specification or not.

B. All work performed on this project will be installed in accordance with the current edition of the NEC, the current edition of The National Electrical Safety Code, the current issue of the NEC, The current edition of ANSI/NECA/BICSI-568 standard for installing commercial building telecommunications cabling, the current edition of the BICSI Telecommunications Distribution Methods Manual (TDMM), the current edition of the BICSI Cabling Installation Manual, the

latest issue of ANSI/TIA standards as published Global Engineering Documents as ANSI/TIA Telecommunications Building Wiring Standards, and all local codes and ordinances. Should conflicts exist with the foregoing, the authority having jurisdiction (AHJ) for enforcement will have responsibility for making interpretation.

C. If this document and any other documents listed above are in conflict, then the more stringent requirements shall apply. All documents listed are believed to be the most current release of the documents. The structured cabling installer has the responsibility to determine and adhere to the most current release.

D. This document does not replace any code, either partially or wholly. The structured cabling installer must be aware of local codes that may impact this project. All, local, State and federal codes are to be followed.

E. All materials shall be UL Listed or listed by other national independent testing agency and shall be marked as such.

F. Install, apply, connect, clean, and operate all materials and equipment per manfuacturer's directions and recommendations. In the even there is a conflict between specifications and manufacturer's directions, obtain instructions from the Designer.

G. Jacks/Panels shall be installed to provide minimal signal impairment by preserving wire pair twists as closely as possible to the point of mechanical termination. The amount of untwisting in a pair as a result of termination to the patch panel shall be no greater than 0.5 inches (13 mm).

H. Jacks/Panels shall be installed according to manufacturer's instructions and properly mounted to a rack, cabinet, bracket or other appropriate mounting device.

I. Jacks/Panels shall be installed such that cables terminated to the jack/panel can maintain minimum bend radius of at least 4 times the cable diameter into the IDC contacts. Cables shall be terminated on the jacks/panels such that there is no tension on the conductors in the termination contacts.

J. Panels shall be properly labeled using labeling machine on front and back with the cable number and port connections for each port in a size that will accommodate the labeling area and is easiest to read.

3.3 WORK NOT INCLUDED

A. The structured cabling installer is not responsible for providing data concentrators, hubs, switches, servers, computers, and other active devices such as PBX's.

3.4 INSTALLATION

A. Install materials and equipment in accordance with applicable standards, codes, requirements, and recommendations of national, state, and local AHJ, and current NEC and with manufacturer's instructions, in a neat and professional manner.

B. Install in accordance with manufacturer's instructions.

C. All cable shall conform to the requirements for communications circuits defined by the NEC (Article 800) and the Canadian Building Code. Cable listed to NEC Article 800-51(a) will be used for "Plenum" installations. Cable listed to NEC Article 800-51(b) shall be installed in vertical runs penetrating more than one (1) floor.

D. Pulling tension on communications cable shall not exceed 100 Newtons or/ 25 foot-pounds.

E. The installer shall avoid cable stress from cable twist during installation and tension from suspended cable runs and from tightly cinched cable ties.

1. All communications cable, j-supports, conduit and trays shall be supported to the structure, independent of other services.
2. All exposed cable in the telecommunications room shall be secured to the plywood backboards or freestanding frames and routed through wire management hardware.
3. Cable should be placed in conduit or cable tray provided for this use. Cable should be supported so that no passageways are obstructed and that no doors are prevented from closing. No cable or attachments shall be installed that inhibit access to any mechanical/plumbing line or ductwork, or electrical or communications cable or device.
4. When placing cable through floor sleeves or penetrations, the installer shall patch and seal all holes and gaps around the cable in accordance with fire rating.
5. Each station/backbone cable run shall be placed as an uninterrupted conductor section from origination to termination point.
6. System inspection shall be provided through pre-construction, in-progress and final inspections by the Owner. The owner or authorized representative or the Contractor may, at his/her discretion, perform tests in addition to those specified in this document if there is any reason to question the condition of the material as furnished and installed.
7. After installation is complete, in addition to any other required testing, and at such time as the Owner directs, the Contractor shall conduct an operational test for approval. The installation shall be demonstrated to be in accordance with the requirements if this specification. Any defects revealed shall be promptly corrected at Contractor's expense and the tests re-conducted. Operational testing is defined for the following circuit types.

a. Station cable
   1) color code compliance
   2) Labeling
   3) Routing
   4) Workmanship
   5) Compliance with EIA/TIA 568A requirements

b. Backbone cable
   1) color code compliance
   2) Labeling
   3) Routing
   4) Workmanship

c. Equipment room and distribution closet jumpers
   1) Patch Cords
   2) Grounding/bonding
   3) Workmanship
   4) Continuity of termination block layout
   5) Installation and routing

d. Fiber optic cable
   1) Labeling
   2) Patch panel connections
   3) Loss measured in dB/km
   4) Workmanship
   5) Splice loss
   6) Connector loss
   7) Circuit length

F. Install station cabling to the telecommunications room, unless otherwise noted.

G. Installation shall conform to the following basic guidelines.

1. Use of approved wire, cable, and wiring devices.
2. Neat and uncluttered wire termination.

H. Where cable tray is not used, attach cables to permanent structure with suitable attachments at intervals of 48 to 60 inches. Support cables above removable ceilings.

I. Follow manufacturer's recommendations on spacing and number and type of cables installed in j-hooks or cable tray to avoid cable stress.

J. Separation and physical barriers between communication cabling and power cables must be maintained at all times.

K. Install adequate support structure for 10 feet of service slack at telecommunications room.

L. Install cables in one continuous piece. Splices or taps will not be allowed.

M. Provide overvoltage protection on both ends of cabling exposed to lightning or accidental contact with power conductors.

3.5 OPTICAL FIBER CABLE

A. Installation

1. There shall be a 10-foot service loop at each end of the cable in each Tele-Communications Room.
2. Any bend in any optical fiber cable at any point shall have a radius of not less than ten times the outside diameter of that cable.
3. All optical fiber cable and pathways shall be clearly identified as housing optical fiber cable at intervals not greater than 50 feet.

B. Termination

1. Tele-Communication Room
   a. All fibers will be properly broken out and buffered prior to termination.
   b. Fibers will be terminated using SC connectors.
   c. The connectors shall be mated to fiber couplings located in panels housed in rack mounted shelves

C. Testing and Inspection

1. All testing of optical fiber shall be per TIA-568-C.0 (Section 6 and Annex E.).

2. Single Mode ISP- Tier 1 testing shall be required. Testing shall include attenuation measurement for permanent link measured with optical loss test set (OLTS) using methods specified by TIA-526-7, method A.1.

3. Multimode ISP and OSP- Tier 1 testing shall be required. For Tier 1, testing shall include attenuation measurement for permanent link measured with optical loss test set (OLTS) using methods specified by TIA-526-7, method B.

4. Optical fiber attenuation (Link Loss) Budgets shall be as follows:

   a. Single mode indoor/(outdoor)- 1.0DB @1310nm/(0.5 DB @ 1310nm). 1.0DB @ 1550nm/(0.5DB @ 1550nm).
   b. Multimode ISP and OSP- 3.5dB @ 850nm; 1.5dB @ 1300nm.
   c. Connector loss (per mated pair)- 0.75dB
   d. Splice (per each)- 0.3dB, in accordance with ANSI/TIA-455-78-B for field testing.

5. Documentation of testing shall include results, test procedure and methods, wavelengths, equipment used, calibration dates of test equipment, and names of testing personnel.
6. All testing must pass manufacturer's specifications as well as industry standards. Cables with visible defects and deformations such as kinks, twists, or crushed cables will be considered a failed installation and will require replacement by contractor regardless of test results.
7. The installer shall ensure the proper usage of optical fiber patch cords during testing. Patch cords utilized during testing shall have the correct core to cladding offset (i.e. 50/125um vs. 62.5/125um) patch cable for the cable under test. Test results shall show calculated loss budget for each fiber length and type. Utilize mode-conditioned launch cables and fiber mandrels where applicable.

3.6 HORIZONTAL CABLE

A. Installation
1. All cables installed from the workstation to CER/BER shall be a continuous run.
2. A 10 foot service loop shall be in each telecommunications room for all copper cables.
3. Quantities of cables per workstation shall be provided as indicated on the construction drawings.
4. All cables shall be installed in accordance with manufacturer recommendations. Strict attention shall be paid to maintaining sheath integrity, avoiding cable kinks and sharp bends and proper use of cable ties.

B. Install all communications device plates in full contact with the wall surface.
1. Leave 12" of cable slack above the ceiling.

C. Termination Data Cable
1. At the telecommunications room, data cables shall be terminated on patch panels as described in the Product section of this specification.
2. At the workstation, the data cables will be terminated as indicated elsewhere in specifications.

3. Pair twist will be maintained as close as possible to the point of termination. Untwisting shall not exceed 13mm (0.5 inch) for "Category 6" installations. The sheath of the cable shall be removed only as far as required to terminate the individual pairs.
4. Install all communications device plates in full contact with the wall.
5. Leave 12" of cable slack above the ceiling.

3.7 RELAY RACKS

A. Racks shall be securely attached to the concrete floor using a minimum ⅜" hardware or as required by local codes.

B. Racks shall be placed with a minimum of 36 inch clearance from the walls on all sides of the rack. When mounted in a row, maintain a minimum of 36 inches from the wall behind and in front of the row of racks and from the wall at each end of the row.

C. All racks shall be grounded to the telecommunications ground bar in accordance with Section B2.0.6 of this document.

D. Rack mount screws not used for installing patch panels and other hardware shall be bagged and left with the rack upon completion of the installation.

E. Wall mounted termination block fields shall be mounted on 4' x 8' x .75" void free plywood. The plywood shall be mounted vertically 12" above the finished floor. The plywood shall be painted with two coats of white fire retardant paint.

F. Wall mounted termination block fields shall be installed with the lowest edge of the mounting frame 18" from the finished floor.

G. Racks shall be provided and installed in all telecommunications rooms as specified in this document and on the construction drawings.

H. Vertical and horizontal cable management hardware shall be installed on the racks.

I. Racks shall be located within the room so as not to block access to any existing equipment or backboard space. The racks shall be located so that there is a minimum 36" access to both the front and rear of the rack.

3.8 GROUNDING AND BONDING

A. All equipment racks, CP, Enclosures, Ladder Rack, Basket Tray and Cabinets shall be bonded and grounded per ANSI/TIA-607-B, latest addition, requirements.

B. All wires used for telecommunications grounding purposes shall be identified with green insulation. Non-insulated wires shall be identified at each termination point with a wrap of green tape. All cables and bus-bars shall be identified and labeled in accordance with the System Documentation Section of this specification.

3.9 FIRE-STOP

A. A fire-stop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Fire-stop systems comprise an effective block for fire, smoke, heat, vapor and pressurized water stream.

B. All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate fire-stop system. This requirement applies to through penetrations (complete

penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item, i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly fire-stopped.

C. Fire-stop systems shall be UL Classified to ASTM E814 (UL 1479) and shall be approved by the State Fire Marshal.

3.10 WORK AREA OUTLETS

A. Cables shall be coiled in the in-walls or surface-mount boxes if adequate space is present to house the cable coil without exceeding the manufacturer's bend radius. In hollow wall installations where box-eliminators are used, excess wire can be stored in the wall. No more than 12" of UTP and 36" of fiber slack shall be stored in an in-wall box, modular furniture raceway, or insulated walls. Include one (1) meter of cable slack for each cable at end of each conduit stub out location containing UTP cabling.

B. Cables shall be dressed and terminated in accordance with the recommendations made in the TIA/EIA-568-B.1 document, manufacturer's recommendations and best industry practices.

C. Pair untwist at the termination shall not exceed 12mm (one-half inch).

D. Bend radius of the cable in the termination area shall not be less than 4 times the outside diameter of the cable.

E. The cable jacket shall be maintained as close as possible to the termination point.

F. Data jacks, unless otherwise noted in drawings, shall be located in the bottom position(s) of each faceplate. Data jacks in horizontally oriented faceplates shall occupy the right-most position(s)

3.11 BACKBONE CABLE INSTALLATION

A. Backbone cables shall be installed separately from horizontal distribution cables.

B. A pull cord (nylon; ⅛" minimum) shall be co-installed with all cable installed in any conduit.

C. Where cables are housed in conduits, the backbone and horizontal cables shall be installed in metallic conduit.

D. Where cables are installed in air return plenum, riser rated cable shall be installed in metallic conduit.

E. Where backbone cables and distribution cables are installed in a cable tray or wireway, backbone cables shall be installed first and bundled separately from the horizontal distribution cables.

F. All backbone cables shall be securely fastened to the side wall of the TR on each floor.

G. Backbone cables spanning more than three floors shall be securely attached at the top of the cable run with a wire mesh grip and on alternating floors or as required by local codes.

H. Vertical runs of cable shall be supported to messenger strand, cable ladder, or other method to provide proper support for the weight of the cable.

I. Large bundles of cables and/or heavy cables shall be attached using metal clamps and/or metal banding to support the cable.

3.12 IDENTIFICATION AND LABELING

A. Self-laminating labels will be used on all cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on each end. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device.

3.13 TESTING

A. General
1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA-568-B. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.
2. All cables shall be tested in accordance with this document, the ANSI/TIA standards and best industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

B. Copper Testing
1. All twisted-pair copper cable links shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance. Horizontal cabling shall be tested using a level III test unit for Category 6 performance compliance, respectively.
2. Continuity – Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicated by the test unit in accordance with the manufacturer's recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.
3. Length – Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the ANSI/TIA-568-B Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.

4. Category 6 Performance:
   a. Follow the Standards requirements
   b. ANSI/TIA/EIA-568-B.1
   c. A Level III test unit is required to verify Category 6 performance.
   d. The basic tests required are:
      1) Wire Map
      2) Length
      3) Attenuation

4) NEXT (Near End Crosstalk)
5) Return Loss
6) ELFEXT Loss
7) Propagation Delay
8) PSNEXT (Power Sum Near-End Crosstalk loss)
9) PSELFEXT (Power Sum Equal Level Far-End Crosstalk loss)

5. Patch Panels shall be tested after horizontal cabling has been installed and terminated to both the panel and the work area outlet.
6. Panels shall be tested as part of the link or channel for Length, DC continuity, NEXT, PSNEXT, Attenuation, Return Loss, ELFEXT, and PSELFEXT using a level III tester for category 6/6A channels.
7. Testers shall be correctly set to test the type and manufacturer of the horizontal cable used in the link or channel being tested, including the correct NVP.
8. A "PASS" indication shall be obtained for all link or channel tests when tested using the appropriate level tester for the appropriate category.

C. Fiber Testing

1. All fiber testing shall be performed on all fibers in the completed end to end system. Thee shall be no splices. Testing shall consist of an end-to-end power meter test performed per TIA-455-53A. The system loss measurements shall be provided at 850 and/or 1300 nanometers for multimode fibers. These tests also include continuity checking of each fiber.
2. Backbone multimode fiber cabling shall be tested at both 850nm and 1300nm in one direction.
3. Test set-up and performance shall be conducted in accordance with ANSI/TIA-526-14 Standard, Method B.
4. Where links are combined to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. ONLY LINK TEST IS REQUIRED. The Contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test method shall be the same used for the test described above. The values for calculating loss shall be those defined in the ANSI/TIA Standard.
5. Attenuation testing shall be performed with a stable launch condition using two-meter jumpers to attach the test equipment to the cable plant. The light source shall be left in place after calibration and the power meter moved to the far end to take measurements.

3.14 FIELD QUALITY CONTROL

A. Employ job superintendent or project manager during the course of the installation to provide coordination of work of this specification and of other trades, and provide technical information when requested by other trades. This person shall maintain current RCDD registration and shall be responsible for quality control during installation, equipment set-up, and testing.

B. Installation personnel shall meet manufacturer's training and education requirements for implementation of extended warranty program.

END OF SECTION 27 15 00

SECTION 27 51 23 - INTERCOM SYSTEM VOIP

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

A. This section shall include microprocessor-based communications system to be furnished and installed by contractor. The components of the system shall include, but not limited to, the following:

1. Administrative/classroom telephones. (by Owner)
2. Speaker assemblies, interior and exterior
3. Digital VOIP telephone system (by Owner)
4. All Call Amplifiers.
5. UPS backup system – Cyber Power network monitored UPS unit.
6. Integrated master clock for class bell schedule.
7. Rauland TCC2045 IP Console

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to Authorities Having Jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.4 COORDINATION

A. Coordinate size and location of raceway system, and provisions for electrical power to equipment of this section. Coordinate work of this section with requirements of telephone service provider.

PART 2 – PRODUCTS

2.1 AVAILABLE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

B. Rauland TCU VOIP intercom system is the basis of this specification. Similar and equal products by other manufacturers that meet these specifications will be acceptable for use.

2.2 SYSTEM REQUIREMENTS

A. CENTRAL SWITCHING EXCHANGE

1. The central switch shall be a microprocessor controlled unit utilizing NMOS technology for memory, sensing, and logic control. The system shall lend itself to modular expansion to a total capacity of 358 stations. The system shall allow future interface of media access and internet media control from the classroom.
2. The central switch shall utilize standard dual tone multi-frequency (DTMF) signaling for conformance with standard telephone practices. Those systems which utilize "smart" instruments which do not generate tones shall not be considered equal.
3. The system shall provide direct dialing, full duplex private telephone communications between all locations equipped with administrative telephones, feature telephones, and staff telephones.
4. The central switch shall provide an RS232C serial data port for connection to a computer for on-site diagnostics or via a modem to a remote computer for off-site diagnostic functions by a distributor or manufacturer personnel. It shall be possible to determine circuit and software faults via these diagnostics and facilitate remote software changes.

B. TELEPHONE COMMUNICATION OPERATION

1. The system shall provide telephone service to administrators and to classrooms as indicated on the drawings (By Owner). Cable for telephone and jacks to be installed and furnished by this contractor. All telephone cable shall be terminated in Communication closets on 66 blocks by this contractor for connection by owner. All telephone handset units shall be furnished and installed by owner.

C. INTERCOM AND PUBLIC ADDRESS OPERATION

1. Each classroom shall be equipped with a ceiling or wall mounted speaker. Refer to the plans for ceiling or wall mounted speaker locations. Contractor to cable all network VOIP jacks. Telephone handsets will be furnished and installed by owner.
2. The central switch shall be supplied with a two-way amplified communication path to locations equipped with speakers. The intercom amplifier shall be capable of delivering at least twelve (12) watts RMS and shall contain an automatic level control. Provide two channels.
3. System shall provide facilities for calling a staff (classroom) station by dialing the station number. The system shall allow for two way speaker communication in classrooms or private telephone type communication. System shall have two communication paths to each classroom. This will allow all call announcements, class change signals, two-way speaker conversation and telephone handset communication at the same time.
4. The system shall provide the capability of assigning speaker locations to any one or more of the eight (8) software programmable zones for zone paging or time tone signal reception.
5. Provide for the distribution of emergency announcements and for the distribution of manually activated tones to all locations with speakers from any authorized telephone.
6. The system shall be equipped with power amplifiers to facilitate the distribution of All-Call Announcements, Zone Paging, Emergency Evacuation Tones and Program Material. The power amplifiers shall have an audio output rated at a minimum of 250 watts.

D. MASTER CLOCK REQUIREMENTS: The system shall have the ability to operate solely as a master clock with the capacity for storing 550 events and up to 100 holidays in non-volatile memory. Ability to review edits and deletes events. Review of events from any entered time of day. Events shall be programmable to any one or all of eight (8) zone circuits. Selection of any one of eight (8) schedules will allow flexibility due to seasonal changes or special events. There shall be a fully automatic holiday program execution. Bells can be silenced or special schedules can be implemented. Normal bells will resume after the holiday period. There shall be a user-programmable automatic Daylight Savings Time change. Programmable Music-on-Class-Change, when the system is equipped with program distribution facilities. This feature shall be programmable from 1 to 15 minutes. There shall be separate bell duration for each zone circuit and latched operation of zones to control lighting or other devices. Ability to test all output zones circuits. Interface with all types of secondary slave clocks whether synchronous wired, electronic, or minute-impulse types. This shall be accomplished without the use of external synchronous adapters. Accumulation of down time during power outage to reset slave clocks, both minute-impulse and synchronous types after the power has been restored. There shall be a user-programmable custom slave clock correction. Output relays rated at 5 amperes shall be provided on all eight (8) zone circuits. Crystal-controlled time base for assured accuracy. Lithium battery will provide not less than 5 years battery back up for timekeeping function. Permit interface to a personal computer/printer to allow remote programming, diagnostics, and call logging. 16 different tones available

2.3 COMMUNICATION UNITS

A. SPEAKERS

1. Ceiling speakers shall be a Rauland BAFK2X2L8RJ or approved equal. It shall be an 8” permanent magnet seamless cone type, with an additional cone provided to extend high frequency response. Frequency range shall be 65 to 17,000Hz; ceramic magnet weight shall be at least 5 oz. (141.75 g); axial sensitivity shall be 93dB at 1 meter with 1 watt input; power rating shall be 8 watts RMS; voice coil impedance shall be 8 ohms and shall measure .75” (1.91 cm) in diameter; speaker depth shall be 2.75” (6.99 cm). Assembly shall be tile replacement speaker with white epoxy finish 2x2 lay in tile support. Unit shall be a complete assembly with TCC2011 IP classroom Module.

2. Recessed wall mounted speakers shall be a Rauland ACC1003 or approved equal. It shall be an 8” permanent magnet seamless cone type, with an additional cone provided to extend high frequency response. Frequency range shall be 65 to 17,000Hz; ceramic magnet weight shall be at least 5 oz. (141.75 g); axial sensitivity shall be 93dB at 1 meter with 1 watt input; power rating shall be 8 watts RMS; voice coil impedance shall be 8 ohms and shall measure .75@ (1.91 cm) in diameter; speaker depth shall be 2.75” (6.99 cm). TCC2011 Ip Module for each speaker. Provide square flush mounted wall baffle and back box.

3. Exterior recessed wall mounted speakers shall be a Rauland ACC1008 or approved equal. It shall be an 8” permanent magnet seamless cone type, with an additional cone provided to extend high frequency response. Frequency range shall be 65 to 17,000Hz; ceramic magnet weight shall be at least 5 oz. (141.75 g); axial sensitivity shall be 93dB at 1 meter with 1 watt input; power rating shall be 8 watts RMS; voice coil impedance shall be 8 ohms and shall measure .75” (1.91 cm) in diameter; speaker depth shall be 2.75” (6.99 cm). The speaker shall be equipped with a universal line matching transformer for 25V/70V output line tapped at 5/16, 5/8, 1-1/4, 2-1/2 and 5 watts. Provide square flush mounted vandal-Proof wall baffle

and backbox.

2.4 ACCESSORIES

A. Provide a rack mounted UPS system as called for hereinafter. UPS shall be Cyber Power PR2200LCDRTXL2UN5-20P with three-year warranty. Include Cyber Power RMCARD 205 network monitoring. Also provide Cyber Power Envirosensor unit. UPS furnished as part of this project must integrate into district's current Cyber Power Panel Business Edition Management Server.

B. TCU Controller and all Rauland 24 Port Patch Panels shall be installed in a upright two post rack equal to Hoffman HDR19FM45U with E45RUBKIT.

C. All Call Amplifier, 250 watt rms with TCC2022 Zone Module for each page zone.

D. Network switches shall be furnished and installed by Union County School System's low voltage wiring vendor as part of a separate contract.

2.5 COMMUNICATIONS TERMINAL SPACE (CTS)

A. CTS shall consist of a 4'-0" x 8'-0" x 3/4" plywood, mount as required by the structure. Provided by and installed by GC contractor.

2.6 CABLING

A. All intercom cabling shall be IP based and shall be four pair 24 gauge Category 6 cable minimum. All intercom cabling shall be color coded with distinct outer insulation color, different from other network wiring used on project.

2.7 COVERPLATES AND JACKS

A. Provide coverplates and jacks for VOIP telephone units, coordinate with Union County IT staff.

2.8 SPEAKER GROUPING

A. Speakers located in corridors and common areas shall be grouped into one zone to allow for paging.

B. Speakers located in the Dining/Commons and Platform areas shall be grouped into one zone to allow for paging.

C. Speakers located in classrooms, offices, work areas, etc. shall not be grouped with other zones.

D. All other areas shall be grouped accordingly. Speakers serving playground areas shall be grouped together.

PART 3 - EXECUTION

3.1 INSTALLATION

A. System wiring and equipment installation shall be in accordance with good engineering practices as

established by the EIA and the NEC. Wiring shall meet all state and local electrical codes. All wiring shall test free from all grounds and shorts. All cabling shall be terminated on 66 type distribution blocks and labeled. Cross-connect wire shall be used for all interconnect between station and field wiring.

B. Wiring Method: All cabling shall be installed open above lay-in ceiling and in conduit where concealed in walls or floors.

C. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

D. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables so they identify media in coordination with system wiring diagrams.

E. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess. Use lacing bars in cabinets.

F. Control-Circuit Wiring: Install number and size of conductors as recommended by system manufacturer for control functions indicated.

G. The telephone companies interface shall be extended from the de-mark to the intercom/telephone system with minimum 25 pair cable with 10% spares. Lightning protection shall be provided for all central office lines.

3.2 GROUNDING

A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding.

C. Install grounding electrodes as specified in Division 16 Section "Grounding and Bonding."

3.3 SERVICE AND MAINTENANCE

A. The contractor shall provide a one-year warranty of the installed system against defects in material and workmanship. All labor and materials shall be provided at no expense to the owner during normal working hours. The warranty period shall begin on the date of acceptance by the owner/engineer. The contractor shall provide a minimum of eight hours of in-service training with this system. These sessions shall be broken into segments that will facilitate the training of individuals in the operation of this system. Operator Manuals and Users Guides shall be provided at the time of this training.

END OF SECTION 27 51 23

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SECTION 28 00 00 - GENERAL ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 OTHER CONDITIONS

A. Applicable provisions of the General conditions, Supplementary Conditions, and Division 1, General Requirements, apply to the Work under this Section.

1.2 SCOPE OF WORK:

A. The work included under this specification consists of, but is not limited to, work as indicated on the drawings and hereinafter specified in Division 28. Without limiting the generality implied by the drawings an specifications, electronic safety and security consists of furnishing all materials, accessories, tools, and labor required and incidental thereto, to provide:
   1. Fire alarm system.

B. All fire alarm system work shall be included in the General Construction contract work. All other Division 28 work listed herein shall be contracted directly with owner. All labor and materials for access control system, security system, and IP CCTV camera system contractor(s) will be quoted directly to owner. Division 26 (electrical) contractor and general contractor shall work with Division 28 contractor(s) that are working directly for owner to coordinate scheduling and installation of this Division 28 work.

1.3 RELATED WORK:

A. Division 21: Fire Suppression, Division 22: Plumbing; Division 23: Mechanical; Division 26: Electrical; Division 27: Communications.

B. See drawings and other sections for equipment requiring electrical service.

C. Painting (except factory-applied finishes on equipment) is specified elsewhere.

1.4 REFERENCE STANDARDS:

A. Make entire electrical installation in strict accordance with the requirements of all city, county, state, or federal codes of law having jurisdiction, the requirements and recommendations of the Board of Fire Underwriters, including all amendments and/or additions to said codes, laws, requirements, and recommendations and the requirements and recommendations of the Power Company. Applicable codes are as follows:

1. NFPA 101 Life Safety Code.
2. NFPA 72
3. NFPA 70
4. NFPA 90A
5. NFPA 92A
6. NFPA 13
7. NFPA 13R
8. NFPA 13D
9. NFPA 14
10. International Building Code
11. International Fire Code
12. International Mechanical Code
13. NFPA 20

B. Should any work shown on the drawings or herein specified be construed a being contrary to or not conforming to the previously mentioned Codes, etc., bring it to the attention of the Architect before executing the work in conformity with the various codes, etc., without additional cost to the Owner, but not until the matter in question has been reviewed by the Architect.

C. Should any work shown on the drawings or herein specified be more rigid as to requirements than the requirements of the various codes, the drawings and specifications shall be used in executing the work.

D. File with proper authorities all necessary drawings as required by various codes, laws, ordinances, or other requirements.

E. Obtain and pay for all permits and for all required inspection certificates. Pay necessary fees.

1.5 WARRANTY-GUARANTEE

A. Warrant and guarantee that all work executed under this section of the specifications will be free from defects of materials and workmanship for a period of one year from the date of final acceptance of the building. The above parties further agree that they will, at their own expense, repair and replace all such defective work and all other work damaged thereby which defective during the term of the warranty-guarantee.

1.6 ARCHITECTURAL DRAWINGS:

A. Refer to architectural drawings for details such as finishes, dimensions, materials, etc. Refer to drawings for door locations, door swings, partitions location, cabinet and counters, making proper allowances therefore. Refer to equipment plans for exact location of electrical connections which are dimensioned.

PART 2 - PRODUCTS

2.1 SUBMITTALS:

A. Manufacturer's Data: Submit manufacturer's specifications, descriptions, illustrations, and installation instructions for each type of manufactured product to include: fire alarm system intended for use on this project. The submittal shall consist of one or more brochures each containing only "one" copy of material describing the product. Several products may be included in each brochure. Submittals shall be provided by contractor in electronic PDF file format. Submittal shall be neatly organized with descriptive file names.

B. Include manufacturer's certification as may be required to show compliance with these specifications. Indicate by transmittal form that a copy of each instruction has been distributed to the installer.

C. Furnish operating and maintenance instructions applying to equipment installed in conjunction with this contract; include parts lists, wiring diagrams, catalog data, stamped approval submittal data, and operational checkout data as called for in these specifications, bound in hardback binders. Instructions shall be submitted to the Architect for approval at least one month in advance of initial system start-up.

2.2 PRODUCTS

A. Materials shall not be ordered until architect's review of submittal material has been made. They shall be new and unused and the manufacturers standard product and the latest designs.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The drawings which show the work included are diagrammatic only; the locations, routing, etc., of the various fixtures, items of equipment, wiring, etc., are approximate only. The entire installation is subject to such deviations, modifications, rerouting, etc., as may be necessary to meet the requirements of the architectural, structural, and other drawings; and also as necessary to obtain a proper coordination of the work with that of all other trades.

B. Carefully check and become familiar with the above-mentioned drawings, and frequently consult with all other trades so that the work may proceed as a harmonious whole.

C. Install concealed all wiring except where the Architect grants specified permission to run same exposed.

D. Installer shall defer the installation of all electrical fixtures liable to damage. After fixtures are permanently installed, completely protect against breaking, damage, or the depositing of any waste material therein until the system is accepted.

3.2 COORDINATION

A. Carefully check locations, layouts, and dimensions of all items to be installed under this section with the above-mentioned drawings, and coordinate with all trades affected.

B. Any work installed without properly checking and coordinating same as above provided, which as a result interferes with the proper installation of the work of other trades, is to be removed and properly reinstalled at contractor's expense.

C. It is the installer's responsibility to notify well in advance, all trades affected, or any chases, recesses, etc., which may be required for the installation of the electrical work. Should this be neglected, any cutting and/or patching required for such chases, recesses, etc., to be done at this contractor's expense.

3.3 PROTECTION AND CLEANING

A. Protect work, equipment, and materials at all times. Tightly cover and protect equipment against dirt, water, chemical, or mechanical injury. At final completion of all work to be thoroughly cleaned and delivered in a perfect unblemished condition.

B. Touch-up all damaged paint surfaces on equipment to match original paint.

3.4 INITIAL OPERATION OF EQUIPMENT

A. Give all equipment furnished in the contract an operational test prior to final acceptance. Assist the Owner in the initial operation when the owner operates the building and equipment. Instruct the owner's personnel in the proper operation and maintenance of all the equipment furnished under this section of the specifications.

3.5 FIRE-RATED WALL PENETRATIONS

A. Where conduit penetrates fire-rated walls, the space between the penetration item and the fire barrier wall shall be properly protected. The space adjoining the conduit penetration shall be filled with a material capable of maintaining the fire rating of the fire barrier, or it shall be protected by an approved device designed for this specific purpose. Where penetrating sleeves are used, the sleeves shall be solidly set in this fire barrier wall, and the space between the conduit and the sleeve shall be filled with a material capable of maintaining the fire resistance of the fire-rated wall.

END OF SECTION 28 00 00

SECTION 28 31 00 - FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Related Sections:

1. Division 01 General Requirements
2. Division 26 Electrical, Section 260500 Common Work Results for Electrical

1.2 SUMMARY

A. Section Includes:

1. This specification describes an addressable Fire Detection and alarm signaling system. The control panel shall be intelligent device addressable, analog detecting, low voltage and modular, with digital communication techniques, in full compliance with all applicable codes and standards. The features and capacities described in this specification are required as a minimum for this project and shall be furnished by the successful contractor.
2. The system shall be in full compliance with National and Local Codes.
3. The system shall include all required hardware, raceways, interconnecting wiring and software to accomplish the requirements of this specification and the contract drawings, whether or not specifically itemized herein.
4. All equipment furnished shall be new and the latest state-of-the-art products of a single manufacturer, engaged in the manufacturing and sale of analog fire detection devices for over ten years.
5. The system as specified shall be supplied, installed, tested and approved by the local Authority Having Jurisdiction, and turned over to the owner in an operational condition. The owner shall be provided factory training class for the BOE fire technician to be certified to maintain the fire alarm system.
6. In the interest of job coordination and responsibilities, the installing contractor shall contract with a single supplier for fire alarm equipment, engineering, programming, inspection and tests, and shall be capable of providing a “UL Listing Certificate” for the complete system.
7. The system specified shall be that of Cerberus PRO™ Fire Safety which meets the project requirements. Other systems shall be submitted 10 days prior to bid date for approval by the Engineer. All system approved shall meet all the requirements spelled out in this specification. System approval shall be in writing by the Engineer and a copy shall be submitted with the system submittals.

1.3 SYSTEM DESCRIPTION

A. Basic Cerberus PRO Fire Safety – The system shall be a complete, electrically supervised fire detection and notification system, with a microprocessor based operating system having the following capabilities, features, and capacities:

1. The local system shall provide status indicators and control switches for all of the following functions:
   a. Audible and visual notification alarm circuit zone control.
   b. Status indicators for sprinkler system water-flow and valve supervisory devices.
   c. Any additional status or control functions as indicated on the drawings, including but not limited to; emergency generator functions, fire pump functions, door unlocking and security with bypass capabilities.

B. Cerberus PRO Fire Safety Intelligent Voice Communication -- The system shall be complete, electrically supervised evacuation system using one-way communication with microprocessor-based operating system having the following capabilities, features and capacities:

1. Listed for emergency and non-emergency use.
2. Listed for MNS from any control point to 'Request/Grant/Deny' and integrated with FC922-924 and FV922-924 (no separate MNS panel)
3. Ability to support up to two microphones per FV922-924 control panel for one-way paging, and up to 64 microphones in a voice network.
4. Ability to provide manual voice control.
5. Two channel message player supporting 300 messages (38 pre-recorded). The system supports MP3 and WAV files.
6. Three simultaneous audio channels for each networked panel.
7. Amplifiers shall be rated for 25V or 70.7V RMS, 50 watts. Voice amplification shall be supervised and backed up with like amplifiers. Back up shall be one or two per node.
8. Ability to provide separate booster amplifier. Amplifiers shall be rated for 25V or 70.7V RMS, 100 watts.
9. Multiple nodes shall provide peer-to-peer voice capability in order to eliminate a single point of failure.
10. Audio shall be synchronized between nodes in order to take into account common areas.
11. Speakers shall have the ability to play coded audio tones.
12. The system shall provide status indicators and control switches for all of the following functions:
    a. Audible and visual notification alarm circuit zone control.
    b. Speaker circuit zone control.
    c. Status indicators for sprinkler system water flow and valve supervisory devices.
    d. Any additional status or control functions as indicated on the drawings, including but not limited to: emergency generator functions, fire pump functions, door unlocking and security with bypass capabilities.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and

accessories. Complete manufacturer's catalog data including supervisory power usage, alarm power usage, physical dimensions, and finish and mounting requirements.

B. Power calculations. Battery capacity calculations. Battery size shall be a minimum of 125% of the calculated requirement. Provide the following supporting information:

1. Supervisory power requirements for all equipment.
2. Alarm power requirements for all equipment.
3. Power supply rating justification showing power requirements for each of the system power supplies. Power supplies shall be sized to furnish the total connected load in a worst-case condition plus 25% spare capacity.
4. Voltage drop calculations for wiring runs demonstrating worst-case condition.
5. NAC circuit design shall incorporate a 15% spare capacity for future expansion.

C. Submit manufacturer's requirements for testing Signaling Line Circuits and device addresses prior to connecting to control panel. At a minimum the following tests shall be required; device address, the usage (Alarm, Supervisory etc), environmental compensation, temperature ratings for thermal detectors and smoke detector sensitivities. This requirement shall need approval before any wiring is connected to the control panel.

D. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.
2. Complete drawings covering the following shall be submitted by the contractor for the proposed system:
   a. Floor plans in a CAD compatible format at a scale of 1/8"=1'-0" showing all equipment and raceways, marked for size, conductor count with type and size, showing the percentage of allowable National Electric Code fill used.
3. Installation drawings shop drawings, and as-built drawings shall be prepared by an individual experienced with the work specified herein.
4. Incomplete submittals shall be returned without review, unless with prior approval of the Engineer.

E. On Site Training.

1. The system supplier shall schedule and present a minimum of four (4) hours of formal site specific instruction for the building owner, detailing the proper operation and maintenance of the installed system.
2. The instruction shall be presented in an organized and professional manner by a person factory trained in the operation and maintenance of the equipment and who is also thoroughly familiar with the installation.
3. The instruction shall cover the schedule of maintenance required by NFPA 72 and any additional maintenance recommended by the system manufacturer.
4. Copies of all training aids, presentations, etc., shall be left with the owner.

1.5 SPARE PARTS

A. The contractor shall furnish the following extra material that matches the products installed. Spares shall be packaged with protective covering for storage and identified with labels describing contents.

B. Automatic detection devices: Two (2) percent of the installed quantity of each type, no less than one piece.

C. Manual fire alarm stations: Two (2) percent of the installed quantity of each type, no less than one piece.

D. Audible and visible devices: One (1) percent of the installed quantity of each type, but not less than two (2) devices.

E. Keys: A minimum of three (3) sets of keys shall be provided and appropriately identified.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire alarm equipment that fail(s) in materials or workmanship within specified warranty period. Warranty Period is 1 year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Siemens Building Technologies

B. Equal products by Notifier, SimplexGrinnell, and EST will be acceptable for use.

2.2 CONTROL PANEL

A. The fire alarm control panel shall be microprocessor based using multiple microprocessors throughout the system providing rapid processing of smoke detector and other initiation device information to control system output functions.

B. There shall be a watchdog circuit, which shall verify the system processors and the software program. Problems with either the processors or the system program the panel shall activate a trouble signal, and reset the panel.

C. The system modules shall communicate with an RS 485 network communications protocol. All module wiring shall be to terminal blocks.

D. The Cerberus PRO Fire Safety FC and FV 924 system shall be capable of the following configurations. Both configurations are permitted on the same network.
   1. The system shall support up to 504 addressable devices, which may be divided in any ratio on one, two, three, or four separate, isolated Class B circuits.
   2. The system shall support 504 addressable devices, each of which may be divided in any ratio on one, two, three, or four separate, isolated Class B circuits.

E. The system shall be capable of supporting unshielded wiring applications.

F. System Components:

1. The System Periphery board shall be capable of 252 intelligent devices distributed between one, two, three, or four Class B SLC circuits. Any trouble on one circuit shall not affect the other circuit. This module controls the signaling from the initiation devices reporting alarms and troubles to the control panel. This module shall also provide the signaling to the field devices for the controlling the output of specific initiation devices. The on board microprocessor provides the periphery board with the ability to function even if the main microprocessor fails. LED's on the board shall provide annunciation for the following; Power, Gnd. Fault, Alarm, Trouble. This board is integral to the system. The board shall be model number FCI2016-U1.
2. The system periphery board shall be capable of supporting two system drivers of 252 intelligent devices distributed between one, two, three, or four Class B SLC circuits, for a total panel capacity of 504 addressable devices. Any trouble on one circuit shall not affect the other circuit. This module controls the signaling from the initiation devices reporting alarms and troubles to the control panel. This module shall also provide the signaling to the field devices for the controlling the output of specific initiation devices. The on board microprocessor provides the periphery board with the ability to function even if the main microprocessor fails. LED's on the board shall provide annunciation for the following: Power, Gnd. Fault, Alarm, Trouble. This board is integral to the system. The board shall be model number FCI2017-U1.
3. The voice-system card cage (Model VCA2002-A1) supports the mounting and field wiring for cards used on a Model FV922 / FV924 FACP.
4. The voice system CPU card (Model VCC2001-A1) is a central-processing unit (CPU) card that controls and monitors all modules and functions for Cerberus PRO Fire Safety intelligent voice-communication FACPs.
5. The In/Out Voice System Card (Model VCC2002-A1) is the Input / Output card for the Cerberus PRO Fire Safety intelligent voice-communication system.
6. The Voice Amplifier (25 / 70 V) Card used in 'real time', emergency communication, the 50W amplifier card (Model VCI2001-U1) provides AC power between a Model FV922 / FV924 panel and a site's speaker system. Up to four (4) Model VCI2001 amplifiers are supported in a 3-to1 backup, or 1-to-1 backup schematic on a single Cerberus PRO Fire Safety intelligent voice-communication system: configured as one (1), two (2) or three (3) main amplifiers, and one (1) or two (2) optional backup amplifiers.
7. The MoNET connection module is used for communication between a Model FCM20-series operating unit and a Voice CPU card (Model VCC2001-A1) in a given Cerberus PRO Fire Safety intelligent voice communication panel. MoNET (Model FCA2031-A1) can additionally provide in system integration between an operating unit and a Modular Ethernet Switch (Model FN2012-A1 in each Cerberus PRO Fire Safety, non-voice FACP.
8. The Microphone Option Module (Model VTO2004-U3) is used to provide live, non-pre-recorded voice communication on a Cerberus PRO Fire Safety intelligent voice communication panel. Model VTO2004-U3 can serve either as a main microphone installed in the main-system enclosure, or as a remote microphone in a remote enclosure. Up to two (2) Model VTO2004-U3 microphones are supported for each Model FV922 / FV924 FACP.
9. The Switch Option Module (Model VTO2001-U3) is a series of front-end, illuminated and programmable pushbuttons primarily mounted in the middle inner door of each Cerberus PRO Fire Safety intelligent voice-communication FACP. Each Model VTO2001-U3 module has 24 group-switches, thus totaling 48 LEDs, and consists of up to 96 multi-color LED-status indicators. Each LED switch-group is assigned specific functionality during the configuration process. Furthermore, a pushbutton [for each affected zone] will illuminate to acknowledge the command has been received at the Voice System CPU Card, Model VCC2001-A1. Additionally, if no microphone is used, up to eight (8) Model

VTO2001-U3 switch-option modules can be used in a given three-eight-unit (3HU) enclosure (Model FHD2007-U3/R3).

10. As an option, the Model EBA2004-A1 Booster Amplifier is a main board that allows for expansion of speaker zones for additional power to a Cerberus PRO Fire Safety intelligent voice communication system.
11. The Signal Line Circuits (SLC) shall be tested for opens, shorts and communications with all addressable devices installed before connection to the control panel. Systems without this capability shall have a test panel installed for initial testing to eliminate any possible damage short term or long term to the control panel. After initial testing replace the test panel and proceed with complete testing.
12. The standard Operator Interface shall have the ability to view events, acknowledge, silence, and reset the system and any networked Cerberus PRO Fire Safety control panels, when configured as a global PMI. The standard operator interface can acknowledge, silence, and reset panels via Global PMI.
13. The LED Operator Interface shall have the ability to view events, acknowledge, silence, and reset the system and any networked Cerberus PRO Fire Safety control panels, when configured as a global PMI. Additionally, the operator interface provides twelve multicolored configurable LEDs for annunciating system status
14. The System Periphery Board shall contain 2 Class B NAC circuits rated at 3 amps each with power-limited outputs. The zones shall be isolated and independently supervised. There shall be at least 6 unique codes/signals for each circuit based on system logic. These signals shall be Temporal Code 3 (Evacuation), Steady (Such as "Recall"), Temporal Code 3 (for CO alarms), March Time 120ppm, March Time 60ppm, and March Time 30ppm. The card shall have the following LED's to provide trouble shooting and annunciation; Power, Gnd. Fault, Zone Activation or Trouble. This functionality shall be integral to the system. The card shall be model number FCI2016-U1/FCI2017-U1.
15. The control panel shall be equipped with four Form C relays for alarm, trouble, supervisory, and programmable output. The system shall provide the mounting of all system cards, field wiring, and panel's inter-card wiring. All power limited field wiring shall be separated from all non-power limited internal wiring. The card shall be model number FCI2016-U1/FCI2017-U1.

G. System response time from alarm to output shall be an average of three (3) seconds.

H. All system cards and modules shall have Flash memory for downloading the latest module firmware.

I. Passwords:

1. Technician Level Password - There shall be a 4 character password that a user must enter into the control panel in order to perform such maintenance- and control-related functions at the panel as:

   a. Arming and disarming devices.
   b. Activating, deactivating or modifying detector ASD and sensitivity settings.
   c. Activating and deactivating the History Log function, and deleting obsolete entries.
   d. Changing the system time and date.

2. Maintenance Level Password - There shall be a 4 character password that a user must enter into the control panel in order to access the panel's reporting functions and walktest functions.

3. Acknowledge Silenceable Reset Access - There shall be a key required to open a locked cabinet that a system user must use in order to acknowledge events, turn silenceable audibles and visuals on and off, and perform panel resets.

J. Degrade Mode Alarm Activation:

K. Software Modifications: The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made. Systems that require the use of external programmers or change of EPROMs are not acceptable.

L. Logic: The fire alarm system shall support generic functions that deal with binary states (True/False, high/low), and produce desired outputs from one or more binary inputs (for example, alarm outputs from detector or manual station inputs). AND, OR, NOT, Any N, Latches, Start Timer, Delay Timer, Restart Timer are generic functions. Generic functions can be used as inputs to other function. The system shall support 500 logic functions.

M. History: The system shall store 2000 events in history. Trouble warnings will occur when the History buffer is full.

N. Reports:

1. The system shall have the ability to provide configuration, status, queue and history reports.
2. Configuration reports shall provide the following information:
   - Custom Messages
   - Database Information
   - Entity Type
   - Zone usage
   - Device Category
   - Firmware revision
3. Status reports shall provide the following information:
   - Disarmed cards and devices
   - ASD settings
   - Sensitivity in %/foot
   - Alarm threshold in %/foot
   - Temperature in degrees F.
   - Walktest
4. Queue reports shall provide the following information:
   - Alarm events with custom message and event time
   - Gas alarm events with custom message and event time
   - Supervisory events with custom message and event time
   - Trouble events with custom message and event time
   - Status events with custom message and event time
   - Information events
5. History reports shall provide Address, History Type, Description, Time & Date and Custom Message. The following event types shall be reported:
   - Alarm events
   - Gas alarm events
   - Supervisory events
   - Status changes
   - Alarm verification
   - Output activation from logic

System Reset
Event Acknowledgements
Block Acknowledgements
Audible Silence System Flag Changes
Sensitivity Changes
Arm / Disarm Commands
Arm / Disarm By Logic
Manual Output Overrides
Output Overrides By Logic
Time Changes
Menu Logins
ASD Changes
Walktest
Device Input to Logic Activations/Deactivations

2.3 POWER SUPPLY

A. The system Power Supply FP2011-U1 shall be a 300 Watt, 6.5-amp that provides 24VDC power for system operation. The power supply shall be filtered and regulated. The power supply provides power for all system operation, including signaling line circuits, notification appliance circuits, auxiliary power, battery charger, and all optional modules The power supply shall be rated for 120/240 VAC 50/60 Hz. The module shall be model number FP2011-U1

B. The system Power Supply FP2012-U1 shall be a 300 Watt, 11.5-amp that provides 24 VDC power for system operation. The power supply provides power for all system operation, including signaling line circuits, notification appliance circuits, auxiliary power, battery charger, and all optional modules. The power supply shall be rated for 120/240 VAC 50/60 Hz. The module shall be model number FP2012-U1.

C. For applications requiring greater than 300W of power, the Model FP2013-U1 power supply can optionally power a Model FV922 or FV924 system. Model FP2013-U1 consists of two (2) power supply units and one (1) interconnection cable, in order to balance the power from Model FP2013-U1. Consequently, this power-supply configuration can provide up to 600W at 24VDC.

D. The battery charger shall be able to charge the system batteries up to 100 AH batteries. Battery charging shall be microprocessor controlled and programmed to select battery sizes.

E. Transfer from AC to battery power shall be instantaneous when AC voltage drops to a point where it is not sufficient for normal operation.

2.4 SYSTEM ENCLOSURE

A. Provide the enclosure as specified. Provide the color as to the local AHJ requirements.

B. Provide three-height-unit backbox as part of the Cerberus PRO Fire Safety intelligent - communication system hardware for use with 3HU system enclosures. Specifically, each backbox is used to fasten with a 3HU outer door.

C. Provide Red cabinet enclosure.

2.5 REMOTE ANNUNCIATOR

A. LCD Annunciator Panel: Provide FT2014/FT2015 LCD remote annunciator(s) as indicated on the drawings. The remote annunciator shall provide visual indication of all system status changes including alarm, supervisory, trouble, and system status. Display shall include text descriptions as programmed at the main panel for all device status and system status. The FT2015 remote annunciator shall provide key-lock switch protected functionality including reset, signal silence/un-silence, and acknowledge. The FT2014/FT2015 shall be available in both red and black housings.

2.6 INTELLIGENT INITIATING DEVICES

A. General: All initiation devices shall be insensitive to initiating loop polarity. Specifically, the devices shall be insensitive to plus/minus voltage connections.

B. Smoke Detectors – Standard Addressable Detectors:

1. The smoke detectors must provide at least 3 environmental parameter sets to assist in device sensitivity configuration.
2. The detectors shall have a tri-color LED to streamline system maintenance/inspection by plainly indicating detector status as follows: green for normal operation, amber for maintenance required, red for alarm.
3. The detector shall be RoHS-compliant: it shall meet standards for Reduction of Hazardous Substances (RoHS) by reduction in lead content and other restricted substances.
4. The detectors shall be UL listed for operation in a 95% relative humidity (RH) environment.
5. The detectors shall be designed to eliminate calibration errors associated with field cleaning of the chamber.
6. The detectors shall support the use of a relay, or LED remote indicator without requiring an additional software address. Low profile, white case shall not exceed 2.5 inches of extension below the finish ceiling.
7. For the detectors where required, there shall be available a locking kit and detector guard to prevent unauthorized detector removal.
8. Available models:
   a. OH921. Multi-Criteria incorporating 1 Optical sensor and 1 Thermal sensor with an operating temperature range of 32°F to 100°F. Available in four parameter sets. Polarity insensitive installation wiring. Three color LED.
   b. OP921. Photoelectric Smoke detector with an operating temperature range of 32°F to 120°F. Available in three parameter sets. Polarity insensitive installation wiring. Three color LED.

C. Heat Detectors – Addressable

1. Thermal Detectors shall be rated at 135 degrees fixed temperature and 15 degrees per minute rate of rise. Detectors shall be constructed to compensate for the thermal lag inherent in conventional type detectors due to the thermal mass, and alarm at the set point of 135 degrees Fahrenheit. The choice of alarm reporting as a fixed temperature detector or a combination of fixed and rate of rise shall be made in system software and be changeable at any time without the necessity of hardware replacement.
2. The detectors furnished shall have a listed spacing for coverage up to 2,500 square feet and shall be installed according to the requirements of NFPA 72 for open area coverage. The thermal detector shall be model number HFPT-11.
3. Model HI921 heat detector shall have the following temperature settings:

Fixed temperature at 135°F, 145°F, 155°F, 165°F, 174°F
Rate of Rise at 15°F/ min (8.3°C) at 135°F (57°C)
Rate of Rise at 15°F/ min (8.3°C) at 174°F (79°C)
Low temperature warning at 40°F (4.4°C)

D. Duct Smoke Detectors – Addressable

1. For duct detector applications, the smoke detector shall be an intelligent digital photoelectric detector. Detectors shall be listed for use as open area protective coverage, in duct installation and sampling assembly installation and shall be insensitive to air velocity changes.
2. The detector communications shall allow the detector to provide alarm input to the system and alarm output from the system within four (4) seconds. The detector shall be mounted in a duct detector housing listed for that purpose. The duct detector shall support the use of a remote test switch, relay or LED remote indicator. The duct detector shall be supplied with the appropriate sampling tubes to fit the installation.
3. Where duct detectors are exposed to the weather a weatherproof enclosure shall be available. A NEMA-3R and NEMA-4X option shall be available. The duct housing cover shall include a test port for functional testing of the detector without cover removal. The duct housing shall include a cover removal switch capable of indicating cover removal status to the fire alarm control panel.
4. The intelligent duct detector shall have a model number from the FDBZ-Series. Where required there shall be available a duct housing with an on-board relay. Also where required, there shall be a standalone housing available with its own power supply and test/reset switch that does not require connection to a fire alarm control panel. It shall be model FBZ492-PR.
5. Duct smoke detector housing shall allow use in duct systems with air velocity ranging from 100 to 4,000 feet per minute, within temperature ranges of 32°F to 120°F per minute, and with relative humidity ranging from 0 to 95%.
6. Duct Housings and Accessories:
   a. FDBZ492-R Global Air Duct Housing for Addressable P2 Detectors with Relay Application
   b. FDBZ-WP Weather-Proof housing to accommodate all versions of Global Air Duct Housings
   c. FDBZ-RTL Remote Test Lamp for Conventional Detectors

E. Detector Bases – Addressable

1. Detector bases shall be low profile twist lock type with screw clamp terminals and self-wiping contacts. Bases shall be installed on an industry standard, 4" square or octagonal electrical outlet box.

F. Manual Pull Stations – Addressable

1. Provide addressable manual stations where shown on the drawings, to be flush or surface mounted as required. Manual stations shall contain the intelligence for reporting address, identity, alarm and trouble to the fire alarm control panel. The manual station communications shall allow the station to provide alarm input to the system and alarm output from the system within less than four (4) seconds.
2. The manual station shall be equipped with terminal strip and pressure style screw terminals for the connection of field wiring. Surface mounted stations where indicated on the

drawings shall be mounted using a manufacturer's prescribed matching red enamel outlet box.

3. The single action pull station shall be model number HMS-S.
4. Where required, there shall also be available pull stations with break glass, capable of explosion proof installation, capable of weatherproof installation, reset key operation, and metal housings.

G. Addressable Interface Devices

1. Addressable Interface Devices shall be provided to monitor contacts for such items as water-flow, tamper, and PIV switches connected to the fire alarm system. These interface devices shall be able to monitor a single or dual contacts. An address will be provided for each contact. Where remote supervised relay is required the interface shall be equipped with a SPDT relay rated for 4 amps resistive and 3.5 amps inductive. The addressable interface modules shall be model number HTRI or FDCIO Series.
2. Where needed, a Conventional Zone Module shall connect to the Signal Line Circuit, which will allow the use of conventional initiation devices. This module shall have the ability to support up to 15 conventional smoke detectors and an unlimited number of contact devices. This module shall also be capable of monitoring Linear Beam detectors and conventional Flame detectors. Where required, there shall be an intrinsically safe detection solution for NEMA defined intrinsically safe installations (model DI-3IS with ISI-1) compatible with the conventional zone module. The module shall be model HZM.
3. Single Device Damper Monitoring and Control: A single HTRI switch input shall be able to monitor all 3 states of a damper – open, closed, and in transit. A single HTRI-R shall be able to fully control a damper (through the relay connected to the motor control) while also using its switch input for monitoring all 3 states of the damper.
4. Model HCP addressable control point shall provide remote, independent control of any of the following:

   A notification appliance circuit (NAC)
   A speaker zone.

2.7 NOTIFICATION APPLIANCES

A. Strobes and Speaker Strobes

1. The appliance shall meet and be listed for UL Standard 1971 (Emergency Devices for the Hearing-Impaired) for Indoor Fire Protection Service
2. Speaker Strobes shall be listed for indoor use, and shall meet the requirements of FCC Part 15 Class B
3. Strobe appliances shall produce a flash rate of one (1) flash per second over the Regulated Voltage Range, and shall incorporate a Xenon flashtube enclosed in a rugged Lexan® lens
4. All inputs shall be compatible with standard, reverse polarity supervision of circuit wiring by a Fire-Alarm Control Panel (FACP)
5. The Strobe shall be of low-current design
6. The strobe intensity shall have field-selectable settings, and shall be rated per UL Standard 1971 for 15/30/75/95cd or 115/177cd for ceiling mount where Multi-Candela appliances are specified
7. The selector switch for selecting the candela shall be tamper resistant
8. The appliance shall be compatible with FC922-924, FV922-924, or PAD-4, 9 amp power supply with built-in sync protocol when synchronization is required
9. The strobes shall not drift out of synchronization at any time during operation

10. If the sync module or Power Supply fails to operate, (i.e. - contacts remain closed), the strobe shall revert to a non-synchronized flash rate
11. The strobes shall be designed for indoor surface of flush mounting
12. The Strobe Appliances shall incorporate a Patented, Integral Strobe Mounting Plate that shall allow mounting to single-gang, double-gang, 4-inch square, 100mm European type back boxes, or the SHBBS Surface Back box
13. The Multi-Candela or Single-Candela Strobe Plate shall mount to either a standard, 4-inch square back box for flush mounting, or shall mount to the SBL2S back box for surface mounting
14. All notification appliances shall be backward compatible

B. All notification appliances shall be listed for Special Applications: Strobes are designed to flash at 1-flash-per-second minimum over their "Regulated Input Voltage Range

2.8 DIGITAL COMMUNICATOR

A. The Multi-Point Digital Alarm Communicator FCA2015-U1 shall be UL864 listed to provide point identification of alarm, supervisory, security and trouble events to a Central or Remove Receiving Station. The DACT shall support the following:

1. Ademco Contact ID or SIA protocol
2. Ademco Contact ID selection shall provide the ability to transmit events for up to 999 individual zones
3. SIA selection shall provide the ability to transmit events for up to 10000 individual points
4. Programming of accounts and phone numbers
5. Dual phone line interface
6. Line fault monitoring.
7. Automatic 24-hour test
8. The Dact shall be connected to a Honeywell Cellular communicator to furnish wireless monitoring and all charges for this service shall be included for the first year.

PART 3 – EXECUTION

3.1 ACCEPTANCE TESTING

A. The acceptance inspector shall use the system record drawings in combination with the documents specified in this specification during the testing procedure to verify operation as programmed. In conducting the ATP, the acceptance inspector shall request demonstration of any or all input and output functions. The items tested shall include but not be limited to the following:

1. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:
   Open, shorted and grounded signal line circuits.
   Open, shorted and grounded notification circuits.
   Primary power or battery disconnected.
2. System notification appliances shall be demonstrated as follows:
   All alarm notification appliances actuate as programmed
   Audibility and visibility at required levels.
3. System indications shall be demonstrated as follows:
   Correct message display for each alarm input at the control display.

Correct history logging for all system activity.

4. System off-site reporting functions shall be demonstrated as follows:
   Correct zone transmitted for each alarm input
   Trouble signals received for disconnect
5. Secondary power capabilities shall be demonstrated as follows:
   a. System primary power shall be disconnected for a period of time as specified herein. At the end of that period, an alarm condition shall be created and the system shall perform as specified for a period as specified.
   b. System primary power shall be restored for forty-eight hours and system-charging current shall be normal trickle charge for a fully charged battery bank.
   c. System battery voltages and charging currents shall be checked at the fire alarm control panel.

3.2 DOCUMENTATION

A. System documentation shall be furnished to the owner and shall include but not be limited to the following:
   System operation, installation and maintenance manuals.

END OF SECTION 28 31 00

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SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Removing existing trees, shrubs, groundcovers plants and grass.
2. Clearing and grubbing.
3. Stripping and stockpiling topsoil.
4. Removing above- and below-grade site improvements.
5. Disconnecting and capping or sealing site utilities.
6. Temporary erosion and sedimentation control measures.

1.2 MATERIAL OWNERSHIP

A. Except for stripped topsoil, engineered fill or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.3 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

C. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section "Earth Moving."

1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

3.3 CLEARING AND GRUBBING

A. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer as recommended in Section 3.12

3.4 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

3.5 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them on Owner's property.

1. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION

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SECTION 31 11 00 - CLEARING AND GRUBBING

PART 1 – GENERAL

1.1 SUMMARY

A. The general provisions of the Contract, including General and Supplementary in this Section.
B. Related Sections include the following:

1. Division 2 Section "Earthwork" and "Notification to Owners of Utilities"

1.2 PERFORMANCE REQUIREMENTS

A. This work shall consist of clearing, grubbing, removal, and satisfactory disposal of all materials within the project limits, except those items designated to remain, or to be removed in accordance with other sections of these Specifications.

1.3 CONSTRUCTION METHODS

A. The project area shall be cleared of all dead trees, stumps, brush, hedges, weeds, logs and other objectionable material and vegetation within 6” of the ground surface.

B. In areas where excavation is to be made and 5 feet beyond the excavation limits, all trees, stumps, roots, brush, hedge, heavy growth of vegetation, etc., shall be cleared and grubbed.

C. In areas where embankments are to be constructed, all trees, stumps, roots, brush, hedge, heavy growth of vegetation etc., shall be cleared and grubbed to a point 5 feet beyond slope intercepts. All depressions made below the ground surface shall be refilled with suitable material and compacted before the embankment is started. Unsatisfactory material such as brush, hedge, roots, stump, branches and logs of trees, heavy vegetation, etc. shall not be embedded or buried within the embankment.

D. This work shall include the preservation from injury of all trees and other vegetation that are not within designated areas of clearing and grubbing, unless marked for removal by the Engineer.

E. All slopes of cuts, embankments, ditches, channels, waterways and all structures, both old and new, shall be cleared and cleaned of all brush, hedges, weeds, heavy vegetation, obstruction, rubbish and other objectionable material or growth; and shall be maintained in a neat, serviceable and satisfactory condition until the project is accepted.

F. Borrow pits and other material pits shall be cleared and grubbed of all trees, stumps, roots, brush, hedge, and other heavy growths of vegetation, and in addition shall be stripped of overburden laying above the material to be obtained. This work is to be completed before any excavation is made in the pit area.

G. All clearing and grubbing shall be completed a satisfactory distance ahead of the construction operations before construction stakes are set.

H. All materials and debris from the clearing and grubbing operation shall be burned, completely destroyed, or otherwise disposed of from the project limits by the Contractor in a satisfactory manner. The Contractor must obtain written permission from any property owner if private property is used for disposal and furnish a copy to the Engineer. All Federal, State, County, and City laws, regulation, and ordinances related to burning or disposal shall be observed.

END OF SECTION 31 11 00

SECTION 31 23 19 DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. The general provisions of the Contract apply to the work specified in this Section.

B. Related Sections include the following:

1. Division 2 Section "Earthwork" and "Erosion Control"

1.2 PERFORMANCE REQUIREMENTS

A. Work Included: Furnish, operate and maintain dewatering equipment for the control, collection and disposal of ground and surface water entering trenches and excavations.

1.3 SUBMITTALS

A. Prior to excavation in areas where dewatering may be required, submit the dewatering methods which are to be utilized to the Engineer for review.

PART 2 - PRODUCTS

2.1 GENERAL:

A. Provide, operate, and maintain a dewatering system to remove all water from excavations and trenches using pumps, drains, wellpoints, piping and any other facilities necessary to keep the excavations and trenches free of water. Have spare units available for immediate use in the event of equipment breakdowns.

PART 3 - EXECUTION

3.1 EXHAMINATION:

A. General:

1. Keep excavations and trenches dry until the structures, pipes, and appurtenances to be built therein have been completed to such an extent that they will not be damaged.

2. Perform dewatering work when necessary at no additional cost to the Owner.

B. Disposal of Water:

1. Dispose of water pumped or drained from the construction site in a suitable manner to avoid public nuisance, injury to public health, damage to public and private property, and damage to the work completed or in progress.

2. Provide suitable temporary channels for water that may flow along or across the construction site.

3. Do not allow ground or surface water to enter piped utilities.

C. Damage:

1. All damage resulting from the dewatering operations or the failure of the Contractor to maintain the work in a suitable dry condition shall be repaired by the Contractor, at no additional cost to the Owner.

2. Take all necessary precautions to protect new work from flooding during storms or from other causes.

3. Thoroughly brace or otherwise protect all pipelines and structures which are not stable, against floatation, when necessary.

D. Cofferdams:

1. Design, construct, maintain and remove cofferdams where necessary for the dewatering, control and diversion of water to keep excavations and trenches free of water.

2. Design and construct cofferdams to withstand all imposed loads to prevent injury to persons and property. Construct cofferdams to depths to permit a reasonable change in depths of the work, of sufficient height to prevent flooding, and of such dimensions to give sufficient clearance for construction and inspection.

3. Remove cofferdams, including all sheeting and bracing, after the completion of permanent construction.

E. Temporary Underdrains:

1. When necessary, lay temporary underdrains in the excavation.

2. Excavate trenches to suitable dimensions to provide space for the underdrains and surrounding gravel.

3. Install underdrains a distance of at least 3 inches below the bottom of the pipe or structure and the top of the bells of the underdrain pipes.

4. Underdrain pipe shall be vitrified clay, concrete, ABS or PVC pipe of standard thickness with open joints wrapped in geotextile fabric to prevent the admission of sand and other soil. Sewer pipe of the quality known as "seconds" will be acceptable.

5. Entirely surround the underdrain and fill the space between the underdrain and the pipe or structure with screened gravel or crushed stone.

6. Compact the gravel or crushed stone, if necessary, and leave the surface suitable for laying the pipe or building the structure.

F. Wellpoint System:

1. If required, dewater the excavations and trenches by an efficient drainage wellpoint system to drain the soil and prevent saturated soil from flowing into the excavated area.

2. Use wellpoints designed for dewatering work.

3. Use pumping units designed to be used with wellpoints, capable of maintaining high vacuums, and capable of handling large volumes of air and water at the same time.

3.2 PREPARATION

A. Dewater foundations, cutoff trenches, and other parts of the construction site and keep free of standing water or excessively muddy conditions as needed for proper execution of the construction work.

B. Furnish, install, operate, and maintain all drains, sumps, pumps, and other equipment needed to perform the dewatering as specified.

C. Dewatering methods that cause a loss of fines from foundation areas will not be permitted.

D. Pipe water pumped from excavations to points discharging into water courses which will not damage adjacent properties.

3.3 REMOVAL OF TEMPORARY WORKS

A. After the temporary works have served their purposes, remove them or level and grade them to the extent required to present a sightly appearance and to prevent any obstruction of the flow of water or any other interference with the operation of or access to the permanent works.

B. Except as otherwise specified, remove pipes and casings from wellpoints and fill to ground level with gravel or other material.

END OF SECTION 31 23 19

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SECTION 31 24 00 EMBANKMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. The general provisions of the Contract, apply to the work specified in this Section.
B. Related Sections include the following:

1. Division 31 Section "Clearing and Grubbing", "Earthwork", and "Site Restoration"

1.2 PERFORMANCE REQUIREMENTS

A. Work Included: Construction of earth embankments and other earth fills required by the Drawings and Specifications.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. Perform embankment work in compliance with applicable requirements of governing authorities having jurisdiction.

B. Soil Testing and Inspection Service:

1. Owner will engage a soil testing and inspection service, to include testing soil materials proposed for use in the work. Testing and inspection service is subject to review by the Engineer.
2. The Contractor shall provide assistance to the soil testing and inspection service to include search for satisfactory soil materials and sampling soil materials proposed for use in the work.
3. Tests for Proposed Soil Materials:

a. One optimum moisture-maximum density test for each type encountered in subgrade and fills. Maximum densities determined in accordance with ASTM Specifications.
b. Determine the suitability of materials to be used as fill.
c. For borrow materials, perform a sieve analysis (ASTM D 422), plasticity index (ASTM D 424), moisture-density curve (ASTM D 1557), and frost susceptibility analysis.
d. Other tests as may be applicable for the analysis of the material being tested.

4. Test Reports:

a. The testing organization will submit 2 copies of the following reports to the Engineer; with a copy to the Contractor.

1) Report and certification of granular fill and drainage fill, to be supplied from off- site.
2) Test reports on borrow material.
3) Field density test reports.

1.4 SUBMITTALS

A. Tests and material certificates, as required.

1.5 JOB CONDITIONS

A. Site Information:

1. Data on indicated subsurface conditions are not intended as representations or warranties of the continuity of such conditions. It is expressly understood that the Owner will not be responsible for interpretations or conclusions drawn there from by the Contractor. Data is made available for convenience of Contractor.
2. Additional test borings and other exploratory operations may be made by the Contractor at no added cost to the Owner.

B. Temporary Protection: Protect structures, utilities, and other facilities from damages caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

PART 2 – PRODUCTS

2.1 FILL AND BORROW MATERIAL

A. Fill Materials:

1. Free of clay, rock larger than 6 inches in its greatest dimension, debris, frozen materials, vegetable, and other deleterious matter.
2. Comply with AASHTO M145, soil classification groups A-1, A-2-4, A-2-5, or A-3.
3. Obtain from required excavations and designated borrow areas.
4. For Construction of the Earth Berms: Sandy loam or silty loam conforming with AASHTO M145, Soil Classification A-4.

B. Borrow:

1. Approved materials required for the construction of embankments or for other portions of the work as designated.
2. Obtain from beyond the contract limits.

C. Engineer's Approval:

1. The Engineer reserves the right to inspect proposed sources of off-site fill material, and to order tests of such material which he deems necessary to ascertain its quality and gradation.
2. No fill material shall be used on this project until approval is obtained from the Engineer and only material from approved sources shall be used.
3. The selection, blending, routing and disposition of materials in the various fills are subject to approval by the Engineer.

D. Material On Site:

1. Material Placed for Site Preloading: Reuse for filling purposes in other locations on the site, if suitable.
2. Native Soils: If suitable for filling purposes, use and dispose of surplus in a lawful and acceptable manner.

E. Alternate Material: Contractor may, at his own expense, substitute other types of material specified in this section in place of on-site material, providing such substitution is approved in advance by the Engineer, and provided that all replaced material is disposed of in a lawful and acceptable manner.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which embankment work is to be performed and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.2 PREPARATION

A. Foundation Preparation:

1. Strip foundations for earth fill to remove vegetation and other unsuitable materials or excavate as specified.
2. Except as otherwise specified, grade earth foundation surfaces to remove surface irregularities and scarify parallel to the axis of the embankment or otherwise acceptably score and loosen to a minimum depth of 2 inches.
3. Earth Abutment Surfaces: Free of loose, uncompacted earth in excess of two inches in depth normal to the slope and at such a moisture content that the earth fill can be compacted against them to effect a good bond between the fill and the abutments.
4. Foundation and Abutment Surfaces: Cleared of all loose materials and free of standing water when fill is placed upon them.
5. Foundation and Abutment Surfaces (i.e., the point where the end of the embankment meets original ground): Not steeper than 1 horizontal to 1 vertical unless otherwise specified.
6. Test Pits or Other Cavities: Compacted earth fill conforming to the specifications for the earth fill to be placed upon the foundation.

B. Borrow:

1. Access to Sources: In wooded areas, keep all pit haul roads to a minimum width and place at approximately right angles to the road or angled away from the view of oncoming traffic.
2. Quantities: Notify the Engineer sufficiently in advance of opening any borrow areas so that cross-section elevations and measurements of the ground surface after stripping may be taken and the borrow material can be tested before being used. When directed by the Engineer, grade and shape existing pits prior to being cross-sectioned for original measurements.

3.3 INSTALLATION

A. Placement of Fill:

1. Do not place until the required excavation and foundation preparation have been completed and the foundation has been inspected and approved by the Engineer.
2. Do not place upon a frozen surface, or incorporate snow, ice, or frozen material in fill.
3. Place in approximately horizontal layers, not exceeding 8 inches thick.
4. Materials Placed by Dumping in Piles or Windrows: Spread uniformly to not more than the specified thickness before being compacted.
5. Hand Compacted Fill, Including Fill Compacted by Manually Directed Power Tampers: Place in layers not more than 6 inches thick before compaction.
6. Adjacent to Structures:

   a. Place in a manner preventing damage to structures and allowing structures to assume the loads from the fill gradually and uniformly.
   b. Height increased at approximately the same rate on all sides of structures.

B. Placement of Borrow:

1. Schedule excavation so as to incorporate all suitable materials in the work.
2. Premature use of the item of borrow resulting in wasting of suitable excavation will occasion the deduction from borrow of the quantity of suitable material wasted as determined by the Engineer.

C. Compaction:

1. Adjacent to Structures:

   a. Accomplish by means of hand tamping or manually directed power tampers or plate vibrators.
   b. Heavy equipment shall not be operated within 2 feet of any structure.
   c. Vibrating rollers shall not be operated within 5 feet of any structure.
   d. Drop weights operating from a crane or hoist will not be permitted.
   e. At least 98 percent of standard proctor density as determined by ASTM D 1557, unless otherwise specified herein.
   f. Do not compact until the concrete has attained the strength specified in Section 03300 for this purpose.
   g. When the required strength of the concrete is not specified: Do not compact fill until the following time intervals have elapsed after placement of the concrete.

Structure	Time Interval (Days)
Retaining walls and counterforts	14
Walls backfilled on both sides simultaneously	7
Conduits and spillway risers, cast-in-place (with inside forms in place)	7
Spillway risers (inside forms removed)	14
Conduits, precast, cradled	2
Conduits, precast, bedded	1
Antiseep collars and cantilever outlet bents	3

2. The passage of heavy equipment will not be allowed:

   a. Over cast-in-place conduits prior to 14 days after placement of the concrete.
   b. Over cradled precast conduits prior to 7 days after placement of the concrete cradle.
   c. Over any type of conduit until the backfill has been placed over the top surface of the structure to a height equal to one-half the clear span width of the structure or pipe or 2 feet, whichever is greater.

E. Control of Moisture Content:

1. During placement and compaction of fill, the moisture content of the materials being placed shall not exceed 2 percent above optimum.
2. Apply water to the fill materials at the borrow areas insofar as practicable. Water may be applied by sprinkling the materials after placement on the fill, if necessary. Obtain uniform moisture distribution by discing, blading or other approved methods prior to compaction of the layer.
3. Remove material that is too wet when deposited on the fill or dry to the specified moisture content prior to compaction. If the top surface of the preceding layer of compacted fill, foundation or abutment contains more than the specified moisture, dry prior to placement of the next layer of fill.
4. If the top surface of a preceding layer of compacted fill or a foundation or abutment surface in the zone of contact with the fill becomes too dry to permit suitable bond scarify and moisten by sprinkling to acceptable moisture content prior to placement of the next layer of fill.

F. Removal and Placement of Defective Fill: Rework fill placed at densities lower than the specified minimum density or at moisture contents outside the specified acceptable range of moisture content or otherwise not conforming to the requirements of the specifications to meet the requirements or remove and replace with acceptable fill.

G. Installation of Roadway Embankments:

1. Placement:

a. Place each layer of fill over the full width of the section.
b. When existing traffic or other conditions restrict operations over the full width, the Engineer may authorize the Contractor to place less than full width layers.
c. When Contractor places material to complete the full width, the exposed edge of the previously placed material shall be cleaned of all contamination before additional fill is placed adjacent thereto.
d. Material as spread shall be well mixed with no pockets of either fine or coarse material.
e. Segregation of large or fine particles will not be allowed.

2. Shaping and Compacting:

   a. Continue compaction of each layer of sand subbase and roadway gravel until a density of not less than 95 percent of maximum density is achieved for full width and depth of layer.
   b. Maintain surface of each layer during compaction operations in such manner that a uniform texture is produced and the aggregate firmly keyed.
   c. Moisture content of material shall be maintained at the proper percent to attain required compaction.

3. Surface Tolerance:

   a. Shape and maintain to a tolerance, above or below the required cross-section shape, of 1/2 inch for roadway gravel and 3/8 inch for sand subbase material.

H. Settlement Observation Platforms (where applicable):

1. Instrument embankments by means of settlement platforms set on the native soil prior to commencing adjacent filling.
2. Furnish and install platforms as directed by the Engineer. Notify the Engineer at least 1 week in advance of commencing filling operations.
3. Number and Location of Settlement Plates: Determined by the Engineer in the field.
4. Exercise extreme caution at all times to prevent damage to riser pipes. Replace and pay the cost of recalibration for any installation which has, in the opinion of the Engineer, been rendered useless by the Contractor's forces.
5. Riser pipes fastened to the platforms shall extend at least 16 inches above the embankment surface. Final riser pipe section should extend 2 feet 6 inches to 4 feet above the completed embankment surface.

3.4 FIELD QUALITY CONTROL

A. Testing:

1. During the course of the work, the Engineer will perform such tests as are required to identify materials, to determine compaction characteristics, to determine moisture content and to determine in-place density of fill. These tests performed by the Engineer will be used to verify that the fills conform to the requirements of the specifications. Such tests are not intended to provide the Contractor with the information required by him for the proper execution of the work and their performance shall not relieve the Contractor of the necessity to perform his own tests for that purpose.

2. Maximum density tests by ASTM D 1557. Density requirements will not apply to the portions of embankments constructed of material which cannot be tested in accordance with ASTM D 1557 or when the material contains more than 30 percent material retained on a 2 inch square mesh sieve. Field density tests will be made by the balloon test method in accordance with ASTM D 2167 or at the option of the Engineer by use of nuclear devices in accordance with ASTM D 2922 or by the sand cone method in accordance with ASTM D 1556.

B. Shaping and Surface Tolerances:

1. Surfaces of the Embankments, Slopes, and Subgrades: Brought to the elevation and shape as designated on the Drawings.
2. Areas to be Seeded: Not less than 4 inches of topsoil to bring the surface to finished grade.
3. The Final Surface of Areas to be Seeded: Maintain to a tolerance of 4 inches above or below the specified surface. No sharp depressions or rises allowed.
4. The Final Surfaces of Areas to Receive Granular Blanket or Roadway Gravel: Maintain to a tolerance of 1 1/2 inches above or below the specified surface. No sharp depressions or rises allowed.

3.5 CLOSE-OUT

A. Prior to the completion of the project all borrow pits in view of any public way and any portion of any haul road visible from any public way shall be graded to blend with adjacent ground, loamed if necessary, seeded and hay mulched. When the Engineer determines that loam, seed and hay mulch is necessary in the case of privately owned pits, incorporate these requirements into an agreement between the pit owner and the Contractor. Furnish a copy of the agreement to Engineer if requested.

END OF SECTION 31 24 00

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SECTION 31 23 00 - EXCAVATING, BACKFILLING, AND COMPACTING FOR STRUCTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section includes the excavation, backfilling and compacting required for the structures shown in the Contract Drawings.

1.2 RELATED SECTIONS

A. Section 013301 - Structural Submittals.

B. Section 014326 - Structural Testing/Inspection Agency Services.

C. Geotechnical Report prepared by GEOService, LLC.

1.3 REFERENCES

A. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils.

B. ASTM D698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3).

C. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

D. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

E. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.4 DEFINITIONS

A. Granular sub-base: Granular fill directly beneath slabs-on-grade.

B. Granular Backfill: Fill immediately behind foundation elements or retaining walls.

C. Structural fill: Fill under the structure other than the granular sub-base.

1.5 SUBMITTALS

A. Upon request, submit soil test reports performed by the Structural Testing/Inspection Agency.

1.6 QUALITY ASSURANCE

A. Structural Testing/Inspection Agency shall perform the following quality related items:

1. Verify structural fill complies with specifications.
2. Determine particle size, liquid limit, plastic limit, plasticity index and maximum density of each type of soil.
3. Observe proofrolling.
4. Perform a sufficient number of field density tests to verify compaction of structural fill. As a minimum, perform one test per lift for every 2500 square feet of fill placed.
5. Verify foundation bearing capacity.
6. Verify quantities of material removed and quantities of material placed where Unit Prices are involved.

1.7 SURVEY

A. Prior to construction, have structure location staked and certified by a licensed surveyor. If discrepancies between actual lines and elevations exist, notify Architect/Structural Engineer before proceeding with layout of structure.

1.8 SUBSURFACE CONDITIONS

A. Copies of a subsurface investigation of the site will be made available upon request. The data is not intended as a representation or warranty of the continuity of such conditions. Owner will not be responsible for interpretation or conclusions drawn therefrom by the Contractor. The data is made available for the convenience of the Contractor and is not guaranteed to represent all conditions that may be encountered.

B. Contractor may examine the site and make his own subsurface explorations at no additional cost to the Owner. Notify Owner prior to making any subsurface explorations.

1.9 EXISTING UTILITIES

A. Locate existing underground utilities by careful hand excavation. If utilities are to remain in place, provide protection from damage during construction operations.

B. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Do not interrupt existing utility service facilities occupied and used by Owner or others, unless written permission is given by the Architect and then only after temporary utility services have been provided.

C. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Architect immediately for directions.

D. Repair damaged utilities to satisfaction of utility owner.

1.10 NOTICE

A. Notify the Architect/Structural Engineer 48 hours prior to the beginning of any excavation work.

PART 2 - PRODUCTS

2.1 GRANULAR SUBBASE

A. Granular sub-base shall be sound and free-draining, such as sand, gravel or crushed stone with less than 10% passing the 200 sieve. Maximum diameter shall be 1-1/2 inches.

2.2 GRANULAR BACKFILL

A. Backfill shall meet the requirements of the granular sub-base.

2.3 STRUCTURAL FILL

A. Structural fill shall be clean soil free of organics, trash, and other deleterious material, containing no rock fragments greater than 6 inches in any one dimension. Structural fill material shall have a standard Proctor maximum dry density of 90 pcf or greater and a plasticity index (PI) of 35 percent or less.

PART 3 - EXECUTION

3.1 STRIPPING

A. Strip vegetation, topsoil, roots, and other unsuitable material to a depth determined by the Structural Testing/Inspection Agency but not less than one foot, nor less than 10 feet outside the perimeter of the structure.

B. Stockpile sufficient amounts of topsoil as required to cover areas to be landscaped with a minimum of six inches of material.

3.2 EXCAVATION

A. Excavation shall be considered unclassified.

B. Perform excavation to the depths and limits on the Drawings and as specified herein.

C. Do not excavate to full depth when there is probability of frost forming or ground freezing in excavation before concrete is placed.

D. Ground water may be encountered during the foundation excavation. Provide a system for controlling the ground water to a level at least three feet below the lowest point of the excavation.

E. Keep excavations dry by sloping ground away from holes and trenches.

3.3 PROOFROLLING

A. After stripping or excavation and before any fill placement, fill areas shall be proofrolled with a minimum of two coverages of a loaded dump truck or scraper in each of two perpendicular directions.

B. Areas found to be soft or pumping shall have the soft soil removed and replaced with structural fill and compacted as outlined herein.

3.4 PLACEMENT OF STRUCTURAL FILL

A. Do not place structural fill on subgrade that contains frost, mud or is frozen.

B. Structural fill shall be placed and compacted in 8 -inch thick loose layers.

C. Compact structural fill to 98 percent of the maximum dry density as measured by Standard Proctor, ASTM D698. The water content during fill compaction should be kept within +3/-2 percent of the optimum moisture content.

3.5 PLACEMENT OF GRANULAR SUB-BASE

A. Do not place granular sub-base on subgrade that contains frost, mud or is frozen.

B. Compact granular sub-base to 95 percent of the maximum dry density as measured by Standard Proctor, ASTM D698. The water content during subbase compaction should be kept within +3/-2 percent of the optimum moisture content.

3.6 PLACEMENT OF BACKFILL

A. Backfill behind wall shall be placed in layers of six inches.

B. Compact backfill behind walls to 95 percent of the maximum dry density as measured by Standard Proctor, ASTM D698. The water content during backfill compaction should be kept within +3/-2 percent of the optimum moisture content.

3.7 CLEAN UP

A. Remove excess excavated materials from job site and upon completion leave site in clean condition.

END OF SECTION 31 23 00

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SECTION 31 25 00 SEDIMENT CONTROL

PART 1 – GENERAL

1.1 SUMMARY

A. The general provisions of the Contract apply to the work specified in this Section.

B. Related Sections include the following:

1. Division 2 Section "Earthwork" and "Dewatering"

1.2 PERFORMANCE REQUIREMENT

A. Work Included: Provide and install all materials, equipment, and labor necessary to ensure sediments do not enter on-site storm sewer system, as shown on drawings and as per TDEC Erosion Control Handbook.

B Temporary Control

1. All temporary control shall conform to TDEC Erosion Control Handbook.

1.3 SUBMITTALS

The Contractor shall furnish to the Engineer, in writing, his plan for controlling sediment before beginning the construction work. Said plan shall also include the methods to be utilized for protecting the infiltration of sediments into the on-site storm sewer system. Acceptance of this plan will not relieve the Contractor of responsibility for completing the work as specified.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Siltation Fence: Envirofence as manufactured by Mirafi Inc. or approved equal.

PART 3 – EXECUTION

3.1 PERFORMANCE

A. Siltation Fence

1. Install per manufacturer's requirements at catch basin and in locations near thework shown on the Drawings and as directed by the Engineer.

3.2 MAINTENANCE

A. All maintenance shall conform to TDEC Erosion Control Handbook.

3.3 HAY BALES FOR EROSION CONTROL

A. Place as ordered to provide for temporary control of sediment.

B. Stake with the required stakes.

C. Upon acceptance of the Contract, the bales shall be left in place unless released to the Contractor.

3.4 REMOVAL OF TEMPORARY WORKS

A. Remove or level and grade to the extent required to present a sightly appearance and to prevent any obstruction of the flow of water or any other interference with the operation of oraccess to the permanent works.

END OF SECTION 31 25 00

SECTION 31 30 00 EARTHWORK

PART 1 – GENERAL

1.1 SUMMARY

A. The general provisions of the Contract, apply to the work specified in this Section.
B. Related Sections include the following:

1. Division 2 Section "Excavation", "Embankment Construction" Backfilling" and "Compaction".

1.2 QUALITY ASSURANCE

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

B. Testing and Inspection Service: The Owner shall employ a geotechnical consultant and testing laboratory to perform soil testing and inspection service for quality control testing during earthwork operations. The geotechnical consultant decision shall be final.

C. Test Reports: Submit 2 copies of the following reports directly to the Engineer from the testing services, with copy to the Contractor:

- Gradation reports on borrow material.
- One moisture density curve for each type of borrow and native soil encountered.
- Field density test reports.
- Report of actual unconfined compressive strength and/or results of bearing tests of each strata tested.

1.3 JOB CONDITIONS:

A. Site Information: Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn there from by Contractor. Data are made available for the convenience of Contractor.

Additional test borings and other exploratory operations may be made by Contractor at no cost to the Owner.

B. Existing Utilities: locate existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.

Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult the Utility Owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

Do not interrupt existing utilities serving facilities occupied and used by Owner or others, except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided.

Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

C. Use of Explosives: Do not bring explosives onto site or use in work without prior written permission from authorities having jurisdiction. Contractor is solely responsible for handling, storage, and use of explosive materials when their use is permitted.

All blasting shall be performed in accordance with all pertinent provisions of the "Manual of Accident Prevention in Construction" issued by the Associated General Contractors of America, Inc.

D. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights. Operate warning lights as recommended by authorities having jurisdiction.

Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

1.4 DEFINITIONS:

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
2. Bulk Excavation: Excavation more than 10 feet (3m) in width and more than 30 feet (9m) in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. (0.76 cu. m) for bulk excavation or ¾ cu. yd. (0.57 cu. m) for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Excavation of Footings, Trenches, and Pits: Late-model track-mounted hydraulic excavator, equipped with a 42-inch- (1065-mm-) wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp (103-kW) flywheel power with bucket-curling force of not less than 28,700 lbf (128 kN) and stick-crowd force of not less than 18,400 lbf (82 kN) with extra- long reach boom; measured according to SAE J-1179.

2. Bulk Excavation: Late-model track-mounted loader; rated at not less than 230-hp (172-kW) flywheel power and developing a minimum of 47,992-lbf (213.3-kN) breakout force with a general-purpose bare bucket; measured according to SAE J-732.

I. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material ¾ cu. yd. (0.57 cu. m) or more in volume that exceed a standard penetration resistance of 100 blows/2 inches (97 blows/50 mm) when tested by a geotechnical testing agency, according to ASTM D 1586.

J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

K. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

L. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

M. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

PART 2 – PRODUCTS

2.1 SOIL MATERIALS

A. Base and Subbase:

1. Aggregate Subbase Material: Aggregate subbase shall be gravel consisting of hard, durable particles which are free from vegetable matter, lumps or balls of clay, and other deleterious substances. The gradation of the portion which will pass a 3-inch sieve shall meet the grading requirements of the following table:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
1/4"	25 - 60
No. 10	10 - 45
No. 40	5 - 25
No. 200	0 - 7

Gravel subbase shall not contain particles of rock which will not pass the 6-inch square mesh sieve.

2. Aggregate Base Materials: Shall be sand or gravel consisting of hard durable particles which are free from vegetable matter, lumps or balls of clay, and other deleterious substances. The gradation of the base materials shall meet the grading requirements of the following tables:

*Aggregate base-screened (Under concrete footings and slabs)

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
3"	100
1/4"	50 - 100
No. 10	30 - 80
No. 40	*12 - 50
No. 200	0 – 5

2. Aggregate Base - Crushed (under paved areas):

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
3"	100
1/2"	45 - 70
1/4"	30 - 55
No. 40	5 - 20
No. 200	0 - 5

B. Pipe Bedding Material:

1. Granular Pipe Bedding Material: Shall be clean sand free of organic matter, silt, or clay lamps, and deleterious materials. The material shall meet the following graduation requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
1/2"	100
No. 4	95 - 100
No. 40	20 - 45
No. 200	0 – 5

3. Stone Pipe Bedding Material: Shall be screened or crushed stone free of organic matter, silt, or clay lumps, and deleterious material. The material shall meet the following graduation requirements.

   100% passing a 1" square mesh sieve and not more than 5% passing a 1/4" square mesh sieve.

C. Miscellaneous Materials:

1. Common Borrow: Shall be earth, suitable for embankment construction. It shall be free of frozen material, perishable rubbish, peat, organic matter, large rock fragments, or other unsuitable material. AASHTO M145 Classifications A-1 through A-5 may be used. Use of other materials as common borrow is at the discretion of the Engineer and only in approved areas.

2. Granular Borrow: Shall conform to AASHTO M145 Classifications A-1 and A-3. Material meeting Classification A-2 may be used, if approved by the Engineer for applications when frost susceptibility is not a factor.

3. Rock Borrow: Shall consist of hard durable rock broken to various sizes that will form a compact embankment with a minimum of voids. The maximum size for any rock shall be 3 feet in its greatest dimension.

4. Impervious Borrow: Shall be an inorganic clay or a mixture of clay with silt and sand. It shall form a stable and impervious mass when placed and compacted as specified.

5. Loam: Shall be good quality friable topsoil free of stones over 2 inches, objectionable weed roots or seeds, clay lumps, sticks, trash, or other extraneous material. The soil shall have an organic content greater than 1.5% by weight and shall not contain soluble salt greater than 500 parts per million.

2.2 ON-SITE MATERIAL

A. Material on the site is the property of the Owner and shall be incorporated in the work if possible. The Engineer shall classify the material under Article 2.01 headings. Any sample testing needed for this classification will be performed by an approved laboratory at the Owner's expense.

B. Material not incorporated in the work either because it is unsuitable or the quantity exceeds the project's needs will be hauled away and disposed of at the Contractor's expense, after written approval of the Engineer.

1. Material designated to be wasted by the Engineer will be disposed of by the Contractor.

2. Material designated to be saved by the Engineer will be stockpiled at a location designated by the Engineer.

3. Unsuitable material shall consist of grubbings or other materials which contain rock of size exceeding specifications, organic materials, or other materials of a deleterious nature as deemed by the Engineer.

PART 3 – EXECUTION

3.1 INSPECTION:

A. Examine the areas and conditions under which excavating, filling, and grading are to be performed and notify the Engineer, in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.2 EXCAVATION:

A. Excavation consists of removal and disposal of material encountered when establishing required grade elevations. All excavation shall be unclassified and shall include any and all material encountered. No extra compensation shall be allowed for excavation work covered by the bid proposal.

1. Excavation for Structures: Conform to elevations and dimensions shown within a vertical tolerance of one-half (1/2) in. and extending a sufficient horizontal distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.

   Excavation for footings and foundations shall extend to the depth necessary to remove all fill material above the native soils. When the footing and foundation grades extend into native soils, the native soil shall be excavated to the foundation grades specified on the plans.

   In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive concrete.

   Rock shattered due to drilling or blasting operations shall be removed. Excess rock excavation shall be filled with Class A or Class B concrete.

B. Excavation for Pavements: Conform to subgrade elevations and dimensions shown, within a vertical tolerance of one (1) in.

B. Excavation for Trenches: Conform to elevations and dimensions within a vertical tolerance of one (1) in. Excavate to the uniform width shown or required for the particular item to be installed. Provide adequate working space for compactive equipment.

   Excavate trenches to the depth indicated or required. Carry the depth of trenches for piping to establish the indicated flow lines and invert elevations and provide suitable bedding. Pipe bedding is specified in other Division 2 sections.

   Where rock is encountered, carry the excavation six (6) in. below the required elevation and backfill with a 6" layer of crushed stone or gravel prior to installing pipe.

Grade bottoms of trenches as indicated, notching under pipe joints to provide solid bearing for the entire body of the pipe.

Concrete is specified in Section 03300.

Do not backfill trenches until authorized by the Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.

C. Site Excavation: Conform to elevations and dimensions shown within a vertical tolerance of one (1) in. Excavate to a depth to provide for any subsequent loam, sod, or other specified surface material.

3.3 STABILITY OF EXCAVATIONS

A. Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.

Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

3.4 SHORING AND BRACING

A. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross- braces, in good serviceable condition.

Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction.

Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

Provide permanent steel sheet piling or pressure creosoted timber sheet piling wherever subsequent removal of sheet piling might permit lateral movement of soil under adjacent structures. Cut off tops as required and leave permanently in place.

3.5 MATERIAL STORAGE

Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage. Locate and retain soil materials away from edge of excavations. Dispose of excess soil material and waste materials as herein specified.

3.6 COLD WEATHER PROTECTION

Protect excavation bottoms against freezing when atmospheric temperature is less than 35°F.

3.7 CLOSING ABANDONED UNDERGROUND UTILITIES

Close open ends of abandoned underground utilities, indicated to remain, permanently with closures sufficiently strong to withstand pressures which may result after closing.

Close open ends of metallic conduit and pipe with threaded galvanized metal caps or plastic plugs, or other suitable method for the type of material and size of pipe. Do not use wood plugs.

Close open ends of concrete and masonry utilities with not less than 8" thick brick masonry bulkheads, constructed to completely fill the opening.

Wet brick before laying. Lay brick in mortar so as to form a full bed with ends and side joints in one operation. Joints shall not be more than three-eighths (3/8) in. wide. Protect fresh masonry from freezing or from rapid drying, as necessary, and maintain protection until mortar has set.

3.8 COMPACTION

A. General: Control soil compaction during construction providing minimum percentage of density specified for each area classification.

B. Percentage of Maximum Density Requirements: *Compact soil to not less than the following percentages of maximum dry density (determined in accordance with ASTM D1557).

1. Footings and Foundations: *Compact disturbed subgrade and each layer of base material to 98% of maximum dry density.

2. Lawn or Unpaved Areas: *Compact each layer backfill or fill material to 85% of maximum dry density.

3. Walkways: *Compact disturbed subgrade and each layer of fill material to 95% of maximum dry density.

4. Pavements: *Compact subgrade and each layer of fill subbase material, and base material to 95% of maximum dry density.

5. Pipe Trenches: *Compact bedding material and each layer of backfill to six (6) in. over the pipe to 90% of maximum dry density.

B. Moisture Control: Where subgrade or a layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, in proper quantities to prevent free water appearing on surface during or subsequent to compaction operations.

Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory level.

3.9 BACKFILL AND FILL

A. General: Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.

1. In excavations, use satisfactory excavated or borrow material.

2. Under grassed areas, use satisfactory excavated or borrow material.

3. Under walks and pavements, use subbase material, aggregate base, or satisfactory excavated or borrow material, or combination of all.

4. Under steps, use aggregate subbase material.

5. Under building slabs, use aggregate base material.

6. In pipe trenches, use material specified in typical trench section.

B. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance by Engineer of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.

2. Inspection, testing, approval, and recording locations of underground utilities.

3. Removal of concrete formwork.

4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Temporary sheet piling driven below bottom of structures shall be removed in manner to prevent settlement of the structure or utilities, or cut off and left in place if required.

5. Removal of trash and debris.

6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

C. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, scarify or break-up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

When existing ground surface has a density less than that specified under "Compaction" for the particular area classification, break up the ground surface, pulverize, moisture-condition to the optimum moisture content, and compact to required depth and percentage of maximum density.

D. Placement and Compaction: Place backfill and fill materials in layers not more than 8" in loose depth for material compacted by heavy compaction equipment, and not more than 4" in loose depth for material compacted by hand-operated tampers.

Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content. Compact each layer to required percentage of maximum dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

Place backfill and fill materials evenly adjacent to structures, to required elevations. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around structure to approximately same elevation in each lift.

3.10 GRADING

A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

B. Grading Outside Building lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes, and as follows:

1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than one (1) inch above or below the required subgrade elevations.

2. Walks: Shape surface of areas under walks to line and grade, with finish surface not more than one-half (1/2) inch above or below the required subgrade elevation.

C. Grading Surface of Fill Under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of one-half (l/2) inch when tested with a 10' straightedge.

D. Compaction: After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

3.11 PAVEMENT BASE AND SUBBASE COURSES

A. General: This work consists of placing aggregate base and subbase material, in layers of specified thickness, over subgrade surface to support the pavement.

See Section 02546 [02512] for paving specifications.

B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.
C. Placing: Place subbase and base course material on prepared surfaces in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.

When a compacted subbase course is shown to be 6" thick or less, place material in a single layer. When shown to be more than 6" thick, place material in equal layers, except no single layer more than 6" or less than 3" in thickness when compacted.

3.12 FOOTING, FOUNDATION, AND BUILDING SLAB BASE COURSE

A. General: Base course consists of placement of aggregate base material, in layers of indicated thickness, over subgrade surface to support concrete building slabs.

C. Placing: Place base material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.

When a compacted base course is shown to be 6" thick or less place material in a single layer. When shown to be more than 6" thick, place material in equal layers, except no single layer more than 6" or less than 3" in thickness when compacted.

3.13 TOPSOILING

A. General: This work consists of placing loam of the specified thickness on prepared subgrade in all areas disturbed by construction and not otherwise surfaced or covered by structures.

B. Material: Use either suitable loam stripped from the site or provide loam from off site sources. loam shall conform to the requirements of Part 2.

C. Placing and Grading: Prior to placement of loam scarify or rototill the surface of the subgrade. Place loam at the locations and specified thickness. Grade and rake the loam to remove all foreign material and rocks over two (2) in. leave the surface uncompacted to receive the seeding operation.

D. Maintenance: Maintain the topsoiled areas until grass is established and accepted by the Engineer.

3.14 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to examine and test subgrades and fill layers. Before further construction work is performed, test results meeting the requirements of 3.08B herein, shall be obtained.

Perform field density tests in accordance with ASTM D1556 (sand cone method), ASTM D2167 (rubber balloon method), or ASTM D2922 (nuclear method) as applicable.

1. Foundation and Footing Subgrade: For each strata of soil on which footings will be placed, conduct at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when acceptable to Engineer.

2. Paved Areas and Building Slab Subgrade: Make at least one field density test of subgrade for every 2000 sq. ft. of paved area or building slab, but in no case less than three tests. In each compacted fill layer, make one field density test for every 2000 sq. ft. of overlaying building slab or paved area, but in no case less than three tests.

2. Foundation Wall Backfill: Take at least two field density tests, at locations and elevations as directed.

   If in opinion of Engineer, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction and testing at no additional expense to the Owner.

3.15 MAINTENANCE

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

   Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

3.16 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Removal from Owner's Property: Remove waste materials, including excess and unacceptable excavated material, trash and debris, and dispose of it off the Owner's property.

END OF SECTION 31 30 00

SECTION 31 31 16 – TERMITE CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes soil treatment with termiticide.

B. Related Sections include the Division 6 Section "Rough Carpentry" for wood preservative treatment by pressure process.

1.3 PERFORMANCE REQUIREMENTS

Service Life of Soil Treatment: Soil treatment by use of a termiticide that is effective for not less than five years against infestation of subterranean termites.

1.4 SUBMITTALS

A. Product Data: For termiticide. Include the EPA-Registered Label for termiticide products.

B. Product Certificates: For termite control products, signed by product manufacturer.

C. Qualification Data: For Installer of termite control products.

D. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following:

1. Date and time of application.
2. Moisture content of soil before application.
3. Brand name and manufacturer of termiticide.
4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes, and rates of application used.
6. Areas of application.
7. Water source for application.

E. Warranty: Special warranty specified in this Section.

F. Meeting Records: Minutes of pre-installation conference.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located.

B. Regulatory Requirements: Formulate and apply termiticides according to the EPA-Registered Label.

C. Source Limitations: Obtain termite control products through one source.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination" to schedule application of termiticide products.

1.6 PROJECT CONDITIONS

Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

1.7 COORDINATION

Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.8 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty:

1. Manufacturer's standard form, signed by Applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

2. Warranty Period: Five years from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

Continuing Service: Beginning at Substantial Completion, provide 12 months' continuing service including monitoring, inspection, and re-treatment for occurrences of termite activity. Provide a standard continuing service agreement. State services, obligations, conditions, and terms for agreement period; and terms for future renewal options.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Bayer Corporation; Premise 75.

2. Dow AgroSciences LLC; Dursban TC.

3. FMC Corporation, Agricultural Products Group; Talstar or Prevail FT.

2.2 SOIL TREATMENT

Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparation before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously

compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

C. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL

General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.

1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.

2. Foundations: Adjacent soil including soil along the entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating the slab, and around interior column footers, piers, and chimney bases; also along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.

3. Masonry: Treat voids.

4. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.

B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

D. Post warning signs in areas of application.

E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION

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SECTION 32 10 00 AGGREGATE BASE AND PAVING

PART 1 – GENERAL

1.1 SUMMARY

A. The general provisions of the Contract, apply to the work specified in this Section.
B. Related Sections include the following:

1. Division 2 Section "Earthwork"

1.2 PERFORMANCE REQUIREMENTS

A. Work Included: Placement of aggregate base and asphaltic concrete paving.

1.3 SUBMITTALS

A. The Contractor shall furnish to the Engineer, in writing, copies of all proposed aggregate gradations and asphalt mix designs

PART 2 – PRODUCTS

2.1 MATERIALS

A. All aggregate base and asphaltic concrete paving materials shall meet the requirements of TDOT, Standard Specifications for Road and Bridge Construction, March 1, 1995, and all applicable TDOT Supplemental Specifications and Special Provisions.

PART 3 – EXECUTION

3.1 PERFORMANCE

A. The construction and placement of all aggregate base and asphaltic concrete paving shall meet the requirements of TDOT, Standard Specifications for Road and Bridge Construction, March 1, 1995, and all applicable TDOT Supplemental Specifications and Special Provisions.

END OF SECTION 32 10 00

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SECTION 32 12 16 - ASPHALT PAVING

PART 1 - **GENERA**L

1.1 SUMMARY

A. Section Includes:

1. Cold milling of existing hot-mix asphalt pavement.
2. Hot-mix asphalt patching.
3. Hot-mix asphalt paving.
4. Hot-mix asphalt paving overlay.
5. Pavement-marking paint.

B. Related Sections:

1. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.
2. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants and fillers at paving terminations.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
2. Job-Mix Designs: For each job mix proposed for the Work.

B. Material Certificates: For each paving material, from manufacturer.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the State of Tennessee DOT for asphalt paving work.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).

2. Asphalt Base Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
3. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4.4 deg C).

PART 2 - PRODUCTS

A. Mineral Aggregate Base will follow the Specifications of the Tennessee Department of Transportation's Section 303 – Mineral Aggregate Base; Mineral Aggregate Base Type A, Grading D.

B. Bituminous Plant Mix Base (Hot Mix) will follow the Specifications of the Tennessee Department of Transportation's Section 307 – Bituminous Plant Mix Base (Hot Mix) for the mix indicated on the plans.

C. Prime Coat will follow the Specifications of the Tennessee Department of Transportation's Section 402 – Prime Coat.

D. Tack Coat will follow the Specifications of the Tennessee Department of Transportation's Section 403 – Tack Coat.

E. Asphaltic Concrete Surface (Hot Mix) will follow the Specifications of the Tennessee Department of Transportation's Section 411 – Asphaltic Concrete Surface (Hot Mix) for the mixes indicated on the plans.

F. Pavement Markings will follow the Specifications of the Tennessee Department of Transportation's Section 716 – Pavement markings for Painted Pavement Markings.

G. Signage will follow the Specifications of the Tennessee Department of Transportation's Section 713 – Highway Signage.

H. Wheel Stops: Solid, integrally colored, 96 percent recycled HDPE or commingled postconsumer and postindustrial recycled plastic; UV stabilized; 4 inches high by 6 inches wide by 72 inches long. Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate.
   1. Dowels: Galvanized steel, 3/4-inch diameter, 10-inch minimum length.

   2. Adhesive: As recommended by wheel-stop manufacturer for application to asphalt pavement.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PATCHING

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd.
   1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
   2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

C. Patching: Follow City of Knoxville, or other local governmental, requirements for patching asphalt streets and as shown on the drawings.

3.3 INSTALLATION

A. Mineral Aggregate Base will follow the Specifications of the Tennessee Department of Transportation's Section 303 – Mineral Aggregate Base.

B. Bituminous Plant Mix Base (Hot Mix) will follow the Specifications of the Tennessee Department of Transportation's Section 307 – Bituminous Plant Mix Base (Hot Mix).

C. Prime Coat will follow the Specifications of the Tennessee Department of Transportation's Section 402 – Prime Coat.

D. Tack Coat will follow the Specifications of the Tennessee Department of Transportation's Section 403 – Tack Coat.

E. Asphaltic Concrete Surface (Hot Mix) will follow the Specifications of the Tennessee Department of Transportation's Section 411 – Asphaltic Concrete Surface (Hot Mix) for the mix indicated on the plans.

F. Pavement Markings will follow the Specifications of the Tennessee Department of Transportation's Section 716 – Pavement markings for Painted Pavement Markings.

G. Signage will follow the Specifications of the Tennessee Department of Transportation's Section 713 – Highway Signage.

3.4 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Sweep and clean surface to eliminate loose material and dust.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Replace and compact hot-mix asphalt where core tests were taken.

C. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.6 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose them.

END OF SECTION

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SECTION 32 13 13 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:

1. Driveways and roadways.
2. Parking lots.
3. Curbs and gutters.
4. Walkways.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete pavement mixture.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

D. Plain Steel Wire: ASTM A 82, as drawn.

E. Deformed-Steel Wire: ASTM A 496.

F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice."

2.2 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150, white Portland Cement Type I. Supplement with the following:

   a. Fly Ash: NO Fly Ash will be permitted on the site of this Project and NO Fly Ash will be approved in any concrete mix used on this Project. Any Fly Ash found in concrete on this site will be rejected and removed from this property as a nonconforming material at no cost to the Owner.
   b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

2. Blended Hydraulic Cement: ASTM C 595, Type IS, portland blast-furnace slag cement.

B. Normal-Weight Aggregates: ASTM C 33, uniformly graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.

2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: ASTM C 494/C 494M, of type suitable for application, certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

2.3 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.

2.4 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

2.5 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.

2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that meet or exceed requirements.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 4000 psi.

2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50.
3. Slump Limit: 3 inches , plus or minus 1 inch.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 5 percent plus or minus 1.5 percent for 3/4-inch nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

F. Cementitious Materials: Limit percentage by weight of cementitious materials other than portland cement according to ACI 301 (ACI 301M) requirements as follows:

1. Fly Ash or Pozzolan: 25 percent.
2. Ground Granulated Blast-Furnace Slag: 50 percent.
3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.

2.6 Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd..CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M[and ASTM C 1116]. Furnish batch certificates for each batch discharged and used in the Work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Proof-roll prepared subbase surface below [**concrete pavements**] <**Insert locations**> with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.4 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness to match jointing of existing adjacent concrete pavement.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a **1/4-inch** radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.5 CONCRETE PLACEMENT

A. Moisten subbase to provide a uniform dampened condition at time concrete is placed.

B. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

D. Screed pavement surfaces with a straightedge and strike off.

E. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.6 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on pavement surface according to manufacturer's written instructions.

1. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
2. After curing, lightly work surface with a steel wire brush or abrasive stone and water to expose nonslip aggregate.

3.7 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, or moisture-retaining-cover curing, or curing compound.

3.8 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch
2. Thickness: Plus 3/8 inch , minus 1/4 inch.

3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch.
4. Joint Spacing: 3 inches.
5. Contraction Joint Depth: Plus 1/4 inch, no minus.
6. Joint Width: Plus 1/8 inch, no minus.

3.9 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement.

C. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 32 31 13 – CHAIN LINK FENCING

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Galvanized (zinc) coated chain link fabric with galvanized steel framework and accessories for commercial or industrial applications.

1.2 RELATED SECTIONS

01 33 13 Certifications
01 33 23 Shop drawings, product data
01 43 13 Manufacturers Qualifications
01 43 13 Installer qualifications
01 45 00 Quality control
01 65 00 Product delivery requirements
03 30 00 Cast-In-Place Concrete
25 50 00 Integrated automation, gate operators/access control
32 31 13.23 Recreational Court Fences and Gates
32 31 13.26 Tennis Court Fences and Gates
32 31 13.33 Chain Link Backstops
32 31 13.53 High-Security Chain Link Fences and Gates

1.3 REFERENCES

A. ASTM A36 Standard Specification for Carbon Structural Steel
B. ASTM A121 Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
C. ASTM A392 Standard Specification for Zinc-Coated Steel Chain-Link Fabric
D. ASTM A780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-dip Galvanized Coatings
E. ASTM A817 Standard Specification for Metallic-Coated Steel Wire for Chain Link Fence Fabric and Marcelled Tension Wire
F. ASTM A824 Standard Specification for Metallic-Coated Steel Marcelled Tension Wire for Use With Chain Link
G. ASTM B221 Standard Specification for Aluminum and Aluminum Alloy Bars, Rods, Wire Profiles and Tubes
H. ASTM F552 Standard Terminology Relating to Chain Link Fencing
I. ASTM F567 Standard Practice for Installation of Chain Link Fence
J. ASTM F626 Standard Specification for Fence Fittings
K. ASTM F900 Standard Specification for Industrial and Commercial Swing Gates
L. ASTM F1043 Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework
M. ASTM F1083 Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
N. ASTM F1184 Standard Specification for Industrial and Commercial Horizontal Slide Gates
O. ASTM F1910 Standard Specification for Long Barbed Tape Obstacles
P. ASTM F1911 Standard Practice for Installation of Barbed Tape

Q. ASTM F2200 Standard Specification for Automated Vehicular Gate Construction
R. UL 325 Door, Drapery, Gate, Louver and Window Operators
S. WLG2445 Chain Link Fence Manufacturers Institute, Chain Link Fence Wind Load Guide for the Selection of Line Posts and Line Post Spacing

1.4 SUBMITTALS

A. Changes in specifications may not be made after the bid date.
B. Shop drawings: Layout of fences and gates with dimensions, details, and finishes of components, accessories, and post foundations.
C. Product data: Manufacturer's catalog cuts indicating material compliance and specified options.
D. Samples: If requested, samples of materials (e.g., fabric, wires, and accessories).

1.5 QUALITY ASSURANCE

A. Manufacturer: Company having manufacturing facilities in the United States with a minimum 5 years' experience specializing in manufacturing of chain link fence products.
B. Fence contractor: Contractor having 5 years' experience installing similar projects in accordance with ASTM F567.
C. Tolerances: ASTM current specification and tolerances apply and supersede any conflicting tolerance.
D. Substitutions: Alternate chain link products may be acceptable by the architect as equal if approved in writing ten days prior to bidding provided that the items submitted meet the specifications contained in this document.
E. Single source: To ensure system integrity obtain the chain link system, framework, fabric, fittings, gates and accessories from a single source.

PART 2 - PRODUCTS

2.01 MANUFACTURER

2.02 CHAIN LINK FENCE FABRIC

A. Galvanized (zinc) coated steel chain link fabric per ASTM A392
Size and Height: Chain link fabric (4 in.) mesh, 10 gauge, 1/8 in. diameter wire having a break load of 10,000 lbf, mesh height 72 in.
B. Selvage of fabric _____at top and at bottom.

2.03 STEEL FENCE FRAMEWORK

A. Steel pipe Type I: ASTM F1043
B. Group IA, ASTM F1083 standard weight schedule 40 hot-dip galvanized pipe having a zinc coating of 1.8 oz/ft² on the outside surface and 1.8 oz/ft² on the inside surface.
Regular Grade: Minimum steel yield strength of 30,000 psi
C. Formed steel "C" sections: Roll formed steel shapes complying with ASTM F1043, Group II, 50,000 psi minimum steel yield strength.
D. external coating, ASTM F1043 Type A, minimum average zinc coating of 20 oz/ft² in accordance with ASTM A 123.
E. Pipe End and Corner Post _____ OD _____ lbs/ft

E. Pipe Line Post _____ OD) _____ lbs/ft
F. Pipe Rail and Braces, 1.660 in. OD (42.2 mm) _____ lbs/ft (_____ kg/m)

2.4 FITTINGS

A. Post caps: ASTM F626 galvanized pressed steel, malleable iron, or aluminum alloy weather tight closure cap for tubular posts. Provide one cap for each post. "C" shaped line post without top rail do not require post caps. When top rail is specified provide line post loop tops to secure top rail.
B. Rail ends: Galvanized pressed steel per ASTM F626, for connection of rails to post using a brace band.
C. Top rail sleeves: 7" (178 mm) galvanized steel sleeve per ASTM F626.
D. Wire ties: 9 gauge (0.148") (3.76 mm) galvanized steel wire for attachment of fabric to line posts and rails. Pre-formed hog ring ties to be 9 gauge (0.148") (3.76 mm) galvanized steel or aluminum for attachment of fabric to tension wire. Tie wire and hog rings per ASTM F626.
E. Brace and tension (stretcher bar) bands: ASTM F626 galvanized 12 gauge (0.105") (2.67mm) pressed steel by 3/4" (19mm) formed to a minimum 300 degree profile curvature for post attachment. Secure bands using minimum 5/16" (7.94 mm) galvanized carriage bolt and nut.
F. Tension (stretcher) bars: Galvanized steel one-piece length equal to 2 inches (50 mm) less than full height of fabric with a minimum cross-section of 3/16" x 3/4" (4.76 mm x 19 mm) per ASTM F626. Provide tension (stretcher) bars where chain link fabric is secured to the terminal post.
G. Truss rod assembly: Galvanized steel minimum 5/16" (7.9mm) diameter truss rod with pressed steel tightener, in accordance with ASTM F626
H. Carriage bolts and nuts: Galvanized of commercial quality

2.5 TENSION WIRE

A. Tension wire: ASTM A824 Type II, zinc coated steel wire, 7-gauge, (0.177") diameter wire having a tensile strength of 75,000 psi. Gate fabric height up to 6 ft. 2.875 in.

2.09 POST SETTING MATERIALS

A. Concrete: Minimum 28-day compressive strength of 3,000 psi (20 MPa).
B. Drive Anchors: Galvanized ASTM A36 steel drive anchor angle blades, 1.25" x 1.25" x 30 "long secured to post with a galvanized shoe clamp, drive anchors are limited to post size 2.785" OD or less

PART 3 EXECUTION

3.01 SITE EXAMINATION

A. Ensure property lines and legal boundaries of work are clearly established.
B. Survey of fence location to be provided by
C. Verify areas to receive fencing are completed to final grade.

3.02 CHAIN LINK FRAMEWORK INSTALLATION

A. Install chain link fence system in accordance with ASTM F567 and manufacturer's instructions.
B. Locate terminal post at each fence termination and change in horizontal or vertical direction of 30° or more.
C. Space line posts uniformly 10' on center

D. Concrete set posts: Excavate holes in firm, undisturbed or compacted soil. Holes shall have diameter 4 times greater than outside dimension of post, and depths approximately 6" deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post bottom 36" (914 mm) below surface when in firm, undisturbed soil. Place concrete around posts in a continuous pour. Trowel finish around post and slope to direct water away from posts. Drive Anchor set line posts: With protective cap, drive post 36" (914 mm) into ground. Excavate a 6" (152.4 mm) diameter by 6" (152.4 mm) deep section around post to accommodate the drive anchor shoe clamp. Drive the 2 diagonal drive anchor angle blades into the soil and securely tighten the angle blades to post via the shoe clamp, backfill hole. Post setting can be a combination of both drive anchors for line posts and concrete for terminal posts, delete reference to drive anchors if not specified.
E. Check each post for vertical and top alignment and maintain in position during placement and finishing operations.
F. Bracing: Install horizontal brace and truss assembly at mid-height or above for fences 6' and over at each fabric connection to the terminal post. The diagonal truss rod is installed at the point where the brace rail is attached to the terminal post and diagonally down to the bottom of the adjacent line post. Place the truss rod in tension by adjusting the turnbuckle.
G. Tension wire: Install tension wires so that it will be located 4" up from bottom the fabric. If top rail is not specified, install the tension wire so that it will be located 4" down from the top of the fabric. Stretch and install tension wire before installing the chain link fabric and attach it to each post using wire ties.
H. Top rail: Install in lengths of 21'. Connect ends with sleeves forming a rigid connection, allow for expansion and contraction.
I. Center Rails: Install mid rails between line posts and attach to post using rail end or line rail clamps.
J. Bottom Rails: Install bottom rails between posts and attach to post using rail end or line rail clamps.

3.03 CHAIN LINK FABRIC INSTALLATION

A. Fabric: Install fabric on security side, pull fabric taut; thread the tension bar through fabric and attach to terminal posts with tension bands spaced maximum of 15" on center and attach so that fabric remains in tension after pulling force is released. Install fabric so that it is 2" +/- 1" above finish grade.
B. Secure fabric using wire ties to line posts at 15" on center and to rails and braces 24" on center, and to the tension wire using hog rings 24" on center. Tie wire shall be secured to the fabric by wrapping it two 360 degree turns around the chain link wire pickets. Cut off any excess wire and bend back so as not to protrude to avoid injury if a pedestrian may meet the fence.

3.04 CLEAN UP AFTER INSTALLATION

A. Clean up area adjacent to fence line from debris and unused material created by fence installation.

END OF SECTION 32 31 13

SECTION 32 92 00 - TURF AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Seeding.
2. Sodding.

1.2 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

E. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product certificates.

C. Planting Schedule: Indicating anticipated planting dates for each type of planting.

1.4 QUALITY ASSURANCE

A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

B. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory.

1. Report suitability of topsoil for lawn growth. State-recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil.

1.5 MAINTENANCE SERVICE

A. Initial Lawn Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

1. Seeded Lawns: 120 days from date of Substantial Completion.

a. When initial maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.

PART 2 - PRODUCTS

2.1 SEED

A. A. Seed mixture shall be fresh, clean, new crop seed. Grass shall be of the previous year's crop and in no case shall the weed seed content exceed 0.25% by weight. The seed shall be furnished and delivered in the proportion specified below in new, clean, sealed and properly labeled containers. All seed shall comply with State and Federal seed laws. Submit manufacturer's Certificates of Compliance. Seed that has become wet, moldy or otherwise damaged shall not be acceptable. All Fescues shall contain Acromonium endophytes. Seed containing endophyte must be kept cool and dry at all times; do not stockpile in the sun.

1. Seed Mixture Composition for General Lawn Conditions in Turf Climatic Zones I and II in areas of the Contract as shown on the Contract Documents:

Common Name	Purity By Weight	Proportion Minimum	Germination Minimum
Tall Fescue	50%	85%	95%
Chewings Fescue	25%	85%	95%
Creeping Red Fescue	25%	85%	95%

a. Tall fescue shall be improved turf-type blends. Kentucky 31 tall fescue shall not be permitted.

b. Seeding rate for the General Lawn Seed Mix shall be 8 pounds per 1,000 square feet.

c. Provide 3 varieties minimum for each Fescue species.

B. Seed may be mixed by an approved method on the site or may be mixed by a dealer. If the seed is mixed on the site, each variety shall be delivered in the original containers that shall bear the dealer's guaranteed analysis. If seed is mixed by a dealer then the Contractor shall furnish the Owner’s Representative the dealer's guaranteed statement of the composition of the mixture.

PART 3 - EXECUTION

3.1 LAWN PREPARATION

A. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 3/4 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply superphosphate fertilizer directly to subgrade before loosening.
2. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.
3. Spread planting soil mix to a depth of 4 inches not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

    a. Reduce elevation of planting soil to allow for soil thickness of sod.

B. Unchanged Subgrades: If lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:

1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
2. Loosen surface soil to a depth of at least 6 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture.

    a. Apply superphosphate fertilizer directly to surface soil before loosening.

C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

D. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

E. Before planting, restore areas if eroded or otherwise disturbed after finish grading.

3.2 SEEDING

A. Limit of grading and earthwork shall be limit of seeding unless otherwise indicated on the Contract Documents. All lawn areas disturbed outside the limit of seeding shall be prepared and seeded as specified herein at no additional cost.

B. The season for seeding shall be from February 21 through March 21 and from August 21 eastern Tennessee to October 7 western Tennessee. The actual planting of seed shall be done, however, only during periods within this season that are normal for such work as determined by weather conditions and by accepted practice in this locality. To prevent loss of soil via water and wind erosion and to prevent the flow of sediment, fertilizer, and pesticides onto roadways, sidewalks, and into catch basins, seed loam areas within 5 Days of spreading the loam.

C. Seed only when the bed is in a friable condition, not muddy or hard.

D. Application rate for seeding shall be as described in Part 2 - PRODUCTS, above.

E. For all slopes steeper than or equal to three to one (3:1) install erosion control matting.

F. When seeding of lawn by Hydro-seeding Method only hose application shall be permitted. At no time shall the mobile tank or tank truck be allowed onto the prepared hydroseed beds.

G. Contractor shall obtain Owner's Representative's written approval of fine grading and bed preparation before doing any hydroseeding.

H. Limit of grading and earthwork shall be limit of hydroseeding unless otherwise indicated on the Contract Documents. All lawn areas disturbed outside the limit of hydroseeding shall be hydroseeded.

I. Seed only when the bed is in a friable condition, not muddy or hard. Construction methods shall conform to hydraulic method requirements specified

3.3 LAWN MAINTENANCE

A. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn. Provide materials and installation the same as those used in the original installation.

B. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings.

3.4 SATISFACTORY LAWNS

A. Satisfactory Seeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm).

B. Satisfactory Sodded Lawn: At end of maintenance period, a healthy, well-rooted, even-colored, viable lawn has been established, free of weeds, open joints, bare areas, and surface irregularities.

C. Use specified materials to reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

END OF SECTION

SECTION 32 92 10 – SOD GRASSES

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Sodding.

B. Related Requirements:
   1. Section 329300 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.
   2. Section 329113 “Soil Preparation”

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.
B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" and drawing designations for planting soils.
E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape and/or sod Installer.
B. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.
C. Product Certificates: For fertilizers, from manufacturer.
D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by supplier for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Land care Network or the American Nursery and Landscape Association.
2. Experience: Five years' experience in turf installation.
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Pesticide Applicator (if applicable): State licensed, commercial.

B. Sod Supplier Qualifications: A qualified turfgrass supplier whose work and product has resulted in successful turf establishment.

1. Professional Membership: Sod supplier shall be a member in good standing with Turf Producers International and Sports Turf Managers Association.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Turfgrass sod must be harvested and transported when its moisture content is at 20 to 30 percent, measured at depth of harvest.
B. Turfgrass sod shall be harvested, delivered and installed/transplanted within a period of 24 hours, unless a suitable preservation method is approved prior to delivery, including, but not limited to refrigeration at 40 degrees Fahrenheit. Turfgrass sod not transplanted within this period, or preserved by approved methods, shall be inspected and approved by Owner's representative prior to its installation.
C. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 TURFGRASS SOD

A. Acceptable Supplier: Graff's Turf, 9809 N. Frontage Road I-76, Fort Morgan, CO 80701. Turfgrass Sod: Approved Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects

Commercial Grade. Turfgrass sod shall be machine cut at a uniform soil thickness of 0.5 inch, plus or minus 0.2 inch, at the time of cutting. Measurement for thickness shall exclude top growth and thatch. Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.

B. Turfgrass sod shall be machine cut at a uniform soil thickness of 0.5 inch, plus or minus 0.2 inch, at the time of cutting. Measurement for thickness shall exclude top growth and thatch. Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.

C. Before harvesting, the turfgrass shall be mowed uniformly heights as follows:

1. 0.625 to 2 inches on cool season grasses (i.e., bluegrass, rye and fescue).
2. 0.5 to 1.50 inches on warm season grasses (i.e., zoysia grass, Bermuda grass, St. Augustine grass, etc.)
3. 0.125 to 0.25 inch for Bent grass.

D. Turfgrass Species: Latitute Bermuda grass

E. Turfgrass Species: Sod of grass species as follows, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:

1. Full Sun: Hy-Performance Bluegrass
2. Sun and Partial Shade: GTF Short Cut Bluegrass
3. Shade: GTF Bluegrass

2.2 FERTILIZERS

A. Fertilizer: Granular, pelleted, or liquid/flowable fertilizer:

1. Composition: 20 percent nitrogen, 20 percent phosphorous,10 percent potassium, and 3 percent iron, by weight.

2.3 PESTICIDES

A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer, following label instructions.

C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
3. Uniformly moisten excessively dry soil that is not workable, or which is dusty. B. Proceed with installation only after unsatisfactory conditions have been corrected.

B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."
B. Placing Planting Soil: Place and mix planting soil in place over exposed subgrade.

1. Reduce elevation of planting soil to allow for soil thickness of sod.
2. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
3. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 SODDING

A. Lay sod within 24 hours of harvesting unless a suitable preservation method is accepted by Architect prior to delivery time. Do not lay sod if dormant or if ground is frozen or muddy.
B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. After establishment, if necessary, to smooth surface, tamp and roll lightly to remove surface undulations. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

1 Lay sod across slopes exceeding 1:3.
2 Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than two anchors per sod strip to prevent slippage.

C. Saturate sod with fine water spray within two hours of planting. During first 20 days after planting, water 3 times daily with short, frequent waterings, as necessary to maintain moist soil to a minimum depth of 1-1/2 inches (38 mm) below sod.

3.5 TURF RENOVATION

A. Renovate existing turf where indicated.
B. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
2. Install new planting soil as required.

C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
D. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
E. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
F. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off.
G. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches
H. Apply initial fertilizer required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.
I. Initial Fertilizer: Applied according to manufacturer's recommendations. Apply sod as required for new turf.
J. Water newly planted areas and keep moist until new turf is established.

3.6 TURF MAINTENANCE

A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
2. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering:

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water turf with fine spray at a recommended ET rate.

C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial

or subsequent mowing's. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowing's to maintain the following grass height:

1. Mow bermudagrass to a height of 1.5 inches.
2. Mow perennial ryegrass and fescue to a height of 0.625 - 2.0 inches.
3. Mow Kentucky bluegrass and buffalo grass to a height of 0.625 – 2.0 inches.

D. Turf Postfertilization: Apply slow-release fertilizer after initial mowing and when grass is dry.
   1. Use fertilizer that provides actual nitrogen of at least 1 lb./1000 sq.ft.to turf area.

3.7 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:
B. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
C. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.8 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations.

3.9 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off.
C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
D. Remove nondegradable erosion-control measures after grass establishment period.

3.10 MAINTENANCE SERVICE

A. Turf Maintenance Service: Provide full maintenance by skilled employees. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:

   1. Sodded Turf: 30 days from date of Substantial Completion.

END OF SECTION 32 92 10

SECTION 32 93 00 - PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Trees.
2. Shrubs.
3. Plants.

1.2 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Finish Grade: Elevation of finished surface of planting soil.

C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

D. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

E. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

F. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples of mineral mulch.

C. Product certificates.

D. Planting Schedule: Indicating anticipated planting dates for exterior plants.

E. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of exterior plants during a calendar year.

1.4 QUALITY ASSURANCE

A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

B. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory.

1. Report suitability of topsoil for plant growth. State-recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil.

C. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock."

D. Preinstallation Conference: Conduct conference at the Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery and handling.

B. Handle planting stock by root ball.

C. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants and trees in shade, protect from weather and mechanical damage, and keep roots moist.

1.6 WARRANTY

A. Special Warranty: Installer's standard form in which Installer agrees to repair or replace plantings that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, abuse by Owner, or incidents that are beyond Contractor's control.
   b. Structural failures including plantings falling or blowing over.

2. Warranty Periods from Date of Substantial Completion:

   a. Trees and Shrubs: One year.

1.7 MAINTENANCE SERVICE

A. Initial Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below.

1. Maintenance Period for Trees and Shrubs: 12 months from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TREE AND SHRUB MATERIAL

A. General: Furnish nursery-grown trees and shrubs complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

B. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1.

C. Provide balled and burlapped trees.

D. Shrub sizes indicated on Drawings are sizes after pruning.

2.2 MULCHES

A. Organic Mulch: Shredded hardwood.

B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve; soluble salt content of 2 to 5 Deci siemens/m.

PART 3 - EXECUTION

3.1 PLANTING BED ESTABLISHMENT

A. Loosen subgrade of planting beds to a minimum depth of 6 inches (150 mm). Remove stones larger than 1-1/2 inches (38 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

B. Finish Grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.2 TREES AND SHRUBS

A. Excavation of Pits and Trenches: Excavate circular pits with sides sloped inward. Trim base leaving center area raised slightly to support root ball and assist in drainage. Do not further disturb base. Scarify sides of plant pit smeared or smoothed during excavation.

1. Excavate approximately three times as wide as ball diameter.
2. Excavate at least 12 inches (300 mm) wider than root spread and deep enough to accommodate vertical roots for bare-root stock.

B. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1.

C. Stock with Root Balls: Set trees and shrubs plumb and in center of pit or trench with top of root ball 1 inch (25 mm) above adjacent finish grades.

1. Balled and Burlapped: Remove burlap and wire baskets from tops of root balls and partially from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
2. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.

D. Bare-Root Stock: Set and support bare-root trees and shrubs in center of pit or trench with trunk flare) above adjacent finish grade. Spread roots without tangling or turning toward surface, and carefully work backfill around roots by hand. Puddle with water until backfill layers are completely saturated. Plumb before backfilling, and maintain plumb while working backfill around roots and placing layers above roots. Tamp final layer of backfill. Remove injured roots by cutting cleanly; do not break.

E. Organic Mulching: Apply 2-inch (50-mm) average thickness of organic mulch extending 12 inches (300 mm) beyond edge of planting pit or trench. Do not place mulch within 3 inches (75 mm) of trunks or stems.

3.3 PLANT MAINTENANCE

A. Tree and Shrub Maintenance: Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

B. Ground Cover and Plant Maintenance: Maintain and establish plantings by watering, weeding, fertilizing, mulching, and other operations as required to establish healthy, viable plantings.

C. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

END OF SECTION

SECTION 33 00 00 – EXISTING UTILITIES

1.1 SUMMARY

A. This section includes how to deal with all existing utilities on site and how they are maintained during construction and care contractor will take to maintain operation during the construction of this project. This includes the preservation of existing

B. Related Sections include the following:
   1. Division 31 Section "Earthwork" for grading and excavation procedures during the underground structures.

1.2 EXECUTION

A. The existing utilities shown on the Drawings are shown diagrammatically and it is not to be inferred that the locations shown are precise.

B. Coordinate with all applicable utility owners prior to excavation in areas where it is reasonable to expect the presence of existing utilities, whether shown on the Drawings or not.

C. The Contractor shall be responsible for any and all damage to any existing utilities, caused by his efforts.

D. Contact the effected utility as soon as any damage is uncovered.

E. The utility shall make the determination as to who makes the necessary repairs.

F. In areas where existing underground structures are shown or suspected, carefully uncover such structures to such extent as to enable the Engineer to determine what adjustments if any need to be made to accommodate the presence or removal or such structures.

END OF SECTION 33 00 00

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SECTION 33 10 00 – WATER UTILITIES

1.1 SUMMARY

A. The general provisions of the Contract, apply to the work specified in this Section.
B. Related Sections include the following:

1. Division 2 Section "Trenching and Backfilling"

1.2 PERFORMANCE REQUIREMENTS

A. Work Included: Furnish and install the pipe materials, fittings, and appurtenances of the type(s) and size(s), and in the location(s) shown on the Drawings and as specified herein..

B. The extent of the work is generally shown on the drawings and shall be extended to accommodate changes which become necessary as a result of encountering unforeseen or changed conditions in the field.

1.3 QUALITY ASSURANCE

A. Materials and installation shall conform to National Fire Protection Association (NFPA) 24, "Standard for the Installation of Private Fire Service Mains and Their Appurtenances," and as specified in this section.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE

A. Standards:

1. Cement-mortar lining for water: ANSI A21.4 (AWWA C104); standard thickness.
2. Ductile iron pipe thickness: ANSI A21.50 (AWWA C150).
3. Ductile iron pipe centrifugally cast in metal or sand lined molds: ANSI A21.51 (AWWA C151).
4. Threaded, flanged pipe: ANSI A21.15 (AWWA C115).
5. Cast and ductile iron fittings: ANSI A21.10 (AWWA C110).
6. Pipe flanges and fittings: ANSI B16.1 and ANSI A21.10 (AWWA C110).
7. Pipe Joints: Push-on joints as specified in ASTM D3139.
8. Joints Between Pipe and Metal Fittings:
   a. Push-on as specified in ASTM D3139.
   b. Compression-type joints/mechanical joints as specified in ASTM D3139 and AWWA C111/A21.11, respectively.
9. Rubber gasket joints: ASTM F477 and ANSI A21.11 (AWWA C111).

B. Pipe:

1. Unless otherwise shown on the Drawings, ductile iron pipe shall meet the following requirements:
   a. For push-on and mechanical joint pipe: Class 52.

2. Furnish with factory applied bituminous coating for all underground piping, in manholes, and other underground vaults.

C. Joints:

1. Push-on and Mechanical Joint:

   a. The plain ends of push-on pipes shall be factory machined to a true circle and chamfered to facilitate fitting an "O"-ring gasket.
   b. Provide gaskets manufactured from a composition material suitable for exposure to the liquid to be contained within the pipe.
   c. Bolts and nuts for mechanical joints shall be made of A588 steel.

2. Grooved split ring couplings, sleeve couplings, flexible joints and couplings, shall be supplied as required.

3. Joint Bracing:

   a. Provide joint bracing to prevent the piping from pulling apart under pressure as required and as specified in NFPA 24.
   b. Types of Bracing:

      1) Pipe and fittings furnished with lugs or hooks cast integrally for use with socket pipe clamps, tie rods, or bridles. Bridles and tie rods shall be a minimum of 3/4-in. diameter except where they replace flange bolts of a smaller size, in which case they shall be fitted with a nut on each side of the pair of flanges. The clamps, tie rods, and bridles shall be coated with a bituminous paint after assembly or, if necessary, prior to assembly.

      2) Mechanical joint ductile iron pipe retainer glands:
         a) Made of ductile iron.
         b) Set screws made of ductile iron or A588 steel.
         c) Working pressure 350 psi, up to 8 in.; 250 psi, 8 in. to 16 in.
         d) or equivalent.

      3) Other types of bracing as shown on the Drawings, including thrust blocks.

4. Fittings: All-bell mechanical joint, unless otherwise indicated or specified.

2.2 GATE VALVES

A. Design:

1. Meet requirements of UL262; Mueller Co. A-2052-20 with post indicator flange; A-2050- 20 without post indicator flange, or approved equal.
2. Mechanical joints, inside screw, non-rising stem, turn left (counterclockwise) to open.
3. Bituminous coated.
4. Furnish with post indicators where shown on the Drawings.

a. Posts shall meet requirements of UL789; Mueller Co. Cat. Fig. A-20804, or approved equal.
b. Furnish with operating nut about 3 feet above grade.
c. Provide each post with 1 coat of primer and 2 coats of red enamel paint.

B. Fabrication:

1. Cast iron body, 175 psi working pressure, bronze mounted double disc, parallel seat type.
2. Cast manufacturer's name and catalog number in valve body.

2.3 VALVE BOXES

A. Acceptable Manufacturers: M & H as manufactured by Dresser Industries, Inc., A.P. Smith as manufactured by U.S. Pipe and Foundry Co., or approved equal product of the size indicated on the Drawings.

B. Design:

1. Cast iron and of the adjustable, telescoping, heavy-pattern type.
2. Construct to prevent the direct transmission of traffic loads to the pipe or valve.

C. Fabrication:

1. The Upper or Sliding Section of the Box: 24-in. top with top flange, 36-in. bottom slide type, cast iron, provided with a flange having sufficient bearing area to prevent undue settlement.
2. The Lower Section of the Box: Designed to enclose the operating nut and stuffing box of the valve and rest on the valve bonnet.
3. Adjustable through at least 6 in. vertically without reduction of the lap between section to less than 4 in.
4. Length: As necessary to suit the ground elevation.
5. Inside Diameter of Box: At least 5¼ in.
6. Covers: Close fitting and substantially dirt-tight, and top of cover flush with the top of the box rim.
7. The word "WATER" shall be cast in the covers.

2.4 FLEXIBLE COUPLINGS

A. Ductile iron, as manufactured by Ford Meter Box Co. or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Install all pipe and fittings in strict accordance with the manufacturer's instructions and recommendations.
2. Install all pipes and fittings in accordance with the lines and grades shown on the Drawings and as required for a complete installation.
3. Install adaptors, as required, when connecting pipes constructed from different materials.
4. Where main is installed within 18-in. vertically of a culvert or water main, furnish and center one 18-ft length of ductile iron pipe on the culvert or water main being crossed.

B. Pipe Laying:

1. Firmly support the pipe and fittings on bedding material as shown on the Drawings and as specified in Section 02225.
2. Do not permanently support the pipe or fittings on saddles, blocking stones, or any material which does not provide firm and uniform bearing along the outside length of the pipe.
3. Thoroughly compact the material under the pipe to obtain a substantial unyielding bed shaped to fully support the pipe.
4. Excavate suitable holes for the joints so that only the barrel of the pipe received bearing pressure from the supporting material after placement.
5. Lay each pipe length so it forms a close joint with the adjoining length and bring the inverts to the required grade.
6. Do not drive the pipe down to grade by striking it with a shovel handle, timber, rammer, or any other unyielding object.
7. When each pipe length has been properly set, place and compact enough of the bedding material between the pipe and the sides of the trench to hold the pipe in correct alignment.
8. After filling the sides of the trench, place and lightly tamp bedding material to complete the bedding.
9. Take all necessary precautions to prevent flotation of the pipe in the trench.

C. Temporary Plugs:

1. When pipe installation work in trenches is not in progress, close the open ends of the pipe with temporary watertight plugs.
2. If water is in the trench when work is resumed, do not remove plugs until all danger of water entering the pipe is eliminated.
3. Do not use the pipelines as conductors for trench drainage during construction.

D. Jointing Push-On Pipe:

1. Connect pipe in accordance with the latest manufacturer's instructions and recommendations.
2. Clear each pipe length, coupling and fitting of all debris and dirt before installing.
3. Provide and use coupling pullers for jointing the pipe.
4. Provide gasket feeler gauges for use by the pipe layer for checking the position of the rubber gaskets in the completed joints.
5. Shove home each length of pipe against the pipe previously laid and hold securely in position. Do not pull or cramp joints.
6. Make all pipe joints as watertight as possible with no visible leakage and no sand, silt, clay, or soil of any description entering the pipeline at the joints.
7. Immediately after making a joint, fill the holes for the joints with bedding material, and compact.

E. Jointing Bolted Joints:

1. Before the pieces are assembled, remove rust-preventive coatings from machined surfaces.
2. Pipe Ends, Sockets, Sleeves, Housings, and Gaskets: Thoroughly clean and smooth burrs and other defects.

F. Jointing Mechanical Joints:

1. Thoroughly brush surfaces against which the gasket will come in contact with a wire brush prior to assembly of the joint.
2. Clean and lubricate the gasket, bell, and spigot by washing with soapy water.
3. Slip gland and gasket, in that order, over the spigot, and insert the spigot into the bell until it is correctly seated.
4. Seat gasket evenly in the bell at all points, centering the spigot, and press the gland firmly against the gasket.
5. After all bolts have been inserted and the nuts have been made up fingertight, progressively and uniformly tighten diametrically opposite nuts all around the joint to the proper tension by means of a torque wrench.
6. The correct range of torque as indicated by a torque wrench and the length of wrench (if not a torque wrench) used by an average man to produce such range of torque, is as follows:

Torque Range Values	
Range of torque	60 - 90 ft-lb
Length of wrench	10 in.

7. If effective sealing of the joint is not attained at the maximum torque indicated above, disassemble the joint, thoroughly clean, and reassemble.
8. Do not overstress bolts to tighten a leaking joint.

G. Pipe Cutting:

1. Cut in accordance with manufacturer's recommendations.
2. Cut the pipe with a hand saw, metal-inserted abrasive wheel (except asbestos-cement pipe), or pipe cutter with blades (not rollers).
3. Examine all cut ends for possible cracks caused by cutting.

H. Pipe Deflection Allowances: Ductile iron pipe.

Maximum permissible deflection, IN.*

Size of Pipe, IN.	Push-on Joint	Mechanical Joint
16	10	11
12	16	18
10	16	18
8	16	18
6	16	25

*Maximum permissible deflection for 18-foot length; maximum permissible deflections for other lengths shall be in proportion of such lengths to 18 feet.

I. Valve Installation:

1. Install in accordance with the specifications for the pipe to which they are to be connected.
2. Make up valve joints in accordance with the Drawings.

3. The valves shall bear no stresses due to loads from the adjacent pipe.
4. Inspect, clean, and lubricate before installation.

J. Bracing and Blocking:

1. Block and anchor all bends, 22½° or greater, tees, plugs, etc. with concrete to prevent movement of the pipe in the joints due to internal or external pressures as specified in NFPA 24.
2. Place concrete around fittings to the walls of the trench, so placed that joints may be caulked or tightened if necessary.
3. Do not backfill until the concrete has set.
4. If the soil does not provide firm support for thrust block placement, provide retainer clamps and tie rods as directed by the Engineer.

K. Vertical Separation From Sanitary Sewer:

1. Whenever water mains must cross sewers, lay at such an elevation that the top of the sewer is at least 18 inches below the bottom of the water main.
2. When the elevation of the sewer cannot be buried to meet the above requirements, center one full length of water main over the sewer so that both joints will be as far from the sewer as possible.

3.2 FLUSHING

A. Flush all underground mains thoroughly to remove rocks and other foreign materials before connections are made to sprinkler or other fire protection system piping.

B. Use flow rates specified in Chapter 8 of NFPA 24, Private Fire Service Mains and Their Appurtenances.

3.3 PRESSURE TESTING

A. Procedures: In accordance with Chapter 8 of NFPA 24, Private Fire Service Mains and Their Appurtenances.
B. Should the pipe fail to meet the leakage requirements, re-excavate and repair at no cost to the Owner.
C. Conduct all testing in presence of Engineer.
D. Complete and submit copies of the Contractor's Material and Test Certificate to the Engineer and fire insurance carrier upon completion of the required testing.

3.4 DISINFECTION

A. After laying, flushing and testing of the mains and before placing in service, disinfect the interior of all pipe, fittings and accessories in accordance with AWWA C651.
B. Apply chlorine in one of the following forms:
   1. Liquid chlorine gas-water mixture.
   2. Calcium hypochlorite and water mixture.
   3. Sodium hypochlorite and water mixture.

END OF SECTION 33 10 00

SECTION 33 41 00 – STORM DRAINAGE

1.1 SUMMARY

A. The general provisions of the Contract, apply to the work specified in this Section.

B. Related Sections include the following:
   1. Division 2 Section "Earthwork"

1.2 PERFORMANCE REQUIREMENTS

A. Construction of site storm drainage system including closed and open drainage systems.

1.3 SUBMITTALS

A. The Contractor shall furnish to the Engineer copies of all certifications of structures, pipe, and materials associated with the construction of the storm drainage system.

PART 2 – PRODUCTS

2.1 MATERIALS

A. All storm drainage structures, pipe, and materials shall meet the requirements of TDOT, Standard Specifications for Road and Bridge Construction, March 1, 1995, and all applicable TDOT Supplemental Specifications and Special Provisions.

PART 3 – EXECUTION

3.1 PERFORMANCE

A. The construction and placement of all storm drainage structures, pipe, materials, bedding, and backfill shall meet the requirements of TDOT, Standard Specifications for Road and Bridge Construction, March 1, 1995, and all applicable TDOT Supplemental Specifications and Special Provisions.

END OF SECTION 33 41 00

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SECTION 34 00 00 - TRANSPORTATION

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes the transportation of goods and materials on and off the project site
B. Related Documents

1. Division 01 Section "Summary" and "Payment Procedures"

1.2 PERFORMANCE REQUIREMENTS

A. Comply with all applicable regulatory requirements listed as well as other applicable Federal, State, Regional, or local laws, codes and ordinances which govern or regulate transportation.
B. Insure that all vehicles entering and leaving the site comply with all safety requirements.
C. Prepare vehicles to prevent spillage or contamination.
D. Transport Aggregate and Backfill from the quarry to the Site.
E. Transport used Asphalt from the site to the approved recycling facility.

1.3 SUBMITTALS

A. Submit the following:

1. Types of vehicles proposed for transport.
2. Proposed route of travel for all vehicles going to or from the site.

1.4 SITE ENTRY

A. Require all transporters to follow the appropriate Health and Safety protocols established for the site.
B. Normal Operating Procedure:

1. Sign-in at [Owner's] registration office.
2. Enter site in the appropriate level of protection and proceed along the designated route to area as designated by the Owner's Representative.

1.5 VEHICLE REQUIREMENTS

A. Bulk Transportation:

1. Use vehicles licensed as applicable under the appropriate Federal, Provincial, and state regulations.

1.6 SPILL CONTROL

A. The Subcontractor is responsible for any and all actions necessary to remedy situations involving material spilled in loading or transit.

PART 2 – PRODUCTS

Not applicable

PART 3 – EXECUTION

3.1 UNLOADING

A. The driver will be directed by Engineer's personnel where to unload material at the Site.

3.2 MEASUREMENT

A. Not Applicable.

3.3 HAULING

A. Identify the route of travel for all vehicles going to or from the site to the final disposal area identified. These routes shall not be changed without approval by the Owner's Representative.

D. Normal Operating Procedure

1. Coordinate with the Engineer's Representative for vehicle inspection and recording of quantities and types of material entering the site.

END OF SECTION 34 00 00