PROJECT MANUAL

THE FALLS ON REFUGEE ROAD

3355 REFUGEE ROAD
COLUMBUS, OH 43232

PREPARED FOR:

COLUMBUS METROPOLITAN HOUSING AUTHORITY
COMMUNITY. COMMITMENT. COLLABORATION.

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CONSTRUCTION DOCUMENT PROGRESS SET
MAY 1, 2025

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SECTION 01 12 16
WORK SEQUENCE

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes specifications for work sequence.

B. Schedule and conduct all work in a manner consistent with the Contract, specific work sequence and milestones as specified.

1.02 WORK SEQUENCE

A. Certain portions of work on this project must follow a specific construction sequence.

B. The following sequence descriptions are general and are not intended as complete scopes of work. The complete scope of work can be determined from the drawings in conjunction with this section.

C. Construction Schedule: See Section 01 32 16.

D. Milestone Dates: TBD

END OF SECTION 01 12 16

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SECTION 01 21 13
ALLOWANCES

PART 1 GENERAL

1.01 SUMMARY

A. Include in the bid, the cost allowances specified below for the various items.

B. Section includes:
   1. Schedule of allowances.
   2. Selection of products.
   3. Adjustment of costs.

1.02 ALLOWANCES FOR PRODUCTS

A. The amount of each allowance includes:
   1. The cost of the product to the Contractor, less any applicable trade discounts.
   2. Delivery to the site.
   3. Labor required under the allowance when labor is specified to be included in the allowance.

B. In addition to the amount of each allowance, include in the Contract Sum (bid price) the Contractor's cost for the following. These items are NOT a part of the allowance.
   1. Handling at the site; including unloading, uncrating and storage.
   2. Protection from the elements and from damage.
   3. Labor for installation and finishing, except where labor is specified to be a part of the allowance.
   4. Other expenses required to complete the installation.
   5. Contractor's and subcontractor's overhead and profit (mark-up).

1.03 SELECTION OF PRODUCTS UNDER ALLOWANCES

A. Architect's Duties
   1. Consult with the Contractor in consideration of products and suppliers or installers.
   2. Make selection in consultation with Owner designating:
      a. Product, model and finish.
      b. Accessories and attachments.
      c. Supplier and installer as applicable.
      d. Cost to Contractor, delivered to the site or installed as applicable.
      e. Manufacturer's warranties.
   3. Prepare Change Orders.

B. Contractor's Duties
   1. Assist Architect and Owner in determining qualified suppliers and installers.
   2. Obtain proposals from specific suppliers and installers when requested by Architect.
   3. Make appropriate recommendations for consideration to the Architect.
   4. Notify Architect promptly of:
      a. Any reasonable objections Contractor may have against supplier, or party under consideration of the Architect.
      b. Any effect on the construction schedule anticipated by selections under consideration.

1.04 CONTRACTOR RESPONSIBILITY FOR PURCHASE, DELIVERY AND INSTALLATION

A. On notification of selection, execute purchase agreement with designated supplier.

B. Arrange for and process Shop Drawings, Product Data and Samples, as required.

C. Make all arrangements for delivery.

D. Upon delivery, promptly inspect products for damage or defects.

E. Submit claims for transportation damage.

F. Install and finish products in compliance with requirements of referenced specification sections.

1.05 ADJUSTMENT OF COSTS

A. Should the net cost be more or less than the specified amount of the allowance, the Contract Sum will be adjusted accordingly by Change Order.
   1. The amount of the Change Order will recognize any changes in handling costs at the site, labor, installation costs, overhead, profit and other expenses caused by the selection under the allowance.
   2. For products specified under a unit cost allowance, the unit cost shall apply to the quantities actually used with a nominal allowance for waste, as determined by receipted invoices, or by field measurement.

B. Submit any claims for anticipated additional costs at the site, or other expenses caused by the selection under the allowance, prior to execution of the work.

C. Failure to submit claims will constitute a waiver of claims for additional costs.

D. At contract closeout, reflect all approved changes in contract amounts in the final state of accounting.

1.06 SCHEDULE OF ALLOWANCES

A. FFE at Clubhouse (offices ,conference room, club room)
   1. $75,000

B. Building, ground sign
   1. $25,000

END OF SECTION 01 21 13

SECTION 01 23 00
ALTERNATES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.02 GENERAL REQUIREMENTS

A. Definitions and Explanations: "Alternates" are defined as alternate products, materials, equipment, systems, methods, units of work or major elements of the construction, which may, at Owner's option and under terms established by Instructions to Bidders and in the Contract or Agreement, be selected for the work in lieu of corresponding requirements of Contract Documents. Selection may occur prior to Contract date, or may, by the Agreement, be deferred for possible selection at a subsequent date. Alternates may or may not change scope and general character of the work substantially. Requirements of this section may be related to, but must not be confused with, requirements of Contract Documents related to "allowances", "unit prices", change orders", "substitutions" and similar provisions.

B. Refer to the Contract, and subsequent modifications thereof, for determination of which several scheduled "Alternates" herein have been accepted, and, therefore, are in full force and effect as though included originally in the contract documents for the base bid.

1. The Owner reserves the right to accept or reject any Alternate at the time of awarding the Contract. If, during the progress of the Work, it should become desirable to reinstate any Alternate not included in the Contract, the Owner reserves the right to reinstate the Alternate at the price bid by the Contractor provided that such actions taken in sufficient time as not to delay the progress of the work.

C. Notification: Immediately following the award of the Contract, prepare and distribute to each entity to be involved in performance of the work, a notification of the status of each alternate scheduled herein and including those subsequently added by notification during bidding. Indicate which alternates have been: 1) accepted, 2) rejected, and, 3) deferred for consideration at a later date as indicated. Include full description of negotiated modifications to alternates, if any.

D. General: The descriptions herein for each alternate are recognized to be incomplete and abbreviated, but imply that each change must be complete for the scope of work affected. Refer to all other applicable specification sections and to applicable drawings, for specific requirements of the work, regardless of whether references are so noted in the description of each alternate.

E. It is recognized that descriptions of alternates are primarily scope definitions, and do not necessarily detail full range of materials and processes needed to complete the work as required.

1.03 SCHEDULE OF ALTERNATES

A. Contract Alternates

1. Alternate No. 1: Air Barrier Option
    a. Provide fluid applied barrier instead of flexible plastic sheet air barrier. Reference sections:
        1) 07 27 19 - Plastic Sheet Air Barriers
        2) 07 27 26 - Fluid-Applied Membrane Air Barriers.

END OF SECTION 01 23 00

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SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for substitutions permitted after the bidding phase.
   1. Provide comparable information as required to enable evaluation of the proposed substitution to the specified performance and materials. It is not the responsibility of the Architect/Engineer to further investigate claims of equivalency. Burden of proof is solely the responsibility of the proposer.

1.02 RELATED SECTIONS

A. Related Sections
   1. Product Requirements (for requirements for submitting comparable product submittals for products by listed manufacturers): Section 01 60 00.
   2. Divisions 02 through 49 Sections for specific requirements and limitations for substitutions.

1.03 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
   1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
   2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.04 SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration, or one copy if submitted electronically. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitutions During the Bidding Phase: See Section 00 43 25.
   2. Substitutions After the Bidding Phase: After the Contract has been executed, the Owner will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in this paragraph. Where materials, equipment, apparatus, or other products are specified by manufacturer, brand name, type or catalog number, such designation shall establish standards of quality and style desired. Any reasonable request for substitution will be considered, if in the opinion of the Architect, such materials are equal to the material specified and entirely satisfactory for use in the project. The Architect shall be the sole judge of acceptability of substitution.
      a. By making requests for substitutions based on paragraph above, the Contractor:
         1) Represents that he has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;
         2) Represents that he 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 but excludes the Architect's re-design 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, without any additional time being added to the contract schedule.
      b. The Architect will reply in writing to the Contractor stating whether the Owner, after due investigation, has reasonable objection to any such proposal. If adequate data on

any proposed manufacturer or installer is not available, the Architect may state that action will be deferred until the Contractor provides further data. Failure of the Owner to reply will constitute notice of non-acceptance. Written acceptance of substitution will not constitute a waiver of any of the requirements of the Contract Documents, and all products furnished by the listed manufacturer must comply with such requirements.

c. Timing: Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect. If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

d. Substitution Request Form:
   1) Use CSI Form 13.1A, facsimile of form provided at end of this Section.
   2) Use form provided at end of this Section.

e. Form of Acceptance: Change Order.

3. Contractor's Substitution 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.

1.05 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

1.06 PROCEDURES

A. Coordination: Modify or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
   1. 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:
      a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
      b. Substitution request is fully documented and properly submitted.
      c. Requested substitution will not adversely affect Contractor's construction schedule.
      d. Requested substitution has received necessary approvals of authorities having jurisdiction.
      e. Requested substitution is compatible with other portions of the Work.
      f. Requested substitution has been coordinated with other portions of the Work.
      g. Requested substitution provides specified warranty.
      h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.
   1. 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:
      a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume.
         1) Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
      b. Requested substitution does not require extensive revisions to the Contract Documents.
      c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
      d. Substitution request is fully documented and properly submitted.
      e. Requested substitution will not adversely affect Contractor's construction schedule.
      f. Requested substitution has received necessary approvals of authorities having jurisdiction.
      g. Requested substitution is compatible with other portions of the Work.
      h. Requested substitution has been coordinated with other portions of the Work.
      i. Requested substitution provides specified warranty.
      j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 25 00

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SECTION 01 25 01
SUBSTITUTION REQUEST FORM

PART 1 - GENERAL

1.01 THIS FORM IS PART OF THE SUBSTITUTION REQUIREMENTS SPECIFIED IN SECTION 01 25 00.

1.02 TO: MOODY NOLAN INC.

300 Spruce Street, Suite 300

Columbus, Ohio 43215

Telephone (614) 461-4664 FAX (614) 280-8881

Contact and Email: _____

ATTN: _____

1.03 SPECIFIED ITEM

Item Name: _____

Section Number _____

Paragraph _____

1.04 PROPOSED SUBSTITUTE

A. Reason for substitute request:

_____

_____

B. Attach complete description, catalog, spec data, and laboratory tests if applicable.

C. What effect will substitution have on dimensions, gauges, weights, etc. indicated in Contract Documents?

_____

_____

D. What effect will substitution have on wiring, piping, ductwork, etc. indicated in Contract Documents?

_____

_____

E. What effect will substitution have on other trades?

_____

_____

F. What effect will substitution have on construction schedule?

_____

_____

G. What are the differences in quality and performance between proposed substitute and specified product?

_____

_____

H. Manufacturer's guarantees of the specified products and proposed products are:

[ ] Same.

[ ] Different, Explain (on separate sheet if needed):

_____

_____

I. What are the differences in all sustainable design characteristics and performance between proposed substitute and specified product?

_____

_____

J. List (on separate sheet if needed), if applicable, the availability of maintenance services and replacement materials for proposed substitute.

_____

_____

K. List (on separate sheet if needed) names, addresses and phone numbers of fabricators and suppliers for proposed substitutes.

_____

_____

L. There [ ] are [ ] are no license fees and royalties pending on the proposed substitute (explain).

_____

_____

M. The undersigned certifies that this substitution meets all requirements of the Contract Documents except as specifically noted herein.

N. SUBMITTED TO CONTRACTOR BY: (Supplier/Fabricator)
   1. Firm: _____
   2. Address: _____
   3. Phone: _____
   4. Name and Title of Person Signing: _____
   5. Signature: _____
   6. Date: _____

O. SUBMITTED TO ARCHITECT BY: (Contractor)
   1. Firm: _____
   2. Address: _____
   3. Phone: _____
   4. Email: _____
   5. Name and Title of Person Signing: _____
   6. Signature: _____
   7. Date: _____

1.05 ARCHITECT/ENGINEER'S REVIEW COMMENTS:

[ ] Tentatively Accepted (pending issuance of Bulletin)

[ ] Rejected due to incomplete form.

[ ] Not Accepted - reason: _____

Signature: _____

Date: _____

Additional remarks: _____

_____

_____

END OF SECTION 01 25 01

SECTION 01 29 00
PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements governing the Contractors' Application for Payment.

B. Each Contractor: Coordinate the Schedule of Values and Applications for Payment with the Construction Schedule, List of Subcontracts and Submittal Schedule.

1.02 RELATED SECTIONS

A. Construction Schedules: Section 01 32 16.

1.03 SCHEDULE OF VALUES

A. Each Contractor: Coordinate preparation of Schedule of Values for its part of the work with preparation of Construction Schedule.
   1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
      a. Contractor's construction schedule
      b. Application for payment form, including continuation sheets.
      c. List of subcontractors.
      d. Schedule of allowances.
      e. Schedule of Alternates.
      f. List of products.
      g. List of principal suppliers and fabricators.
      h. Schedule of submittals.
   2. Submit Schedule of Values to Architect at the earliest possible date, but no later than 2 days before the date scheduled for pre-construction meeting.

B. Form and Content: Use the Project Manual Table of Contents as a guide to establish the format 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. Project number.
      d. Contractor's name and address.
      e. Date of submittal.
   2. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:
      a. Related specification section.
      b. Description of work.
      c. Name of subcontractor.
      d. Name of supplier or fabricator.
      e. Name of supplier.
      f. Change Orders (numbers) that have affected value.
      g. Dollar value.
      h. Percentage of contract sum to the nearest one-hundredth percent, adjusted to total 100 percent.
   3. Provide a breakdown of the contract sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual Table of Contents. Break principal subcontract amounts down into several line items.
   4. Round amounts off to the nearest whole dollar; the 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. Include requirements for insurance and bonded warehousing, if required.
6. Provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value for that part of the work.
7. Margins of Cost: Show line items for indirect costs, and margins of actual costs, only when such items are listed individually in Applications for Payment. Each item in the Schedule of Values and Application for Payment shall be complete. Include the total cost and proportionate share of general overhead and profit margin for each item.
    a. At the Contractor's option, temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown as separate line items in the Schedule of Values or distributed as general overhead expense.
8. Schedule Updating: Update and resubmit the Schedule of Values when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.04 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the Owner.
    1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment applications is the last day of each month. The period covered by each application for payment starts on the day following the end of the preceding period.

C. Payment Application Forms: AIA G702 and G703.

D. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Owner. Incomplete applications will be returned without action.
    1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
    2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.

E. Transmittal: Submit signed and notarized original copy of each Application for Payment to the Architect by a method ensuring receipt within 24 hours. One copy shall be complete, including waivers of liens and similar attachments, when required.
    1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Architect.

F. Waivers of Mechanics Lien: With each Application for Payment submit waivers of mechanics liens from every entity who is lawfully entitled to file a mechanics lien arising out of the contract and related to the Work covered by the payment.
    1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
    2. When an application shows completion of an item, submit final or full waivers.
    3. The Owner reserves the right to designate which entities involved in the Work must submit waivers.
    4. Waiver Delays: Submit each Application for Payment with the Contractor's waiver of mechanics lien for the period of construction covered by the application.
        a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of Work covered by the application who could lawfully be entitled to a lien.
    5. Waiver Forms: Submit waivers of lien on forms, and executed in a manner, acceptable to the Owner.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:
   1. List of subcontractors.
   2. List of principal suppliers and fabricators.
   3. Schedule of Values.
   4. Contractor's Construction Schedule (preliminary if not final).
   5. Schedule of major products.
   6. List of Contractor's staff assignments.
   7. Copies of building permits.
   8. Copies of authorizations and licenses from governing authorities for performance of the work.
   9. Initial progress report.
   10. Report of pre-construction meeting.
   11. Certificates of Insurance and insurance policies.

H. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment; this application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Administrative actions and submittals that shall proceed or coincide with this application include:
   1. Occupancy permits and similar approvals.
   2. Warranties (guaranties) and maintenance agreements.
   3. Test/adjust/balance records.
   4. Maintenance instructions.
   5. Start-up performance reports.
   6. Change-over information related to Owner's occupancy, use, operation and maintenance.
   7. Final cleaning.
   8. Application for reduction of retainage, and consent of surety.
   9. Advice on shifting insurance coverage.
   10. List of incomplete work, recognized as exceptions to Architect's Certificate of Substantial Completion.

J. Final Payment Application: Administrative actions and submittals which must proceed or coincide with submittal of the final payment Application for Payment include the following, as applicable:
   1. Completion of project close-out requirements.
   2. Completion of items specified for completion after Substantial Completion.
   3. Ensure that unsettled claims will be settled.
   4. Ensure that work not complete and accepted will be completed without undue delay.
   5. Transmittal of required Project construction records to Owner.
   6. Proof that fees and similar obligations have been paid.
   7. Removal of temporary facilities and services.
   8. Removal of surplus materials, rubbish and similar elements.
   9. Change of door locks to Owner's access.

END OF SECTION 01 29 00

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SECTION 01 31 00
PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Coordination Drawings.
   3. Administrative and supervisory personnel.
   4. Requests for Interpretation (RFIs).
   5. Pre-Installation Conferences.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility may be assigned to a specific contractor.

1.02 RELATED SECTIONS

A. Project Meetings: Section 01 31 19.

1.03 DEFINITIONS

A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.04 INFORMATIONAL SUBMITTALS

A. Key Personnel Names: Within 15 (calendar) days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
   1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.05 GENERAL COORDINATION PROCEDURES

A. 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. 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.
   1. 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: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
   1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.06 COORDINATION DRAWINGS

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. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
      b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
      c. Indicate required installation sequences and for anticipated replacement of components during the life of the installation.
      d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
      e. Indicate required installation sequences.
      f. 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 sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
      g. Complete sufficient demolition to confirm dimensions and clearances before submitting drawings.
      h. Preparation of coordination drawings of the Work specified in divisions 21 through 28 shall include the following procedure:
         1) Ductwork shop drawings shall be prepared indicating bottom of duct elevations.
         2) A reproducible of these drawings shall be given to the sub-contractors responsible for Division 21 through Division 28 work, and they shall each review the drawing for conflicts with their work.
         3) Contractor shall hold coordination meetings at which coordination conflicts will be resolved. Contractor to document agreed to coordination resolution.
         4) Installation of work may not proceed without resolution of coordination conflicts by the Contractor. Work not installed in accordance with the agreed to coordination documents is subject to replacement if conflicts remain, with related costs borne by the Contractor.

B. Coordination Drawing Organization: Organize coordination drawings as follows:
   1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of

visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.

2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:
    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Show plumbing lines. Notate code required slope elevations.
    c. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    d. Fire-rated enclosures around ductwork.
7. Electrical Work: Show the following:
    a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger and racks of smaller conduit are required.
    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
    d. Location of pull boxes and junction boxes, dimensioned from column center lines.
8. Fire-Protection System: Show locations of standpipes, mains piping, branch lines, pipe drops, sprinkler heads and inspected test valve drains.
9. Review: Consultant will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Consultant determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Consultant will so inform Contractor, who shall make changes as directed and resubmit.

C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
    1. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.
    2. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
        a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
        b. Execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.]

1.07 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
    1. Include special personnel required for coordination of operations with other contractors.

1.08 REQUESTS FOR INFORMATION (RFI'S)

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. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

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: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
      a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Hard-Copy RFIs: Identify each page of attachments with the RFI number and sequential page number.

D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.
   1. Attachments shall be electronic files in Adobe Acrobat PDF format.

E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow 15 calendar 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 for approval of submittals.
      b. Requests for approval of substitutions.
      c. Requests for approval of Contractor's means and methods.
      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 Change Proposal according to Division 01 Section "Contract Modification Procedures."
      a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

F. 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 days if Contractor disagrees with response.

G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. 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.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.09 PREINSTALLATION CONFERENCE

A. Where required in individual specification Sections, conduct a preinstallation conference at Project site.
   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. Contract Documents.
      b. Options.
      c. Related RFIs.
      d. Related Change Orders.
      e. Purchases.
      f. Deliveries.
      g. Submittals.
      h. Review of mockups.
      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. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
   4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
   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.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 31 00

SECTION 01 31 19
PROJECT MEETINGS

PART 1 GENERAL

1.01 SCOPE

A. This section specifies administrative and procedural requirements for project meetings including:
   1. Pre-Construction Meeting.
   2. Progress Meetings.
   3. Specially called meetings.

1.02 RELATED SECTIONS

A. Project Management and Coordination: Section 01 31 00.

1.03 DESCRIPTION

A. Schedule and administer preconstruction meeting, progress meetings and specially called meetings throughout the progress of the work.
   1. Prepare agenda for meetings.
   2. Preside at meetings.
   3. Record the minutes; include all significant proceedings and decisions.
   4. Reproduce and distribute copies of minutes.
      a. To all participants in the meeting.
      b. To all parties affected by decisions made at the meeting.

B. Make physical arrangements for meetings.

C. Representatives of the Contractors, subcontractors and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents.

1.04 PRE-CONSTRUCTION MEETING

A. Scheduled within 15 days after date of Notice to Proceed.

B. Location: A central site, convenient for all parties, designated by Contractor.

C. Attendance
   1. Owner's Representative
   2. Architect and Consultants
   3. Prime Contractors' Superintendents
   4. Major Subcontractors
   5. Major Suppliers

D. Agenda: Discuss items of significance that could affect progress, including the following:
   1. Tentative construction schedule.
   2. Critical work sequencing and long-lead items.
   3. Designation of key personnel and their duties.
   4. Lines of communications.
   5. Procedures for processing field decisions and Change Orders.
   6. Procedures for RFIs.
   7. Procedures for testing and inspecting.
   8. Procedures for processing Applications for Payment.
   9. Distribution of the Contract Documents.
   10. Submittal procedures.
   11. Preparation of Record Documents.
   12. Use of the premises.
   13. Work restrictions.
   14. Working hours.
   15. Responsibility for temporary facilities and controls.

16. Procedures for moisture and mold control.
17. Procedures for disruptions and shutdowns.
18. Construction waste management and recycling.
19. Parking availability and restrictions.
20. Office, work, and storage areas.
21. Equipment deliveries and priorities.
22. First aid.
23. Security.
24. Progress cleaning.
25. Owner's occupancy requirements.
26. Phasing.

1.05 PROGRESS MEETINGS

A. Schedule regular periodic meetings, as required.

B. Hold called meetings as required by progress of work.

C. Location of the Meetings: Project field office of the General Contractor.

D. Attendance
1. Architect and consultants as needed.
2. Prime Contractors.
3. Subcontractors as appropriate to the agenda.
4. Suppliers as appropriate to the agenda.
5. Owner's Representative

E. Suggested Agenda
1. Review, approval of minutes of previous meeting.
2. Review of work progress since previous meeting.
3. Field observations, problems, conflicts.
4. Problems which impede Construction Schedule.
5. Review of off-site fabrication, delivery schedules.
6. Corrective measures and procedures to regain projected schedule.
7. Revisions to Construction Schedule.
8. Plan progress, schedule, during succeeding work period.
9. Coordination of schedules.
10. Review submittal schedules; expedite as required.
11. Maintenance of quality standards.
12. Review proposed changes for:
    a. Effect on Construction Schedule and on completion date.
    b. Effect on other contracts of the project.
13. Status of RFIs.
14. Status of proposal requests.
15. Pending changes.
16. Status of Change Orders.
17. Pending claims and disputes.
18. Documentation of information for payment requests.
19. LEED

1.06 PRE-INSTALLATION CONFERENCES

A. Section 01 31 00.

END OF SECTION 01 31 19

SECTION 01 32 16
CONSTRUCTION SCHEDULES

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. These requirements generally describe the form of the construction schedule, a basic description of the schedule contents and the submittal procedures. This Section is a supplement to Paragraph 3.10 and other paragraphs of the General Conditions. Refer to General Conditions for additional requirements regarding the Contractor's necessity to maintain the approved construction schedule and the project completion.

B. Authorization to proceed with the work will not be given until the construction schedule has been approved by the Architect.

1.02 FORM OF SCHEDULES

A. Prepare schedules in the form of a time-scaled logic diagram, defined as a network logic diagram with connecting lines specifically identifying relationships between all activities of the work using the "Critical Path Method".

1. Diagram may be machine plotted or hand drafted showing the activities duration time-scaled to the appropriate calendar in an easily readable format as approved by Architect. Base schedule on the early start early finish dates of the activities. All relationships between activities must be clearly noted including associated lag times, if required. The diagram must also have the critical path (the series of activities with the least value of total float) clearly marked. In addition, the Contractor must provide a tabular report indicating the early start, early finish, late start, late finish, and total float for every activity in the schedule.

1.03 CONTENT OF SCHEDULES

A. Quantity of Activities: Defined by complexity of the project. An adequate number of activities are to be included in the project in order that sufficient detail of the demolition process (and resulting temporary construction) and weekly progress requirements are clearly stated.

B. Where applicable, progress schedule must also include a shop drawing schedule with the activities "Prepare Shop Drawings", "Architect Review and Approval", and "Fabricate and Deliver to the Jobsite". This sequential series of activities must be assigned to each item on the project which requires a shop drawing or performance data submittal prior to its installation. The shop drawing schedule shall be tied directly to the progress schedule, but shall be provided to the Architect as a separate time-scaled logic diagram.

C. Architect reserves the right to request that the schedule of activities be presented in a different format or organization than described above.

1.04 PROGRESS REVISIONS

A. Update schedule and submit in the above format each month with pay requests. Progress completion shall be defined as the remaining duration of any activity which started on or before the schedule update. In addition, revise the duration of all activities as more accurate scheduling information becomes available.

1. Indicate progress of each activity to date of submission.
2. Show changes occurring since previous su]bmission of schedule:
    a. Major changes in scope.
    b. Activities modified since previous submission.
    c. Revised projections of progress and completion.
    d. Other identifiable changes.

B. Provide a narrative report as needed to define:

1. Problem areas, anticipated delays, and the schedule.
2. Corrective action recommended, and its effect.

1.05 SUBMITTALS

A. Submit initial schedules within 15 days after award of Contract.
   1. Architect will review schedules and return review copy within 10 days after receipt.
   2. If required, resubmit within 7 days after return of review copy.

B. Submit revised progress schedules with each application for payment.

C. Submit four opaque copies of initial schedule, large enough to show entire schedule for entire construction period.
   1. Submit an electronic copy of schedule, using software indicated, in .pdf format. Include type of schedule (Initial or Updated) and date on label.

1.06 DISTRIBUTION

A. Distribute copies of the reviewed schedules to:

1.07 JOB SITE FILE.

1. Subcontractors.
2. Owner.
3. Architect.
4. Other concerned parties.

END OF SECTION 01 32 16

SECTION 01 33 23
SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.02 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.

1.03 GENERAL REQUIREMENTS

A. Requirements of this Section are in addition to the requirements of the General Conditions.

B. This Section includes procedures for processing:
   1. Shop drawings.
   2. Product data.
   3. Samples.
   4. Certificates of compliance.
   5. Reports.
   6. Schedules.
   7. Design data.
   8. Other submittals listed.

C. Completed reviews of submittals do not constitute a change order.

D. 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.
      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

E. Submittals Schedule: See Section 01 32 16, Construction Schedules, for list of submittals and time requirements for scheduled performance of related construction activities.
   1. Submittals received prior to receipt of the initial Submittals Schedule will be rejected.
   2. Submittals received prior to the time they are indicated on the Submittal Schedule to be submitted will be rejected.

F. Provide all submittals far enough in advance of scheduled dates for installation to provide sufficient time for review(s), for possible revisions and resubmittals, and for placing orders and securing delivery.
   1. Provide samples via postal or delivery service to Architect or appropriate consultant for their review.
   2. Delays caused by the tardiness of the Contractor in preparing and forwarding submittals will not be an acceptable basis for an extension of the Contract completion date or for consideration of alternate products which do not meet the specified requirements of this Project Manual.
      a. Initial Review: Allow 14 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.
   3. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

4. Resubmittal Review: Allow 14 days for review of each resubmittal.
5. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is necessary, allow 14 days for initial review of each submittal.
6. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 14 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

G. 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 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.
      1) Submittal number shall use Specification Section number.
   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.

H. Notify Architect in writing at time of submittal of deviations from the requirements of the Contract Documents. In addition, highlight, encircle, or otherwise specifically identify deviations.

I. 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: 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. Submittal and transmittal distribution record.
   k. Remarks.
   l. Signature of transmitter.
2. 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.

J. Resubmittals: When Architect requires that a submittal be resubmitted, comply with requirements of this section.
1. Identify changes made since the previous submittal.

K. 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.

L. Digital Documents: At Contractor's written request, copies of Architect's Digital Documents will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:
   1. Execute Agreement & Waiver Release of Digital Documents provided by the Architect to obtain files.
   2. The digital documents are provided for the Contractor’s convenience and their use will be at the Contractors risk.
      a. There are no assurances that the information in the digital doucments is current. All dimensions must be field-verified.

M. Electronic PDF Submittals: When acceptable, prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

N. Submittals for Web-Based Project Software: When acceptable, prepare submittals as PDF files, or other format indicated by Project software website.

1.04 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

B. Product Data
   1. Submit only pages which are pertinent.
      a. Mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number.
      b. Show reference standards, performance characteristics, and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances.
   2. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.
   3. Stamp and sign each set of manufacturer's product data before submitting to Architect to certify compliance with Contract Documents.
   4. Number of Copies Required: Submit two paper copies of Product Data, and in portable data file (.pdf) format, unless otherwise indicated. When submitting for Concurrent Consultant Review, submit two copies to Consultant and one copy to Architect. Architect will return one copy. Mark up and retain returned copy as a Project Record Document.
      a. Reproduction and cost of reproduction of processed Product Data for distribution to concerned parties is Contractor’s responsibility.

C. Shop Drawings
   1. Reproduction of any portion of the Contract Documents for use as submittals for Shop Drawings is not acceptable.
   2. Submit Shop Drawings in a clear and thorough manner.
      a. Title each drawing with Project name.
      b. Identify each element of drawings by reference to sheet number and detail, schedule, or room number of Contract Documents.
   3. Identify the following:
      a. Requirements of the individual section of Project Manual.
      b. Field measurements.
      c. Field construction criteria.
      d. Relation to adjacent or critical features of the Work or products.
      e. Conformance of submittal with requirements of Contract Documents.
   4. Each sheet of Shop Drawings shall be stamped and signed by Contractor before submitting to Architect. Certify compliance with requirements of Contract Documents.

5. Review by the Architect shall not relieve Contractor from his responsibility in preparing and submitting proper Shop Drawings in accordance with his current obligations.
6. All submissions which, in the opinion of the Architect are incomplete, contain errors or have not been checked or only superficially checked, will be returned unchecked by the Architect for resubmission.
7. Fabrication of products or start of work before required Shop Drawings are reviewed by Architect and returned to Contractor shall be at Contractor's risk.
8. Number of Copies Required: Submit two paper copies of each submittal, and in portable data file (.pdf) format, unless indicated otherwise. When submitting for Concurrent Consultant Review, submit two copies to Consultant and one copy to Architect. Architect will return one copy. Mark up and retain one returned copy as a Project Record Drawing.
    a. Reproduction and cost of reproduction of processed Shop Drawings for distribution to concerned parties is Contractor’s responsibility.
    b. This procedure is to be followed for each submission of a drawing or group of drawings until they are finally reviewed by the Architect.

D. Office 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.
    a. Provide samples via postal or delivery service to Architect or appropriate consultant for review.
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. Disposition: Maintain sets of reviewed 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.
    a. 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.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
4. 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 Required: Submit two sets of Samples. Architect will retain one Sample set; the other will be returned.
        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 two sets of paired units that show approximate limits of variations.

E. Mock-Up Samples: Where samples are specified in the individual specification sections for use in constructing mock-ups, comply with requirements for "Office Samples", and process transmittal forms for mock-ups to provide a record of activity.

F. Submittals Schedule: Refer to project Construction Schedule.

1.05 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.
   1. Number of Copies: Submit one copy of each submittal, unless otherwise indicated. Architect will not return copy.
   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. Test and Inspection Reports.

B. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

C. 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.

D. 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.

E. 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.

F. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

G. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

H. 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.

I. 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.

J. 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:
   1. Name of evaluation organization.
   2. Date of evaluation.
   3. Time period when report is in effect.
   4. Product and manufacturers' names.
   5. Description of product.
   6. Test procedures and results.
   7. Limitations of use.

K. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

L. 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.

M. 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.

N. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment.

O. Design Data: 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.

P. 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.

Q. Manufacturer's Field Reports: Prepare written information documenting factory authorized service representative's tests and inspections. Include the following, as applicable:
   1. Name, address, and telephone number of factory-authorized service representative making report.
   2. Statement on condition of substrates and their acceptability for installation of product.
   3. Statement that products at Project site comply with requirements.
   4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
   5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   6. Statement whether conditions, products, and installation will affect warranty.
   7. Other required items indicated in individual Specification Sections.

R. Insurance Certificates and Bonds: 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.

S. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect, except as required in "Action Submittals" Article. Retain copies at jobsite.

T. Coordination Drawings: Submit when applicable and as required.

1.06 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.
   1. 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: In addition to Shop Drawings, Product Data, and other required submittals, submit 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. When submitting for Concurrent Consultant Review, submit two copies to Consultant and one copy to Architect.

1. 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 APPLICABLE)

PART 3 EXECUTION

3.01 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 Contractor's approval stamp before submitting to Architect.

3.02 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. Reference the General Conditions for Architect's review responsibilities. Review of a specific item does not indicate acceptance or review of an assembly of which the item is a component. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
   1. **NO EXCEPTIONS TAKEN**: No further review of submittal is required.
   2. **MAKE CORRECTIONS NOTED**: Incorporate corrections in work; resubmission of submittal is not required.
   3. **REVISE AND RESUBMIT**: Revise as noted; resubmit submittal for review.
   4. **REJECTED**: Submittal is not in compliance with Contract Documents.
   5. **FOR RECORD ONLY**: Filed for record or information purposes only, not reviewed.
   6. **NOT REQUIRED FOR REVIEW**: Submittal is not required by Contract Documents; not reviewed.

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 will forward each submittal to appropriate party.

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 23

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Submittal Review Cover

Moody Nolan

1. Contractor or Construction Manager

Submittal Number

Project

Project Number

Drawing Number and Specification Section

Manufacturer or Supplier

- ☐ **Calculations**
- ☐ **Certifications or Qualifications**
- ☐ **Coordination Drawing**
- ☐ **LEED Submittal**
- ☐ **Other:**
- ☐ **Product Data**
- ☐ **Samples** Copies: _____
- ☐ **Schedules**
- ☐ **Shop Drawings**

Item(s) Being Submitted

○ **Action** ○ **Information Only** ○ **Record**

Submitted For

○ **Low** ○ **Moderate** ○ **High** ○ **Critical**

Priority

Remarks or Deviations

Submitted By Date

Contractor Certification *Uncertified submittals will be returned without review.*

Reviewed By Date

2. Architect or Engineer

*To be filled **after** section above is completed.*

Date Received

Comments *See attached sheet(s) for additional comments.*

- ○ **No Exceptions Taken**
  No further review of submittal is required.
- ○ **Revise and Resubmit**
  Revise as noted; resubmit for review.
- ○ **For Record Only**
  For record or information purposes only.
- ○ **Make Corrections Noted**
  Incorporate corrections in work; resubmission is not required.
- ○ **Rejected**
  Submittal is not in compliance with Contract Documents.
- ○ **Not Required for Review**
  Submittal is not required by Contract Documents.

This review is for general conformance with the design concept and the contractor remains responsible for:

1. compliance with the contract documents
2. confirming and correlating quantities and dimensions
3. selecting fabrication processes and techniques of construction
4. coordination of the work with other trades
5. review of a specific item shall not indicate an approval of an assembly of which the item is a component

This review neither extends nor alters any contractual obligations of the architect or contractor, and does not authorize changes in the contract sum, nor time.

Reviewed By Date

Submittal Review Cover

Moody Nolan

2. Architect or Engineer

Additional Comments

Teamed Architect or Engineer Certification

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 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-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 quality-control procedures that facilitate compliance with the Contract Document requirements.
   3. Requirements for Contractor to provide quality-control services required by A/E, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.02 RELATED SECTIONS

A. Cutting and Patching (for repair and restoration of construction disturbed by testing and inspecting activities): Section 01 73 29.

B. Specific test and inspection requirements: Divisions 02 through 49 Sections.

1.03 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by A/E.

C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups 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. Mockups establish the standard by which the Work will be judged.

D. Preconstruction 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.

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: 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.
   1. 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 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.

1.04 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.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to A/E.

1.05 REFERENCE STANDARDS

A. 29 CFR 1910 - Occupational Safety and Health Standards; Current Edition.

1.06 CONFLICTING REQUIREMENTS

A. 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. Refer uncertainties and requirements that are different, but apparently equal, to A/E for a decision before proceeding.

B. Minimum Quantity or Quality Levels: 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 to A/E for a decision before proceeding.

1.07 SUBMITTALS

A. Shop Drawings: For integrated exterior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
   1. Indicate manufacturer and model number of individual components.
   2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit 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, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

C. Testing Agency Qualifications: For testing agencies 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.

D. Reports: Prepare and submit certified written reports that include the following:
   1. Date of issue.
      a. Project title and number.
   2. Name, address, and telephone number of testing agency.
   3. Dates and locations of samples and tests or inspections.
   4. Names of individuals making tests and inspections.
   5. Description of the Work and test and inspection method.
      a. Identification of product and Specification Section.
   6. Complete test or inspection data.
   7. Test and inspection results and an interpretation of test results.
   8. Ambient conditions at time of sample taking and testing and inspecting.

9. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
10. Name and signature of laboratory inspector.
    a. Recommendations on retesting and re-inspection.

E. 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.

1.08 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. 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.

C. 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.

D. 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.

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 is 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.
    1. 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.
    a. 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.

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.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction 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. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
f. 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 A/E, 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.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by A/E.
2. Notify A/E seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain A/E's approval of mockups before starting work, fabrication, or construction.
a. Allow seven days for initial review and each re-review of each mockup.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
a. Cover mock-ups to protect them from deterioration and weathering.
6. Demolish and remove mockups when directed, unless otherwise indicated.

1.09 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.
2. Payment for these services will be made by the Owner.
3. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
1. 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.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with A/E and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify A/E and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   3. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to A/E, Engineer and Owner with copy to Contractor and to authorities having jurisdiction.
   4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
   5. Do not perform any duties of Contractor.

G. 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. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   6. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.10 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by [OBC] [IBC] as the responsibility of the Owner, and as follows:

B. Special Tests and Inspections: Conducted by a qualified special inspector 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 A/E 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 A/E 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.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 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 A/E.
   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 A/E's reference during normal working hours.

3.02 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Comply with requirements of Section 01 73 29, 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

SECTION 01 45 00
QUALITY CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Administrative and Procedural Requirements for project Quality Control.

B. Including but not limited to, Font Water, Fountain Water, Duct, Piping, and testing laboratory services for materials, products, and construction methods.

1.02 PERFORMANCE REQUIREMENTS

A. Inspection and testing by Owner, Architect, Contractor, their consultants or government agencies to examine Work performed by Contractor does not relieve Contractor of responsibility for compliance with Contract Documents.

B. Quality control services include inspections, tests and related actions including reports, performed by Contractor. They do not include inspections, tests or related actions performed by Architect, Owner, governing authorities or independent agencies hired by Owner or Architect.

1. Contractor and each agency engaged to do inspections, tests, and similar services will coordinate sequence of activities to accommodate required services with minimum of delay. In addition, Contractor and each agency will coordinate activities to avoid necessity of removing and replacing construction to accommodate inspections and tests. Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.
2. Provide inspections, tests, and similar quality control services specified in individual specification Sections or required by governing authorities.
3. Where results of inspections, tests, or similar services show that the Work does not comply with Contract Document requirements, correct the deficiencies in the Work.
4. Cooperate with agencies performing required inspections, tests, and similar services and provide reasonable auxiliary services as requested. Notify agency sufficiently before operations to allow assignment of personnel. Auxiliary services required include but are not limited to -
    a. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
    b. Taking adequate quantities of representative samples of materials that require testing or helping agency in taking samples.
    c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
    d. Providing agency with preliminary design mix proposed for use for materials mixes that require control by testing agency.
    e. Securing and protecting samples and test equipment at Project site.

C. Upon completion of inspection, testing, sample-taking, and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with Contract Documents in making such repairs.

D. Protect construction exposed by or for quality control service activities and protect repaired construction.

E. Repair and protection are Contractor's responsibility, regardless of who caused the inspection, testing, or similar services.

1.03 TESTING AND INSPECTING SERVICES

A. Contractor is responsible to install, make operational, and perform their own testing and balancing for their Work during the commissioning process. Owner will engage independent testing and inspection services to verify that work is acceptable.

B. Duties of Testing Agency:
   1. Independent testing agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual specification Sections will cooperate with Architect and Contractor in performance of its duties and will provide qualified personnel to perform required inspections and tests.
   2. Agency will notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   3. Agency is not authorized to release, revoke, alter, or enlarge requirements of Contract Documents, or approve or accept any portion of the Work.
   4. Agency will not perform any duties of Contractor.

C. Submittals:
   1. Independent testing agency will submit certified written report of each inspection, test, or similar service, to Architect, in duplicate, unless Contractor is responsible for service. If Contractor is responsible for service, submit certified written report of each inspection, test, or similar service through Contractor, in duplicate.
      a. Submit additional copies of each written report directly to governing authority, when authority so directs.
      b. Written reports of each inspection, test, or similar service will include, but not be limited to:
         1) Date of issue.
         2) Project name.
         3) Project number.
         4) Project Location.
         5) Project Architect and Engineer.
         6) Name, address and telephone number of testing agency.
         7) Name of Contractor and sub-contractor.
         8) Dates and locations of samples and tests or inspections.
         9) Names of individuals making the inspection or test.
         10) Designation of the Work and test method.
         11) Identification of product and specification Section.
         12) Date tests were performed.
         13) Complete inspection or test data.
         14) Test results and interpretations of test results.
         15) Ambient conditions at time of sample-taking and testing.
         16) Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.
         17) Name and signature of laboratory inspector.
         18) Recommendations on retesting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 45 00

SECTION 01 45 33
SPECIAL INSPECTIONS AND STRUCTURAL TESTS

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Special Inspections and Structural Testing shall be in accordance with applicable project Building Code.

B. The program of Special Inspection and Structural Testing is a Quality Assurance program intended to ensure that the work is performed in accordance with the Contract Documents.

C. This specification section is intended to inform the Contractor of the Owner's quality assurance program and the extent of the Contractor's responsibilities. This specification section is also intended to notify the Special Inspector, Testing Laboratory and other Agents of the Special Inspector of their requirements and responsibilities.

D. The Owner has obtained the services of a qualified professional to perform the special inspections and structural testing required by applicable project Building Code.

1.02 CONTRACTOR RESPONSIBILITIES

A. The Contractor shall cooperate with the Special Inspector and his agents so that the special inspections and testing may be performed without hindrance.

B. The Contractor shall be responsible for coordinating and scheduling inspections and tests. The Contractor shall notify the Special Inspector or Testing Laboratory at least 24 hours in advance of a required inspection or test. Uninspected work that required inspection may be rejected solely on that basis.

C. The Contractor shall provide incidental labor and facilities to provide access to the work to be inspected or tested,, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, storage and curing of test samples.

D. The Contractor shall keep at the project site the latest set of construction drawings, field sketches, approved shop drawings, and specifications for use by the inspectors and testing technicians.

E. The Special Inspection program shall in no way relieve the Contractor of his obligation to perform work in accordance with the requirements of the Contract Documents or from implementing an effective Quality Control program. All work that is to be subjected to Special Inspections shall first be reviewed by the Contractor's quality control personnel.

F. The Contractor shall be solely responsible for construction site safety.

1.03 LIMITS OF AUTHORITY

A. The Special Inspector or Testing Laboratory may not release, revoke, alter, or enlarge on the requirements of the Contract Documents.

B. The Special Inspector or Testing Laboratory will not have control nor responsibility over the Contractor's means and methods of construction.

C. The Special Inspector or Testing Laboratory shall not be responsible for construction site safety.

D. The Special Inspector or Testing Laboratory has no authority to stop the work.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 45 33

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SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Requirements of this Section apply to the Work of all other Sections.

B. Section Includes:
   1. Transportation and Handling.
   2. Storage and Protection.
   3. Standards.
   4. Manufacturers and Types.
   5. Fabrications.
   6. Shop Priming.
   7. Prohibited Materials and Methods.

1.02 RELATED SECTIONS

A. Quality Requirements: Section 01 40 00.

B. Cutting and Patching: Section 01 73 29.

C. Shop Drawings, Product Data and Samples: Section 01 33 23.

D. Execution Requirements: Section 01 73 00.

E. Sustainable Design Requirements: Section 01 81 13.

1.03 STANDARDS

A. Standards, codes and regulations published by Manufacturer's Associations, governmental agencies and other regulatory authorities form a part of these Specifications as minimum requirements. Such references include the latest issue and all amendments up to 30 days prior to the Bid Date.

B. "Governing Authority" means all federal, state and local laws and regulations.

C. Where differences occur between the Contract Documents and such standards, the most restrictive requirement shall apply.

D. Supply all materials and perform all work in accordance with the Manufacturer's Specifications and installation procedures, and in conformance with published trade and manufacturer's association standards, unless specifically noted otherwise herein.

1.04 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accordance with construction schedules and installation, coordinate to avoid conflict with work and conditions at the site.
   1. Transport products by methods to avoid product damage.
   2. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
   3. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and accepted submittals, and that products are properly protected and undamaged.

B. Provide equipment and personnel to handle products by methods to prevent soiling or damage.

1.05 DELIVERY, HANDLING, STORAGE AND PROTECTION

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. 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.

C. 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.
   1. 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.
   2. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected. Reject damaged and defective items.

D. Storage products in accordance with manufacturer's instructions.
   1. Store products with seals and labels intact and legible.
   2. Store products to allow for inspection and measurement of quantity or counting of units.
   3. Store products subject to damage by the elements in weathertight enclosures.
   4. Maintain temperature and humidity within the ranges required by manufacturer's instructions.
   5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

E. Exterior Storage
   1. Store fabricated products above the ground, on blocking or skids, to prevent soiling or staining. Cover products which are subject to deterioration with impervious coverings. Provide adequate ventilation to avoid condensation.
   2. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign materials.
   3. Store foam plastic away from exposure to sunlight, except to extent necessary for period of installation and concealment.

F. Arrange storage in a manner to provide access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage.

G. Protection After Installation: Provide coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove when no longer needed.

PART 2 PRODUCTS

2.01 GENERAL PRODUCT REQUIREMENTS

A. Products include materials, equipment and systems.

B. Products incorporated into the work:
   1. Comply with specifications and referenced standards as minimum requirements.
   2. Undamaged.
   3. Manufactured and fabricated products:
      a. Design, fabricate and assemble in accordance with the best engineering and shop practices.
      b. Manufacture like parts of duplicate units to standard sizes and gages, to be interchangeable.
      c. Two or more items of the same kind shall be identical, by the same manufacturer.
      d. Products shall be suitable for service conditions.
      e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing by the Architect.
   4. Do not use material or equipment for any purpose other than that for which it is designed or is specified.
   5. New and unused at time of installation, except as otherwise indicated.
   6. 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.

7. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

C. Sustainable Design Product Material:

D. See Section 01 81 13 for required project goals.
   1. The specified product selections contain sustainable design attributes to achieve project goals. Proposed comparable products must meet or exceed specified product attributes to be considered for acceptance.

2.02 MANUFACTURER AND PRODUCT SELECTION PROCEDURES

A. Specified Product: Where specifications name a single manufacturer and product or refer to a single manufacturer and product indicated on the drawings, provide the named product. Comparable products or substitutions for Contractor's convenience will not be considered.

B. Specified Manufacturer: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

C. Multiple Specified Products: Where more than one manufacturer and specific product is listed, provide one of the products named. No substitutions will be permitted after signing the contract. Comparable products or substitutions for Contractor's convenience will not be considered

D. Multiple Manufacturers: Where specifications include a list of manufacturers names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

E. Basis of Design: Where specifications name a Basis of Design or refer to a Basis of Design product indicated on the drawings, the design is based on the product listed. Subject to compliance with requirements, provide the specified product or a product manufactured by one of the other manufacturers listed.

F. The characteristics of the Basis-of-Design Product 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 additional manufacturers named in the specification.
   1. Equipment or materials from these manufacturers will be acceptable contingent upon their meeting the design, appearance and functional standards established by the specified items. If equipment or a material of an acceptable manufacturer requires changes; electrically, mechanically, structurally, from what is indicated on the drawings, it shall be the responsibility of the Contractor requiring such change, to pay all costs involved with no additional costs to the Owner.
   2. Submit evaluations as follows:
      a. Submit proposed comparable products for evaluation by the Architect at least two weeks prior to awarding contract to the manufacturer of a comparable product.
      b. Obtain samples of Basis-of-Design product.
      c. Select comparable products that comply with the characteristics specified. Submit evidence demonstrating compliance.
      d. Submit samples of comparable products displayed side-by-side with samples of Basis-of-Design products.
      e. Architect will determine whether the proposed comparable product is acceptable. Architect is not obligated to prove non-equivalence of proposed comparable products.

G. Where a performance is specified and no manufacturer is listed, submit through the Shop Drawing procedure the name of the manufacturer, the product proposed, and detailed information showing its characteristics. Such proposal shall meet or exceed the specification, line item by line item, or be rejected.

2.03 EQUIVALENT COMPONENTS (ARTICLES, DEVICES, MATERIALS, FORMS OF CONSTRUCTION, FIXTURES, ETC.) MAY BE SUBMITTED TO THE ARCHITECT FOR APPROVAL PRIOR TO BIDDING REGARDLESS OF LISTED MANUFACTURERS.

A. Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.04 CONFLICTING REQUIREMENTS

A. Documents: If documents state 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 A/E for a decision before proceeding.

2.05 FABRICATION

A. Fabricate all items in the shop insofar as practicable. Where items cannot be completely shop fabricated and assembled for shipment, assemble and fit in shop, disassemble and ship. Identify parts for field assembly.

B. Fabricate items to be straight, square, in proper alignment, and with hairline joints where joints are necessary and permitted. Pre-plan field joints to be as inconspicuous as possible; coordinate locations with Architect.

2.06 SHOP PRIMING

A. Shop prime or seal surfaces of all products to receive paint materials in accordance with the requirements of Section 09 91 00.

B. Apply a primer or sealer compatible with the specified paint materials.

C. In the event such a primer is determined to be incompatible with the specified finish paint system, provide a barrier coat or remove the primer and reprime as directed, at no additional cost to the Owner.

2.07 PROHIBITED MATERIALS AND METHODS

A. The following items are expressly prohibited:
   1. Attachment Related Items
      a. Powder Fasteners: Powder fasteners are defined as anchors which are driven into place by any device which produces an impact force by use of a powder charge, compressed air, gas or any other propellent. Powder fasteners prohibited for the following conditions:
         1) Attachment of structural members.
         2) Where public may be endangered by misuse.
      b. Plug anchorage by use of wood, lead or plastic.
      c. Perforated steel strap iron for pipe or other support or anchorage.
      d. Suspension systems that are not independently supported.
         1) Ceiling grid systems shall not be supported from ductwork, electrical conduit, heating or plumbing lines, and vice versa.
         2) Each utility system and the ceiling system shall be a separate installation, each independently supported from the building structure.
         3) Where interference occurs, provide trapeze type hangers or other suitable supports for each system.
         4) Locate hangers and supports where they will not interfere with access to mixing boxes, fire dampers, valves, and other appurtenances requiring servicing.
   2. Methods Related Items
      a. The penetration of floors and walls by pipes, ducts, or other penetrations unless openings are appropriately fire stopped by fire doors or fire dampers, and voids around pipes, ducts, conduits, etc. are sealed with fireproof materials.

b. The use of ink marking pens on surfaces of any kind of materials receiving paint or other finish in exposed location.

3. Materials Related Items
   a. Asbestos or asbestos containing materials.
   b. Barbed wire in construction fencing.
   c. Water soluble treatment of insulation jackets or facings, to impede or retard smoke or flames.
4. Earthwork Related Items
   a. Use of explosives is prohibited.
   b. Grits as backfill material.
5. Masonry Related Items
   a. Chicken wire type masonry reinforcing.
   b. Cinder block.
   c. Muriatic acid.
6. Door Related Items
   a. Knock-down (KD) door frames.
   b. Thresholds raised more than 1/2" at doors indicated as wheel chair accessible.
7. Roofing Related Items
   a. Dead level roofs. All roofs must slope to drain.
   b. Pitch pans or pitch pockets.

PART 3 EXECUTION - NOT USED

END OF SECTION 01 60 00

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SECTION 01 64 00
OWNER-FURNISHED PRODUCTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Owner and Contractor responsibilities for items furnished by the Owner.

1.02 OWNER'S RESPONSIBILITIES

A. Where applicable, provide the following:
   1. Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to Contractor.
   2. Deliver supplier's bill of materials to Contractor.

B. Arrange and pay for delivery to site in accordance with Contractor's progress schedule.

C. Inspect deliveries jointly with Contractor.

D. Submit claims for transportation damage.

E. Arrange for replacement of damaged, defective, or missing items.

F. Arrange for manufacturer's field services; arrange for and deliver manufacturer's warranties and bonds to Contractor.

1.03 CONTRACTOR'S RESPONSIBILITIES

A. Designate submittal and delivery dates for each product in a schedule of Owner furnished items. Submit this schedule concurrently with the first submission of the progress schedule.

B. Where applicable, review shop drawings, product data, samples, and other submittals.

C. Inspect deliveries jointly with Construction Manager, record shortages, and damaged or defective items.

D. Handle products at site, including uncrating and storage.

E. Protect products from damage, and from exposure to element.

F. Assemble, install, connect and adjust products.

G. Arrange for installation inspections required by public authorities.

H. Repair or replace items damaged or lost.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 64 00

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SECTION 01 71 23
FIELD ENGINEERING

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies administrative and procedural requirements for field engineering services, including, but not necessarily limited to, the following:
   1. Establishing and maintaining lines and levels;
   2. Structural design of shores, forms and similar items provided by the subcontractor as part of their means and methods of construction.

1.02 SUBMITTALS

A. Project Record Documents: Where applicable, each contractor shall submit a record of work performed as required under the provisions of Section 01 78 39, Record Documents.

1.03 QUALITY ASSURANCE

A. Use adequate number of skilled workmen who are thoroughly trained and experienced in the necessary craft and who are completely familiar with the specified requirements and the methods needed for proper performance of the work.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.01 GENERAL

A. Each trade contractor is responsible for any and all layout required to complete their scope of work.

B. Verify layout information shown on the drawings, in relation to the property survey and existing benchmarks before proceeding to the layout work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.

C. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points, or requirements to relocate reference points, or requirements to relocate reference points because of necessary changes in grades or locations.

D. Promptly replace lost or destroyed project control points. Base replacements on the original survey control points.

E. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities and other construction.

F. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer and water service piping.

3.02 PERFORMANCE

A. Working from lines and levels established by the property survey, establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to properly locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale drawings to determine dimensions.

B. Advise entities engaged in construction activities of marked lines and levels provided for their use. Provide a minimum of two column lines as control in two directions which shall be used as reference points.

C. As construction proceeds, check every major element for line, level and plumb.

D. Surveyor’s Log: Maintain a surveyor’ log of control and other survey work. Make this log available for reference.

E. Record deviations from required lines and levels, and advise the Architect when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.

F. Existing Utilities: Furnish information necessary to adjust, move or relocate existing structures, utility poles, lines, services or other appurtenances located in, or affected by construction. Coordinate with local authorities having jurisdiction.

END OF SECTION 01 71 23

SECTION 01 73 00
EXECUTION REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Requirements of this Section apply to the Work of all other Sections.

B. Section Includes:
   1. Examination of Substrate.
   2. Preparation.
   3. Installation.
   4. Workmanship.
   5. Protection.
   6. Overhead Attachments.
   7. Prohibited Methods.

1.02 RELATED SECTIONS

A. Quality Control: Section 01 45 00.

B. Cutting and Patching: Section 01 73 29.

C. Shop Drawings, Product Data and Samples: Section 01 33 23.

D. Product Requirements: Section 01 60 00.

1.03 STANDARDS

A. Standards, codes and regulations published by Manufacturer's Associations, governmental agencies and other regulatory authorities form a part of these Specifications as minimum requirements. Such references include the latest issue and all amendments up to 30 days prior to the Bid Date.

B. "Governing Authority" means all federal, state and local laws and regulations.

C. Where differences occur between the Contract Documents and such standards, the most restrictive requirement shall apply.

D. Supply all materials and perform all work in accordance with the Manufacturer's Specifications and installation procedures, and in conformance with published trade and manufacturer's association standards, unless specifically noted otherwise herein.

1.04 NON-CONFORMING WORK

A. Faulty work or work not in conformance with the Contract Documents will not be permitted by the Architect.
   1. It is the responsibility of the Contractor to propose a remedy by means of detailed drawings and written documentation and submit such documentation to the Architect for comments.
   2. All costs for the removal and reconstruction of such work, as well as additional services of the Architect, shall be paid for by the Contractor.

PART 2 PRODUCTS - NOT APPLICABLE

PART 3 EXECUTION

3.01 EXAMINATION OF SUBSTRATE

A. Examine the substrates or structure to which a product is to be applied or installed. Do not proceed until unsatisfactory conditions have been corrected. Starting the work indicates acceptance of conditions and the installer assumes full responsibility for results.

B. Check the substrate or structure for proper tolerances and clearances. Tolerances are listed under individual specification Sections.

3.02 PREPARATION

A. Substrate: Where the products are applied to a substrate, prepare the substrate as recommended by the product manufacturer. That generally includes the following:
   1. Bringing substrate to a uniform surface by smoothing uneven surfaces and filling holes, cracks and depressions with recommended filler or compatible type material.
   2. Depressed Slabs: Bring to required elevation to receive finished materials where finished materials cannot completely fill depression. Use approved cementitious filler or compatible type material. Coordinate depressed slab locations with finish material locations.
   3. Remove substances such as dust, oils and other foreign matter, not compatible with the product.
   4. Surfaces shall be dry, unless moisture content or wetting requirement is specified or recommended.

B. Concrete Slabs: Provide steel shot abrasive cleaning of concrete slabs receiving designated finish flooring materials.
   1. Designated Finish Flooring Materials
      a. Cementitious or cementitious set materials.
      b. Sheet flooring materials.
      c. Waterproofing materials.
      d. Paint materials.
      e. Polymer or epoxy type seamless flooring.
   2. Equipment: Electric powered portable unit with self-contained dust collection system. Size(s) of unit(s) and shot media suitable for conditions and proposed finish materials. WHEELABRATOR CORP. "Blastrac" or similar type system by SASE COMPANY INC., BW MANUFACTURING or INNOVATECH.
   3. Cleaning: Remove concrete surfaces to sufficient depth to remove bond breakers and contaminants such as curing compounds, oils, and other foreign matter which may be detrimental to the completed flooring installation.
      a. Work smoothly and evenly over entire surface; avoid creating dips, ridges, or other imperfections which would show or telegraph in the completed installation.
      b. Small transitions for different flooring materials may be obtained by multiple passes if carefully executed to create smooth even slope of not more than 1/8" in 2 feet.
   4. Clean floor as near as possible to flooring installation to avoid contamination from work of other trades. Protect clean floor from soiling with suitable sheet materials. Reclean soiled areas.

C. Inserts and Anchorages
   1. Anchorages where not detailed are the responsibility of the installer to design a suitable connection, structurally sound, and aesthetically acceptable to the Architect. Furnish calculations, drawings and product data when requested by the Architect. Such information may or may not be returned as indicated in Section 01 33 23.
   2. It is the responsibility of the installer to furnish built-in fastening devices for his/her product to the proper trade for installation as the work proceeds.
   3. In the event such devices are not furnished in time to be built-in, it is the installer's responsibility to provide other methods for attaching their product. Submit drawings and other required data to the Architect.

D. Templates: Provide templates, diagrams and other coordinating documents to the proper Contractor, manufacturer or supplier of related items affecting the Work.

E. Dimensions
   1. If the exact location of an item is not indicated by dimension on the Drawings or noted in the Specifications, the Architect reserves the right to determine such location in the field prior to roughing-in.

2. If the exact dimensions of a product are not indicated, the Architect reserves the right to determine dimensions prior to the ordering or fabrication of a product.
3. Such dimensional changes shall not be a basis for changes in the Contract Sum.
4. Where miscellaneous devices, such as thermostats, switches, controls, grilles, pipes, or outlets of any nature are not specifically located by the Contract Documents, request such location or obtain approval of the location prior to installation. If approval has not been obtained, the Architect may direct the relocation of such devices at the expense of the installer.

3.03 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.
      a. Where pipes occur in partitions, furred-out spaces and chases, determine exact location and size and fit entirely concealed into allotted space. Report conflicts to Architect prior to installation.
      b. Where two or more pipes are to installed in parallel, or parallel to the piping of other trades, the piping shall be installed with sufficient space between the pipes to allow for the proper application of pipe covering, painting, and servicing.
      c. Furnish advance information on locations and sizes of frames, boxes, sleeves and openings needed for the Work to installers.
   4. Install work to allow for installation of future work identified on drawings.
   5. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.

B. Install products in accordance with manufacturer's recommendations or the requirements of trade associations, listed standards, Shop Drawings and Contract Documents.

C. If a conflict exists between these references, the most strict requirements govern. If printed instructions are not available, consult with the manufacturer or the manufacturer's field representative, where applicable.

D. Provide hangers, auxiliary framing, and other means for installing ceiling suspension systems, lighting fixtures, diffusers, and other equipment in ceilings to avoid ductwork, piping, etc.
   1. Suspend from structural members (i.e. joists, beams, etc.), and not from ductwork or piping.
   2. Provide supplemental framing members (i.e. angles, tubes, light gage steel framing, etc.) to span between structural members where required to support items of this paragraph C.

E. Install work that will not interfere with the proper installation of the Work of other trades.

F. Install work in a manner to facilitate operating, servicing and repairing.

G. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

H. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

3.04 SPACE PREFERENCE

A. Carefully check and coordinate the location and level of all Work to avoid conflicts between all contractors. Where conflicts occur, the following preferences shall generally govern:
   1. Recessed electrical light fixtures
   2. High and medium pressure ductwork
   3. Low pressure ductwork
   4. Soil, waste, vent and storm piping

5. Sprinkler piping
6. Liquid heat transfer and refrigerant piping
7. Domestic water piping
8. Electrical conduits from branch circuits

B. However, no ductwork or liquid heat transfer main shall have preference over plumbing piping below plumbing fixtures, nor over electrical conduits above or below electrical switchgear and panels. No piping conveying liquids shall be installed directly over electrical or elevator equipment. No piping shall be installed in electrical or elevator equipment rooms.

C. Where headroom or space conditions resulting from application of these preferences appear inadequate, notify the Architect prior to installing the Work.

D. Coordinate the mounting heights of busways, electrical equipment and raceways to clear the opening heights of doors, the height of vehicles and the heights of equipment which needs to be routinely removed, and out of paths required for maintenance.

3.05 WORKMANSHIP

A. Install products straight, plumb, level and in line. Securely attach items to the substrate, using recommended adhesives, mechanical fasteners or other devices. Where holes are provided for attachment, do not field drill or cut new holes without the approval of the Architect.

B. Where applicable, match finished work to the approved samples or mock-ups.

C. Conceal fasteners wherever possible, unless exposed fasteners are permitted or specified.

D. Weld in accordance with AWS standards; comply with AWS for qualifications of operators and for workmanship.

E. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.

F. Recheck measurements and dimensions, before starting each installation.

3.06 PROTECTION

A. Protect finished surfaces of product being installed and surrounding products from damage during installation. Provide protective devices as required and as recommended by the manufacturer. Cover work subject to damage at the end of each day's work.

B. Coat concealed surfaces of metal products with a bituminous or other approved coating to prevent contact between dissimilar metals or other material which can cause deterioration.

C. Correct damage by repairing or replacing as directed by the Architect. Repairing will be permitted only where the repair is undetectable and does not cause structural damage or interfere with proper functioning of the part.

D. Protect finish of installed products until Substantial Completion of the Project by use of wrappings, covers or other approved protective devices. Remove such protection immediately prior to final cleaning.

E. Limiting Exposures: Coordinate and supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Maintain exposures within the manufacturers recommended limits. Where applicable, such exposures include, but are not limited to, the following:
   1. Excessive static or dynamic loading
   2. Excessive internal or external pressure
   3. Excessive high or low temperatures
   4. Thermal shock
   5. Excessively high or low humidity
   6. Air contamination or pollution
   7. Water or ice
   8. Solvents

9. Chemicals
10. Light
11. Radiation
12. Puncture
13. Abrasion
14. Heavy traffic
15. Soiling, staining and corrosion
16. Bacteria
17. Rodent and insect infestation
18. Combustion
19. Electrical current
20. High speed operation
21. Improper lubrication
22. Unusual wear or other misuse
23. Contact between incompatible materials
24. Destructive testing
25. Misalignment
26. Excessive weathering
27. Unprotected storage
28. Improper shipping
29. Theft
30. Vandalism

F. Take precautions to protect existing concrete and asphalt pavement from damage due to vehicle loads, parking, and storage.
   1. Schedule loading to minimize pavement material consolidation during hot weather. Distribute wheel loads to the greatest extent possible.

3.07 OVERHEAD ATTACHMENTS

A. Where overhead hangers are required, and not indicated on the drawings, provide one or more of the following as required:
   1. Concrete inserts prior to placement of concrete or drilled type inserts after concrete is placed.
   2. Trapeze from adjacent structure with suitable steel framing.
   3. Connections to Structure: Suitable anchorage devices with a minimum load carrying capacity of 250 pounds plus safety factor of 4:1 for the applied load.
      a. Concrete: Steel expansion anchors. See Prohibited Material and Methods specified in Section 01 60 00.
      b. Steel: Bolted or welded connections to steel structure.

B. Where metal deck is furnished with hanger tabs or similar devices, applied total load, including work of other trades, not to exceed 75 pounds for each device. Loads in excess of permitted limit to be supported by trapeze framing as specified above.

C. Verify support requirements of heavy or unusual loads not specifically shown on drawings with Architect.

3.08 OPERATION AND MAINTENANCE

A. Contractor shall maintain all systems and equipment operated during construction. The contractor responsible for the installation of the system shall operate and maintain it. Make all repairs and perform all maintenance to assure Work is turned-over to Owner in first class condition.

B. Maintenance work includes:
   1. Lubrication
   2. Adjustments
   3. Filter replacements

4. Chemical treatment.

END OF SECTION 01 73 00

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 GENERAL

1.01 DESCRIPTION

A. Execute cutting, fitting or patching of Work, required to:
   1. Make several parts fit properly.
   2. Uncover Work to provide for installation of ill-timed Work.
   3. Remove and replace defective Work.
   4. Remove and replace Work not conforming to requirements of Contract Documents.
   5. Remove samples of installed Work as specified for testing.
   6. Install specified Work in existing construction.

B. In addition to contract requirements, upon written instructions of Architect:
   1. Uncover Work to provide for Architect's observation of covered Work.
   2. Remove samples of installed materials for testing.
   3. Remove Work to provide for alteration of existing Work.

C. Do not endanger any Work by cutting or altering Work or any part of it.

1.02 SUBMITTALS

A. Prior to cutting which affects structural safety of Project, submit written notice to Architect, requesting consent to proceed with cutting, including:
   1. Identification of Project.
   2. Description of Affected Work.
   3. Necessity for cutting.
   4. Affect on other Work, on structural integrity of Project.
   5. Description of proposed Work. Designate:
      a. Scope of cutting and patching.
      b. Contractor and trades to execute work.
      c. Products proposed to be used.
      d. Extent of refinishing.
   6. Alternative to cutting and patching.

B. Should conditions of Work, or schedule indicate change of materials or methods, submit written recommendation to Architect, including:
   1. Conditions indicating change.
   2. Recommendations for alternative materials or methods.
   3. Submittals as required for Substitutions.

C. Submit written notice to Architect, designating time Work will be uncovered, to provide observation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching of materials and surfaces shall be in accordance with the requirements of the Contract Documents. Where not otherwise defined, patching shall match adjacent surfaces and proper materials shall be provided accordingly.

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect existing conditions of Work, including elements subject to movement or damage during cutting and patching.

B. After uncovering Work, inspect conditions affecting installation of new products.

3.02 PREPARATION PRIOR TO CUTTING

A. Provide shoring, bracing and support as required to maintain structural integrity of Project.

B. Provide protection for other portions of the Project, including all Contractors' personnel.

3.03 PERFORMANCE

A. Execute fitting and adjustment of products to provide finished installation to comply with specified tolerances, finishes.

B. Execute cutting and demolition by method which will prevent damage to other Work, and will provide surface to receive installation of repairs and new Work.
   1. No cutting shall be performed which will, in any way, reduce the structural strength of the building. Should such cutting be necessary, consult Architect and do not proceed with such operation unless written approval is given.
   2. Finished Surfaces: Cur or drill from the exposed or finished side into concealed surfaces.
   3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

C. Restore Work which has been cut or removed; install new products to provide completed Work in accord with requirements of Contract Documents.

D. Patching of materials and surfaces shall be in accordance with the requirements of the Contract Documents. Where not otherwise defined, patching shall match existing or adjacent surfaces and proper materials shall be provided accordingly.
   1. Wherever existing walls, floors, ceilings, etc., are cut, the exposed surfaces must be neatly finished by patching, painting, wall covering, etc., as required to blend patched areas into adjacent existing surfaces. Patched areas shall not be visible when viewing entire wall surface.
      a. 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.

E. Where painting or finishing of patched surfaces or application of wall or floor covering is required, finish the entire plane of surface in which patched area occurs.
   1. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
   2. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

3.04 SLEEVES AND OPENINGS

A. Where pipes, conduits, ductwork or other materials pass through new walls, partitions, floors, roof or ceilings, provide suitable sleeves in these elements or provide openings where sleeves are not practical.

B. Close sleeves and openings to prevent passage of smoke or fire using approved methods and materials to maintain the fire rating of the construction being penetrated. See Section 07 84 00.
   1. Unless otherwise indicated, extend floor sleeves 2" above finished floor.

C. Where pipes, conduit, ductwork etc., pass through, behind, or above existing construction, provide all cutting, patching, and refinishing for doing this work as specified herein.

D. Lintels: Provide steel or precast concrete lintels to span openings in masonry walls sized in accordance with schedule shown or as detailed on structural drawings. In general, lintels are not required for openings less than the width of masonry unit in which wall is being constructed. Penetrations under beams or other concentrated loads require approval of Architect.

3.05 CLEANING

A. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

END OF SECTION 01 73 29

SECTION 01 74 00
CLEANING

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. These requirements supplement General Conditions. Refer to General Conditions for additional requirements.
   1. See General Conditions and modifications specified in the Special Conditions for each individual Prime Contractors' specific cleaning requirements.

B. Execute cleaning, during progress of the work and at completion of the work, as required by Contract Documents.

1.02 RELATED SECTIONS

A. Cutting and Patching: Section 01 73 29.

B. Cleaning for Specific Products or Work: Specification section for the work.

1.03 CLEANING AND DISPOSAL REQUIREMENTS

A. Standards: Maintain project in accord with the following safety and insurance standards:
   1. Applicable Federal and State Requirements.
   2. National Fire Protection Association.

B. Hazards Control: Each Contractor shall comply with the following requirements:
   1. Store volatile wastes in covered metal containers, and remove from premises daily.
   2. Prevent accumulation of wastes which create hazardous conditions.
   3. Provide adequate ventilation during use of volatile or noxious substances.

C. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
   1. Do not burn or bury rubbish and waste materials on project site.
   2. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary sewers.
   3. Do not dispose of waste into streams or waterways.
   4. Wet down dry materials and rubbish to prevent dust.

D. Clean streets, highways, and private properties of all mud, earth, rubbish, rocks, refuse or other debris of any kind resulting from such work or related transportation to and from the work site.

PART 2 PRODUCTS

2.01 MATERIALS

A. Select and use cleaning materials and equipment with care to avoid scratching, marring, defacing, staining or discoloring surfaces cleaned.

B. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned.
   1. Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

C. Use cleaning materials only on surfaces recommended by the cleaning material manufacturer.

PART 3 EXECUTION

3.01 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

B. Provide, maintain and empty 55 gallon metal and dumpster type containers for collection of waste materials, debris and rubbish. Locate containers as directed by Architect.
   1. Provide containers with adequate capacity to accommodate anticipated needs. If containers do not have adequate capacity, increase intervals of waste removal or capacity

of containers until adequate capacity is provided.

C. At reasonable intervals during progress of Work, but in no case less than once a week, dispose of waste materials, debris and rubbish.

D. Site: Maintain Project site free of waste materials and debris.

E. 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.

F. 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.

G. Direct Special Attention To:
   1. Provide non-staining layout lines and other markings on masonry and concrete. Use chalk lines wherever possible and remove when no longer needed.
   2. Remove all stains from concrete surfaces, including floors.
   3. Shop marks shall not appear on exposed surfaces of any item.
   4. Remove concrete, mortar and paint spatters.
   5. Clean both brick and concrete unit masonry.
   6. Protect aluminum frames during construction and thoroughly clean upon completion of the installation.

H. Clean interior surfaces before start of finish painting and continue cleaning on an as-needed basis until painting is finished.

I. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces.

J. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

K. Vacuum interior building areas where work is performed prior to painting and other finish work. Continue vacuum cleaning on an as needed basis until building is ready for occupancy.

L. Protect interior of ductwork during construction from accumulation of dirt, dust or debris.

M. Clean trash from all chases and concealed spaces before final enclosure.

3.02 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.
   1. Leave Project clean and ready for occupancy.

B. Employ experienced workmen, or professional cleaners for final cleaning.

C. At the completion of the work, remove all surplus material, false work, temporary structures, including foundations thereof, plants of any description and debris of every nature resulting from their operations and put the site in a neat and orderly condition.

D. Clean exposed interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition.

E. 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.

F. Sweep concrete floors broom clean in unoccupied spaces.

G. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.

H. Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials from sight-exposed interior and exterior surfaces, including light fixtures and lenses; polish surfaces so designated to a shine finish.
   1. Clean finishes free of dust, stains, films and other foreign substances.
   2. Clean transparent and glossy materials to a polished condition; remove foreign substances. Polish reflective surfaces to a clear shine.

I. Remove temporary protection and labels not required to remain

J. Clean surfaces of equipment; remove excess lubrication.

K. Remove debris, rubbish, dirt, etc. from open concealed spaces, chases and above ceilings.

L. Repair, patch and touch-up marred surfaces to specified finish, to match adjacent surfaces.

M. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.

N. Remove waste, foreign matter, and debris from roofs, gutters, areaways, and drainage systems.

O. Clean plumbing fixtures to a sanitary condition.

P. Clean permanent filters of ventilating equipment and replace disposable filters when units have been operated during construction; in addition, clean ducts, blowers, and coils when units have been operated without filters during construction.

Q. Clean light fixtures and lamps; polish lenses.

R. Clean dirt and debris from interior of all electrical panels and user accessible electrical enclosure boxes prior to installation of covers or in the case of hinged access doors, before final cleaning of adjacent space. Clean the exterior surfaces of all switchgear located in Mechanical and Electrical Rooms and spaces.

S. 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.

T. Clean dirt and dust from interior of air handling units before installing final filters. Wipe down the exterior surfaces of all HVAC equipment located in Mechanical Rooms and spaces.
   1. Exposed painted ductwork to be brushed clean of dust.

U. Site/Exterior Items: 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.
   1. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   2. Rake grounds that are neither planted nor paved to a smooth, even textured surface.
   3. Remove tools, construction equipment, machinery, and surplus material from Project site.
   4. Clean exposed hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces.

V. Maintain cleaning until Final Completion.

W. Prior to Final Completion, or Owner occupancy, Contractor shall conduct an inspection of sight exposed interior and exterior surfaces, and all work areas, to verify that the entire work is clean.

END OF SECTION 01 74 00

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SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Salvaging nonhazardous demolition and construction waste.
   2. Recycling nonhazardous demolition and construction waste.
   3. Disposing of nonhazardous demolition and construction waste.

1.02 RELATED SECTIONS

A. Sustainable Design Requirements: Section 01 81 13.

B. Selective Demolition - for disposition of waste resulting from partial demolition of buildings, structures, and site improvements: Section 02 41 19.

C. Structure Demolition - for disposition of waste resulting from demolition of buildings, structures, and site improvements: Section 02 41 16.

1.03 MASONRY – FOR DISPOSAL REQUIREMENTS FOR MASONRY WASTE: SECTION 04 00 00.

1.04 DEFINITIONS

A. Alternative Daily Cover: Material other than earthen material placed on the surface of the active face of a landfill at the end of each operating day to prevent odor, scavenging, and litter.

B. Commingled Waste: Building waste streams that are combined on the project site and hauled away for sorting into recycling streams.

C. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

D. Construction Waste Management Plan: Plan for reducing the construction and demolition waste disposed of in landfills and incineration facilities by recovering, reusing, and recycling materials.

E. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

F. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

G. Land-Clearing Debris and Soil: Materials that are natural (e.g., rock, soil, stone, vegetation). Materials that are man-made (e.g., concrete, brick, cement) are considered construction waste even if they were on site.

H. Onsite Separated Waste: Each type of material is sent to a separate recycling facility.

I. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

J. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

K. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.05 PERFORMANCE GOALS

A. General: Achieve end-of-Project rates for salvage/recycling of 75% of total construction and demolition debris and at least four material streams. Alternative daily cover and land-clearing debris do not qualify as material diverted for disposal.

1.06 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00, "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
   1. Review and discuss waste management plan including responsibilities of waste management coordinator.
   2. Review requirements for documenting quantities of each type of waste and its disposition.
   3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
   4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
   5. Review waste management requirements for each trade.

1.07 SUBMITTALS

A. Waste Management Plan: Submit 2 copies of plan within 14 days after the Notice to Proceed.

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include separate reports for demolition and construction waste. Include the following information:
   1. Material category.
   2. Generation point of waste.
   3. Total quantity of waste in tons.
   4. Quantity of waste salvaged, both estimated and actual in tons.
   5. Quantity of waste recycled, both estimated and actual in tons.
   6. Total quantity of waste recovered (salvaged plus recycled) in tons.
   7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

C. Waste Reduction Calculations: Before request for Substantial Completion, submit three (3) copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

H. LEED Submittal: LEED letter template for Credit MR 2, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.

I. Qualification Data: For waste management coordinator and refrigerant recovery technician.

J. 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.

1.08 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: LEED Accredited Professional by U.S. Green Building Council.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 01 31 19 "Project Meetings." Review methods and procedures related to waste management including, but not limited to, the following:
   1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
   2. Review requirements for documenting quantities of each type of waste and its disposition.
   3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
   4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
   5. Review waste management requirements for each trade.

1.09 CONSTRUCTION WASTE MANAGEMENT (CWM) PLAN

A. General: Develop a waste management plan according to Section 01 81 13: Sustainable Design Requirements. Waste Management Plan must include the following information:
   1. Waste diversion goals
   2. 5 targeted materials, both structural and non-structural, for diversion and approximate percentage of overall project waste these materials represent
   3. Separation procedures
   4. Description of where the material will be taken and how the facility will process the material
   5. Tracking procedures and records

B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Use Form CWM-1 for construction waste. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
   1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
   2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
   3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
   4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
   5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
   6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.

B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
   1. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
   2. Comply with Section 01 50 00 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.02 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
   3. Store items in a secure area until installation.
   4. Protect items from damage during transport and storage.
   5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Not permitted on Project site.

C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
   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.

D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

F. Plumbing Fixtures: Separate by type and size.

G. Lighting Fixtures: Separate lamps by type and protect from breakage.

H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.03 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
    a. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.04 RECYCLING DEMOLITION WASTE

A. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.

B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
    1. Pulverize concrete to maximum 1-1/2-inch size.
    2. Crush concrete and screen to comply with requirements in Division 31 Section "Earthwork" for use as satisfactory soil for fill or sub base.

C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
    1. Clean and stack undamaged, whole masonry units on wood pallets.

D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

E. Metals: Separate metals by type.
    1. Structural Steel: Stack members according to size, type of member, and length.
    2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

F. Asphalt Shingles: Separate organic and glass fiber asphalt shingles and felts. Remove and dispose of nails, staples and accessories.

G. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

H. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in dry location.

I. Metal Suspension System: Separate metal members, including trim and other metals, from acoustical panels and tile and sort with other metals.

J. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

K. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

L. Plumbing Fixtures: Separate by type and size.

M. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

N. Lighting Fixtures: Separate lamps by type and protect from breakage.

O. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

P. Conduit: Reduce conduit to straight lengths and store by type and size.

3.05 RECYCLING CONSTRUCTION WASTE

A. Packaging

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Site-Clearing Wastes: Chip brush, branches, and trees at landfill facility.
   1. Comply with requirements in Division 32 Section "Plants" for use of chipped organic waste as organic mulch.

C. Wood Materials:
   1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
   2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
      a. Comply with requirements in Division 32 Section "Plants." for use of clean sawdust as organic mulch.

D. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
   1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.06 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
   1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 01 74 19

SECTION 01 77 00
PROJECT CLOSE-OUT

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the work.
   1. These requirements supplement the Owner/Contractor General Conditions. Refer to General Conditions for additional and/or similar requirements. Notify the Architect if any conflicting requirements are evident.

B. Related Requirements
   1. Fiscal Provisions, Legal Submittals and Additional Administrative Requirements: Conditions of the Contract.
   2. Operating and Maintenance Data: The respective specification sections.
   3. Warranties and Bonds: The respective specification sections.
   4. Close-out Submittals Required of Contractor: The respective specification sections.

1.02 SUBSTANTIAL COMPLETION

A. When Contractor considers the work to be substantially complete, he shall submit to the Architect:
   1. A written notice that the work, or designated portion thereof, is substantially complete.
   2. A list of items to be completed or corrected.

B. Within a reasonable time after receipt of such notice, the Architect will make an inspection to determine the status of completion.

C. Should the Architect determine that the work is not substantially complete:
   1. Architect will promptly notify the Contractor in writing, giving the reasons therefore.
   2. Contractor shall remedy the deficiencies in the work, and send a second written notice of substantial completion to the Architect.
   3. Architect will re-inspect the work.

D. When the Architect concurs that the work is substantially complete, he will:
   1. Prepare a Certificate of Substantial Completion on AIA Form G 704, accompanied by Contractor's list of items to be completed or corrected as verified and amended by the Architect.
   2. Submit the Certificates to Owner and Contractor for their written acceptance of the responsibilities assigned to them in the Certificate.

1.03 FINAL INSPECTION/COMPLETION

A. When a Contractor considers the work is complete, he shall submit written certification that:
   1. Contract Documents have been reviewed.
   2. Work has been inspected for compliance with Contract Documents.
   3. Work has been completed in accordance with Contract Documents.
   4. Equipment and systems have been tested in the presence of the Owner's representative and are operational.
   5. Work is completed and ready for final inspection.

B. Submit certified copy of Owner and Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Owner and Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

C. Architect will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.

D. Should Architect consider that the work is incomplete or defective:

1. Architect will promptly notify the Contractor, in writing, listing the incomplete or defective work.
2. Contractor shall take immediate steps to remedy the stated deficiencies, and send a second written certification to Architect that the work is complete.
3. Architect will reinspect the work.

E. When the Architect finds that the work is acceptable under the Contract Documents, he shall request the Contractor to make closeout submittals.

1.04 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit 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.
   4. Submit list of incomplete items in the following format:
      a. PDF electronic file.

1.05 CLOSE-OUT SUBMITTALS

A. Evidence of compliance with requirements of governing authorities:
   1. Certificate of Occupancy
   2. Certificates of Inspection
      a. Plumbing
      b. Fire Protection
      c. HVAC
      d. Electrical
      e. Health Department

B. Project Record Documents: To requirements of Section 01 78 39.

C. Warranties and Bonds: To requirements of respective Specification Sections.
   1. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of final acceptance of the work or substantial completion is indicated.
   2. Partial Occupancy: Submit properly executed warranties within 15 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.
   3. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
      a. 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.
      b. 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.
      c. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

4. Provide additional copies of each warranty to include in operation and maintenance manuals.

D. Final Commissioning Documentation: See Section 01 91 13.

1.06 FINAL ADJUSTMENT OF ACCOUNTS

A. Submit a final statement of accounting to Architect.

B. Statement shall reflect all adjustments to the Contract Sum:
   1. The original Contract sum.
   2. Additions and Deductions Resulting From:
      a. Previous Change Orders
      b. Allowances
      c. Unit Price
      d. Deductions for uncorrected work
      e. Other adjustments
   3. Total Contract sum, as adjusted.
   4. Previous payments
   5. Sum remaining due

C. Architect will prepare a final Change Order reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

1.07 FINAL APPLICATION FOR PAYMENT

A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 77 00

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SECTION 01 78 23
OPERATING AND MAINTENANCE

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under contract.
   1. These requirements supplement the Owner/Contractor General Conditions. Refer to General Conditions for additional and/or similar requirements. Notify the Architect if any conflicting requirements are evident.

B. Instruct Owner's designated personnel in the maintenance of products and in the operation of equipment and systems.

C. Related Requirements
   1. Each respective section of specifications listing operating and maintenance data requested for specific products.
   2. Division 22: Additional Plumbing requirements.
   3. Division 23: Additional HVAC requirements.
   4. Division 26: Additional Electrical requirements.

1.02 QUALITY ASSURANCE

A. Preparation of data shall be performed by personnel:
   1. Trained and experienced in maintenance and operation of described product.
   2. Skilled to extent required to communicate essential written data and prepare required drawings.

1.03 FORM OF SUBMITTALS

A. Prepare data in the form of an instructional manual for use by Owner's personnel

1.04 CONTENT OF MANUAL

A. Title Page: Identify title of project, address, date of submittal, name, address and telephone number of Contractor and Architect.

B. Table of Contents: Typewritten list of each product or system required to be included.

C. Product Data
   1. Include only those sheets which are pertinent to the specific product.
   2. Annotate each sheet to:
      a. Clearly identify the specific product or part installed.
      b. Clearly identify the data applicable to the installation.
      c. Delete references to inapplicable information.

D. Drawings
   1. Supplement product data with drawings as necessary to clearly illustrate:
      a. Relations of component parts of equipment and systems.
      b. Control and flow diagrams.
   2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
   3. Do not use Project Record Documents as maintenance drawings.

E. Written text, as required to supplement product data for the particular installation:
   1. Organize in a consistent format under separate headings for different procedures.
   2. Provide a logical sequence of instructions for each procedure.

F. Copy of each warranty, bond, and service contract issued.

G. Provide information sheet for Owner's personnel giving:
   1. Proper procedures in the event of failure.
   2. Instances which might affect the validity of warranties or bonds.

1.05 MANUAL FOR MATERIALS AND FINISHES

A. Content for architectural products, applied materials, and finishes:
   1. Manufacturer's data, giving full information on products.
   2. Catalog number, size, composition.
   3. Color and texture designations.
   4. Information required for reordering specially manufactured products.
   5. Instructions for care and maintenance.
   6. Manufacturer's recommendation for types of cleaning agents and methods.
   7. Cautions against cleaning agents and methods which are detrimental to the product.
   8. Recommended schedule for cleaning and maintenance.
   9. Housekeeping Manuals containing manufacturer's recommended cleaning practices for vinyl wallcoverings, painted surfaces and all floor finishes.

B. Content for moisture protection and weather exposed products:
   1. Manufacturer's data, giving full information on products.
   2. Applicable standards.
   3. Chemical composition.
   4. Details of installation.

C. Instructions for inspection, maintenance and repair.

D. Additional requirements for maintenance data: The respective sections of Specifications.

E. Provide complete information for products of applicable sections of the Project Manual including, but not limited to, the following types of materials, as applicable:
   1. Metal fabrications.
   2. Waterproofing.

F. Roofing.
   1. Flashing and sheet metal.
   2. Roof accessories.
   3. Joint sealants.
   4. Doors and frames.
   5. Windows.
   6. Hardware.
   7. Glazing.
   8. All finish materials.
   9. Toilet partitions.
   10. Toilet accessories.

1.06 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Content for each unit of equipment and system, as appropriate:
   1. Description of unit and component parts.
   2. Function, normal operating characteristics, and limiting conditions.
   3. Performance curves, engineering data, and tests.
   4. Complete nomenclature and commercial number of all replaceable parts.

B. Operating Procedures
   1. Start-up, break-in, routine and normal operating instructions.
   2. Regulation, control, stopping, shutdown, and emergency instructions.

C. Summer and winter operating instructions.
   1. Special operating instructions.

D. Maintenance Procedures
   1. Routine operations.
   2. Guide to "troubleshooting."
   3. Disassembly, repair, and reassembly.

4. Alignment, adjusting, and checking.

E. Servicing and lubrication schedule.
   1. List of lubricants required.

F. Manufacturer's printed operating and maintenance instructions.

G. Description of sequence of operation by control manufacturer.

H. Original manufacturer's parts list, illustrations, assembly drawings, and diagrams, required for maintenance.
   1. Predicted life of parts subject to wear.
   2. Items recommended to be stocked as spare parts.

I. As-installed control diagrams by controls manufacturer.

J. Coordination drawings.
   1. As-installed color coded piping diagrams.

K. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

L. Other data as required under pertinent sections of Specifications.

M. Content for each electrical and electronic system, as appropriate:
   1. Description of system and component parts.
   2. Function, normal operating characteristics and limiting conditions.
   3. Performance curves, engineering data, and tests.
   4. Complete nomenclature and commercial number of replaceable parts.
   5. Circuit directories of panelboards.
   6. Electrical service.
   7. Controls.
   8. Communications.
   9. As-installed color-coded wiring diagrams.
   10. Operating schedules
      a. Routine and normal operating instructions
      b. Sequences required.
      c. Special operating instructions.
   11. Maintenance procedures
      a. Routine operations.
      b. Guide to"troubleshooting."
      c. Disassembly, repair, and reassembly.
      d. Adjustment and checking.

N. Manufacturer's printed operating and maintenance instructions.
   1. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
   2. Other data as required under pertinent sections of Specifications.

O. Prepare and include additional data when the need for such data becomes apparent during the instruction of Owner's personnel.

P. Additional requirements for operating and maintenance data: The respective sections of Specifications.

Q. Provide complete information for products of applicable sections of the Project Manual including, but not limited to, the following types of materials:
   1. Drainage systems.
   2. Plumbing systems.
   3. Domestic water conditioners.
   4. Fire protection.
   5. Power or heat generation.

6. Air distribution.
7. Controls and instrumentation.
8. Motors.
9. Power generation and transmission.
10. Service and distribution.
11. Lighting.
12. Special systems.
13. Communications.
14. Chemical Treatment.

1.07 SUBMITTAL SCHEDULE

1.08 SUBMIT ONE COPY OF COMPLETED DATA IN FINAL FORM BEFORE FINAL INSPECTION AND ACCEPTANCE.

1.09 INSTRUCTION OF OWNER'S PERSONNEL

A. Before final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment and systems.

B. Operating and maintenance manual shall constitute the basis of instruction.

C. Review contents of manual with personnel in full detail to explain all aspects of operation and maintenance.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 78 23

SECTION 01 78 39
PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 GENERAL

A. Provide Project Record Documents.
   1. These requirements supplement the Owner/Contractor General Conditions. Refer to General Conditions for additional and/or similar requirements. Notify the Architect if any conflicting requirements are evident.

B. Contractor: Maintain at the site one record copy of:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Order and other modifications to the Contract.
   5. Architect's field orders or written instructions.
   6. Approved shop drawings, product data and samples.
   7. Field test records.
   8. Approved permit sets.

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Store documents and samples in Contractor's field office apart from documents used for construction.
   1. Provide files and racks for storage of documents.
   2. Provide locked cabinet or secured storage space for storage of samples.

B. File documents and samples in accordance with the table of contents of the Project Manual.

C. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.

D. Make documents and samples available at all times for inspection.

1.03 RECORDING

A. Label each document "PROJECT RECORD" in neat printed letters.

B. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.

C. Drawings: Legibly mark to record actual construction.

D. Depths of various elements of foundation in relation to finish first floor datum.
   1. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   2. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.
   3. Field changes of dimension and detail.
   4. Changes made by Field Order or by Change Order.
   5. Details not on original contract drawings.

E. Specifications and Addenda: Legibly mark each Section to record:
   1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
   2. Changes made by Field Order or by Change Order.

1.04 SUBMITTAL

A. At Contract close-out, deliver Record Documents to Architect for submission to the Owner.

B. Accompany submittal with transmittal letter in duplicate, containing:
   1. Date.

2. Project title and number.
3. Contractor's name and address.
4. Title and number of each Record Document.
5. Signature of Contractor or his authorized representative.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 78 39

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 01 Specifications, apply to this Section.

1.2 DESCRIPTION

A. Basic specification: Perform work of this Section according to ACI 301-16, "Specifications for Structural Concrete", except as specifically modified herein.

B. Work included: All cast-in-place concrete work shown on the Drawings and required by these Specifications. Allow for the installation of cast-in items furnished under other Sections. Install anchor bolts for structural steel. Provide and install grout under steel column base plates and beam bearing areas. Provide and install dowels for masonry walls.

C. Related work specified elsewhere: The general provisions of the Contract apply to the work of this Section, as though reproduced herein. Carefully examine all other Sections and all Drawings for related work such as concrete pads, piers, curbs, and bases required for equipment of all trades. Coordinate dimensions and details of equipment being supplied, prior to placing concrete. Cooperate with other trades who will provide and install items of work (sleeves, piping, conduit, inserts, etc.) to be cast in the concrete. Place no concrete until all such items are in place.

1.3 QUALITY ASSURANCE

A. Reference standards:
1. ACI 301, Specifications for Structural Concrete
2. ACI 318, Building Code Requirements for Structural Concrete.
3. ACI 117, Specification for Tolerances for Concrete Construction and Materials
4. ACI 347R, Guide to Formwork for Concrete.
5. ACI 302.1R, Guide to Concrete Floor and Slab Construction.
6. “Placing Reinforcing Bars", CRSI & WCRSI Recommended Practices.
7. ACI 439.5R, Comprehensive Guide for the Specification, Manufacture and Construction Use of Welded Wire Reinforcement.
8. ACI 304R, Guide for Measuring, Mixing, Transporting, and Placing Concrete.
9. ACI 305.1, Specification for Hot Weather Concreting.

10. ACI 306R, Guide to Cold Weather Concreting.
11. ACI Field Reference Manual, SP-15.

1.4 SUBMITTALS

A. Submit a mix design for each type of concrete mix required in accordance with ACI 301, Section 1.5.
   1. Acceptable methods of determining concrete proportions shall be in accordance with one of the following methods per ACI 301, Section 4:
      a. Establish based on previous field strength test data with standard deviation calculations.
      b. Establish based on trial mixtures with tested strength data relative to each mix design.

      In either case, provide accurate test data within allowable time periods indicated in ACI 301. Incorrect or missing data will cause for rejection of submittals.

B. Submit Placing Drawings for all reinforcing. Indicate strength, size, and details of all bar reinforcing, and style and specification of all welded wire fabric. Details must indicate clear cover used to determine chair heights.

C. Submit shop drawings for all formwork and shoring. Formwork design shall follow the guidelines of ACI 347 and ACI 347.2R. Shop drawings shall indicate sequence of form removal and reshoring for each type of construction. Include minimum concrete strengths for each reshored level at time of form stripping and concrete placement. Provide calculations sealed by a professional engineer registered in the applicable state of project location.

D. Submit test data for aggregates proposed for use, indicating source and compliance with specification requirements.
   1. Submit blended aggregate mix gradation data for review in all mixes which utilize blended aggregates.

E. Submit product literature for admixtures and curing compounds proposed for use.

F. Submit product literature on all proprietary materials including joint systems, waterstops, hooked anchorage systems, sealers, and patching compounds.

G. Sustainability Submittal Requirements: Refer to Section 01 81 13 for submittal requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cement: Portland Cement, ASTM C150, Type I or Type II or ASTM C1157, Type LH or GU. All cement to be from the same mill.

B. Supplementary Cementitious Materials
1. Fly Ash: ASTM C618, Type C or F
2. Ground Granulated Blast-Furnace Slag, GGBF Slag: ASTM C989, Grade 100 or 120
3. Silca Fume, Microsilica: ASTM C1240

C. Water: Potable.

D. Aggregates:
1. Normal weight aggregates: conform to ASTM C33, (4.2.1.2).
2. Light weight aggregates, fine and coarse: conform to ASTM C330, (7.2.1).
3. Coarse aggregate:
   a. Topping slabs on precast concrete deck and fill on stair pans: Gradation #8.
   b. All other classes: Gradation #57.
   c. A blended aggregate mix may be used at the Contractor/Suppliers' discretion.
4. For architecturally exposed concrete, use a single source of uniform quality throughout the work.

E. Admixtures, where required or permitted per ACI 301, Section 4:
1. Water-Reducing: ASTM C494, Type A or D.
2. Mid-Range Water-Reducing admixture: ASTM C494, Type A.
3. Air-entraining: ASTM C260 (4.2.1.4).
4. High-Range Water-Reducing admixture (Superplasticizer): ASTM C494, Type F or G.
5. Non-Chloride, Non-Corrosive accelerator: ASTM C494, Type C or E.
6. Fly Ash: ASTM C618, Type C or F.
7. Ground Granulated Blast-Furnace Slag, GGBF Slag: ASTM C989.
8. Calcium Chloride and admixtures containing more than 0.06% chloride ions are NOT permitted.
9. Use of admixtures other than those listed will be permitted only when approved prior to bid.

F. Reinforcing:
1. Deformed bars - Uncoated: ASTM A615 or A706. Minimum yield strength to be 60 ksi.
2. Deformed bars – Epoxy Coated. ASTM A615, A616, A617, or A706. Minimum yield strength to be 60 ksi. Epoxy coated in accordance with the requirements of ASTM A775 or A934.
3. Welded Wire Fabric:

a. Plain welded wire reinforcement: ASTM A1064. Provide in sheet form for all uses other than slabs-on-grade. Minimum yield strength is to be 65 ksi.
b. Lap sheets a minimum distance of cross wire spacing plus two inches.

4. Smooth joint dowel bars: ASTM A36, plain steel bars, cut true to length with square ends.
5. Reinforcing support accessories:
   a. Provide reinforcement accessories, consisting of bar supports, spacers, hangers, chairs, ties, and similar items as required for spacing, assembling, and supporting reinforcement in place. Conform with CRSI RB4.1 and Manual of Standard Practice and the following requirements:
   b. For footings, grade beams, and slabs on grade, provide supports with precast concrete or mortar bases or plates or horizontal runners where wetted base materials will not support chair legs.
   c. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms or are in close proximity to finish surfaces, provide supports with legs which are galvanized, plastic-protected, or stainless steel.
6. Structural synthetic fiber reinforcement: Structural fibers shall be a coarse monofilament or self-fibrillation, polypropylene / polyethylene blend in accordance with ASTM C1116, Paragraph 4.1.3, Type III. Structural fibers shall have a minimum tensile strength of 73 to 80 ksi, have a minimum length of 1-1/2 inches, thickness of 0.015 inches, and a width of 0.045 inches.

G. Premolded expansion joint filler: ASTM D1751.

H. Curing and Sealing Compound (VOC Compliant, 350 g/l): Liquid type membrane-forming curing compound, clear styrene acrylate type complying with ASTM C1315, Type I, Class B, 25% solids content minimum. Moisture loss shall be not more than 0.40 kg/m^2 when applied at 300 ft^2/gal. Manufacturers' certification is required. Do not apply to surfaces that are to receive subsequent cementitious toppings, sealers, hardeners, ceramic tile resilient flooring, vinylbacked carpet, wood, terrazzo, epoxy or urethane overlays or adhesives, or other coating or finishing products. Subject to project requirements, provide one from the following manufacturers:
1. BASF Construction Chemicals.
2. Euclid Chemical Company.
3. W.R. Meadows

I. Curing Compound (Strippable): The compound shall conform to ASTM C309 and is to be used on slabs that are to receive subsequent applied finishes and where noted on the drawings. Install in strict accordance with the manufacturer's recommendations and supervision. Verify compound is compatible with the applied finish prior to placement. Subject to project requirements, provide one from the following manufacturers:
1. BASF Construction Chemicals.
2. Euclid Chemical Company.

3. W.R. Meadows

J. Penetrating Sealer for Elevated Parking Decks: Meets or exceeds performance requirements of NCHRP 244 and have minimum 40% silane content. Subject to project requirements, provide one from the following manufacturers:
   1. Euclid Chemical Company.
   2. Kaufman Company.
   3. Sika Corporation.

K. Grout for masonry core fill: ASTM C476, coarse type.

L. Grout under steel base plates and bearing plates: Non-shrinking, non-metallic, with minimum 28-day strength of 5,000 psi, when mixed to a fluid consistency. Subject to project requirements, provide one from the following manufacturers:
   1. BASF Construction Chemicals.
   2. Euclid Chemical Company.
   3. Kaufman Company.

M. Vapor Retarder:
   1. Conform to ASTM E1745 “Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs”, Class A.
   2. Vapor retarders are required under all slabs on grade which are to receive moisture-sensitive floor covering, and in humidity-controlled areas. Vapor retarders are not required under industrial slabs on grade nor under those in non-humidity-controlled areas.
   3. Vapor retarder shall be installed in accordance with ASTM E1643 Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs. The vapor retarder/barrier shall be a minimum of 10 mils thick and placed directly on the granular fill, below the concrete floor slab. Lap joints a minimum of 6 inches and seal with manufacturer’s recommended tape or adhesive.

N. Granular fill below slabs on grade: Provide as recommended in project specific soils report. If soils report is not provided for project, use 6” deep of compacted ODOT 304 or approved equivalent AASHTO dense graded base course. Provide ASTM D448 size #57 stone under slabs-on-grade where radon evacuation is anticipated.

O. Waterstops: Provide waterstops at all construction joints and other joints in all foundation walls below grade and where shown on the drawings. Size to suit joints. Provide either premolded polyvinylchloride or swellable type.
   1. Premolded, flexible, polyvinylchloride, with center bulb. CRD C572
   2. Rubber and Swellable Clay CRD C513

P. Structural Bonding Compound: Epoxy adhesive, 100% solids, two-component material suitable for use on dry or damp surface. Subject to project requirements, provide one from the following manufacturers:
   1. Euclid Chemical Company.
   2. Kaufman Company.

3. Sika Corporation.

Q. Patching Compound, Epoxy Type: 100% solids, suitable for use on dry or damp surface. Subject to project requirements, provide one from the following manufacturers:
   1. Euclid Chemical Company.
   2. Sika Corporation.
   3. W.R. Meadows

R. Patching Compound, Cementitious Type: Subject to project requirements, provide one from the following manufacturers:
   1. Euclid Chemical Company.
   2. Sika Corporation.
   3. W.R. Meadows

S. Curing sheets for wet curing – the following materials are approved:
   1. Sisalcraft Sk-10 (C171).
   2. Burlap
   3. Filter Fabric (8-ounce minimum)
   4. Visqueen plastic, 8 mils minimum.
   5. Bur-lene curing blankets.

2.2 MIXES

A. The following mixes of concrete are required:

Mix Usage	f'_c at 28 days	Exposure Class	Maximum Water Cementitious Ratio	Air Content
Lean Concrete, & Mud Slabs	1,500 PSI	F0	---	---
Footings & Interior Column Piers	3,500 PSI	F1	0.55	optional
Interior Slabs on Grade	3,500 PSI	F0	0.50	optional
Exterior Foundation Stem Walls & Exterior Column Piers	4,500 PSI	F2, C1	0.45	5%-7%
Exterior & Site Concrete	5,000 PSI	F3, C2	0.40	5%-7%

Concrete Mix Notes:

1) Exposure class requirements are achieved through the F'c, w/cm, and air content requirements provided to ensure adequate durability conforms to Freeze/Thaw exposures (F) or Corrosive exposures (C).
2) For all slab mixes, provide a minimum cementitious content of 520 lbs.
3) Slump: Maximum 5" for all members. If a superplasticizer is used, initial slump to be 3", increased to 8" maximum after addition (at the job site) of the superplasticizer.
4) Fly ash is permitted in all mixes but shall not exceed 25% of cement weight indicated above and can be included in the water-to-cementitious ratio.

5) Ground granulated blast-furnace slag is permitted in all mixes but shall not exceed 35% of the cement weight indicated above and can be included in the water-to-cementitious ratio.
6) Silica fume (microsilica) is permitted in all mixes but shall not exceed 10% of the cement weight indicated above and can be included in the water-to-cementitious ratio.
7) Total supplemental cementitious material shall not exceed 35% of the total cement weight.
8) Mixes to be pumped are to be so identified on the mix design submittal. All pumped mixes are to have a mid-range or high-range water reducer.
9) Concrete for slabs on grade must include a mid-range or high-range plasticizer.
10) All admixtures (other than superplasticizer) are to be added at the batch plant. Superplasticizers, designed for addition to the mix at the plant, may be added at the batch plant with verification from the Engineer of Record and verification that the water-to-cement ratio has not been exceeded.
11) Maximum water-soluble chloride ion content in Non-Prestressed concrete shall not be more than the ACI limits set forth for defined corrosion classes. For all other concrete, the maximum water-soluble chloride ion content shall not be more than 0.06 percent (by weight) of the weight of cement as determined by ASTM C1218.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Verify that excavations are free of water and ice, are of the required dimensions, and have been approved by the Soils Engineer, prior to placing concrete.

B. Determine field conditions by actual measurement.

C. Notify Architect not less than 24 hours in advance of placing concrete. Place concrete only when Construction Manager is present, unless this requirement is specifically waived.

3.2 FORMWORK AND REINFORCING

A. All formwork shall follow the guidelines of ACI 347R resulting in final formed surfaces within the tolerances of ACI 117.

B. Footings may be cast against earth cuts when soil conditions permit.

C. Removal of forms and shoring:
   1. Remove no forms within 24 hours after placement.
   2. Shoring is to remain in place until concrete reaches its design strength. Windsor Penetrometer is to be used to verify in-place strength if forms are removed prior to 28 days after casting concrete.

D. Reinforcing:
   1. Welding of reinforcing is prohibited, except where shown.
   2. Use plastic-tipped or stainless-steel bar supports for surfaces exposed to view in finished structure.

3.3 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install all embeds shown on contract documents, including but not limited to: headed stud embeds, anchor bolts, brick ledge inserts, and dovetail anchor slots.
   2. Install sleeves for mechanical, electrical, and plumbing penetrations.
   3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

B. Aluminum conduit shall not be installed in concrete.

3.4 DELIVERY AND PLACEMENT

A. Preparation before placement:
   1. Remove all debris from forms and deck. Clean steel deck of grease, oil, and other substances that would reduce bond to concrete.
   2. Standing water shall be removed from place of deposit before concrete is placed.
   3. Do not use additives or salts to remove ice. Non-chloride deicers may be used.
   4. In cold weather, comply with ACI 306R; maintain temperature of forms and reinforcing within a range of 55 - 90 degrees F.
   5. In hot weather, comply with ACI 305.1.
   6. Prior to placing topping slabs on Precast Concrete Hollow Core Planks, thoroughly dampen the precast surface but do not leave standing water. Immediately before placing topping, re-dampen the surface and broom on a coat of thin neat cement grout. Apply grout only to small enough areas so that it will not begin to set or dry before placement of the topping slab.
      a. In lieu of neat cement grout, a manufactured bonding agent may be used. The bonding agent must be integrally colored to show the extent of application. Apply by brush or spray, at recommended rates, in accordance with the manufacturer’s directions.

B. Delivery is to conform to ASTM C94.
   1. Delivery tickets to contain the following, in addition to the information required by C94:
   2. Reading of revolution counter at first addition of water.
   3. Type and brand of cement and supplementary cementitious materials.
   4. Cementitious content.
   5. Total water content by producer.
   6. Maximum size of aggregate.
   7. Secure Architect's written approval if non-agitating type equipment is to be used for transportation.

8. ASTM C94 requires discharge within 1-1/2 hours or 300 revolutions; whichever comes first, after the introduction of water to cement and aggregates, or the introduction of cement to the aggregates. Architect may require an earlier discharge during hot weather, or when high-early strength cement is being used.

C. Water addition at the site will not be permitted, except when the approved mix design has been formulated to allow for on-site addition of water. Water may only be added by personnel authorized by the Architect/Engineer and Concrete Producer.

D. Conveying: Keep delivery carts and buggies on runways; do not allow them to bear on reinforcing or uncured concrete.

E. Placement.
1. Place within 6 feet of final position. Spreading with vibrators is prohibited.
2. In walls and columns, deposit concrete in uniform horizontal layers, with a maximum depth of 4 feet (18 inches for architectural concrete).
3. Maximum free fall without chutes or elephant trunks to be 5 feet (3 feet for architectural concrete).
4. Place concrete continuously to a designed joint such that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of cold joints or planes of weakness.
5. Concrete shall be consolidated per guidelines in ACI 309.2R.

F. Records: Keep a complete log of pours, including date, location, quantity, weather, and identification of test cylinders for each pour.

3.5 JOINTING

A. Interior slabs on grade:
1. Locate control (contraction) joints as shown on the Drawings. In the absence of information on Drawings, locate at openings, walls, columns, grid lines, and inside corners. The maximum spacing of contraction (control) joints, for reinforced and unreinforced slabs, is to be 6 times the square root of the slab thickness (i.e. for a 4-inch slab the maximum spacing is 12 feet). Cut joints ¼ times the slab thickness. The Soff-Cut Saw shall be used immediately after final finishing. A conventional saw shall be used as soon as possible without dislodging aggregate. Schedule slab pours and saw-cutting operations such that sawing is completed prior to onset of shrinkage cracking.
2. Provide isolation joints at columns (½ inch thick) and at walls (⅛ inch thick). Where isolation joint will be exposed to view, set top of joint filler below top of slab a distance equal to the filler thickness, to receive sealant. Where not exposed to view, set top of filler flush with top of slab.

B. Exterior slabs on grade: Locate joints as shown on Drawings. In the absence of information on Drawings, provide the following (for sidewalks only):

1. Expansion joints: Full depth, with ½ inch joint filler, where slabs abut vertical surfaces at intersections of sidewalks, at abrupt changes in width, and at a spacing not exceeding 30 feet.
2. Control joints: Tooled, 1 inch deep, 4'-0" to 6'-0" on center between expansion joints.

C. Above-grade, Below-grade and foundation walls: Locate contraction joints at maximum spacings of 60'-0" on center, except as approved otherwise. Provide horizontal reinforcing separation, doweling of adjacent placements, and v-grooves each face per details on Structural Drawings. Construction joints in walls shall be submitted to EOR for review and approval.

3.6 FINISHES

A. Schedule of finishes on flatwork per ACI 301, section 5 is as follows:
1. Typical interior floor areas to receive carpet, resilient floor covering, or to remain exposed - troweled finish.
2. Interior floor areas to receive terrazzo, quarry tile, or ceramic tile - floated finish.
3. Exterior slabs - broom finish.
4. Areas indicated on Drawings:
   a. Exposed aggregate.
   b. Non-slip.
   c. Liquid sealer/densifier – per manufacturer's instructions, under direction of manufacturer's representative. Use on all interior trowel finished slabs subject to small-wheeled vehicular traffic.
   d. Hardener - per manufacturer's instructions, under direction of manufacturer's representative.

B. Surfaces of floor slabs shall be finished to the following tolerances, per ACI 117:
1. Minimum flatness of F(f) 30, and a minimum levelness of F(l) 20, are required for typical slabs on grade. Preceding values are average values to be obtained over a given area. Minimum local values (one-half bay) of F(f) 25 and F(l) 17 shall be obtained.

C. Determination of the flatness and levelness of a concrete slab shall be made on the day following placement of the first concrete pour. Tests shall be made in accordance with ASTM E115. After it is established that proper procedures are being utilized to obtain the desired results, flatness/levelness test shall be performed only as directed by the Owner.

D. Any bay not conforming to the above flatness and levelness requirements is subject to: repair, or removal; replacement; and retesting; at no expense to the Owner.

E. "F Numbers" shall be submitted to the Owner and Architect immediately after they are determined by the testing laboratory.

3.7 CURING AND PROTECTION

A. Curing:
   1. Interior slab areas that will receive non-moisture sensitive terrazzo, ceramic tile, quarry tile, or a liquid sealer/densifier, are to be moist-cured for a minimum of 7 days, without the use of a curing compound.
   2. Interior slab on grade areas which will receive moisture sensitive floor coverings are to be cured with plastic sheeting, conforming to ASTM C171, for 7 days. Edges and joints are to be sealed. Rewetting of the slab at any time during construction should be avoided.
   3. All other slab areas which will receive non-moisture sensitive floor coverings may be either moist-cured or receive an application of curing compound, except that when concrete above grade is placed in the open, and the air temperature exceeds 60 ºF, the concrete is to be moist-cured for the first 24 hours.
   4. Whichever curing method is used, it is to commence immediately after placement. Do not allow curing to be delayed overnight.
   5. Prevent excessive moisture loss from formed surfaces. If forms are removed before 7 days have elapsed, cure the formed surfaces by moist-curing or application of curing compound for the remainder of the curing period.

B. Protection:
   1. When air temperature during placement is less than 40 ºF, or will be within 24 hours, temperature of concrete as placed is to be between 50 ºF and 90 ºF (55 ºF and 90 ºF for sections less than 12 inches thick) and a non-chloride accelerator shall be used. Maintain concrete temperature within these limits for the full curing period of 7 days.
   2. When air temperature during placement is greater than 80 degrees, a water-reducing retarder shall be used. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

3.8 CLEANING AND REPAIR

A. Repair any slabs that do not meet the finish requirements. The Architect will determine whether grinding, filling of cracks, or patching and leveling procedures are required.

B. For slabs that are dusting, or showing other signs of improper curing, any corrective measures attempted will be subject to prior approval of the Architect and will be performed at Contractor's expense. These may include additional applications of sealer/densifier, or grinding, or covering with specified repair topping.

C. Immediately prior to final acceptance, remove from all interior and exterior surfaces that are exposed to view, any stain-producing elements, such as pyrites, nail, wire, reinforcing steel, and form ties.

D. Remove all stains completely. Use of weak acids or patented cleaners is acceptable, but surface is to be completely neutralized after use.

E. All repairs shall conform to ACI 301, Section 5.3.7 except that the specified bonding com- pounds, cementitious, or epoxy repair materials must be used. Repair procedures must be submitted and reviewed by the Engineer of Record.

F. As-cast formed finishes shall be comply with the following:
   1. Concrete surfaces not exposed to view (Surface Tolerance Class D per ACI 117)
      a. Patch voids larger than 1-1/2" wide or ½" deep.
      b. Remove projections larger than 1".
   2. Concrete surfaces exposed to view (Surface Tolerance Class C per ACI 117)
      a. Patch voids larger than ¾" wide or ½" deep.
      b. Remove projections larger than ½".
      c. Patch tie holes.

G. Failure of concrete topping to bond to substrate (as evidence by a hollow sound when tapped), or disintegration or other failure of topping to perform as a floor finish, will be considered failure of materials and workmanship. Repair or replace toppings in areas of such failures, as directed.

3.9 ACCEPTANCE

A. Concrete work with serious honeycombing, form misalignment, or other deviation from Contract requirements is subject to rejection per ACI 301, Section 1.

B. When observations or tests indicate that the Contract requirements have not been met, the Contractor is to bear the costs of any additional testing and analysis to determine acceptability and also the cost of removal and replacement, if such is required per ACI 301, Section 1.

3.10 FIELD QUALITY CONTROL

A. Inspection and testing shall be in accordance with Special Inspections designated for this project as approved by the Building Official. Special Inspections must be documented with all corrective measures completed to satisfy compliance certificates as deemed necessary by the jurisdiction.

B. All tests and inspection shall be per ACI 301, Section 1.6

END OF SECTION 03 30 00

SECTION 03 35 30
CONCRETE CLEANING AND SEALING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Cleaning - Existing and New Concrete Slabs: Clean cured concrete surfaces. All exposed slabs including slabs with applied cure and seal compounds.
   1. Clean surfaces without stripping sealing compounds unless hardening-densifying type is to be applied.

B. Cure and Sealing - Fresh Construction Slabs: See Section 03 30 00 for cure and seal compound. If not specified in 03 30 00, apply cure and seal compound specified herein.

C. Hardening - Densifying and Sealing - New and Existing Cured Construction Slabs: Clean concrete cured surfaces and apply clear hardening liquid sealer compound specified herein.
   1. Concrete Surface Preparation: Verify and completely remove applied concrete curing and sealing compounds with cleaning products herein.

D. Test and ensure all concrete surface preparations and subsequent compound applications are compatible.

1.02 RELATED SECTIONS

A. Sustainable Design Requirements: Section 01 81 13.

B. VOC Limits: Section 01 81 16

C. Cast in Place Concrete: Section 03 30 00.

1.03 REFERENCES

A. ACI 515.1R - Guide to the Use of Waterproofing, Dampproofing, Protective, and Decorative Barrier Systems for Concrete.

1.04 SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, chemical composition, physical properties, test data, and mixing, surface preparation, and application instructions.

B. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.05 QUALITY ASSURANCE

A. Manufacturer: Certify in writing that proposed materials meet or exceed specifications and are appropriate for intended use.

B. Test Sample: Identify an area approximately 36” x 36” where a test cleaning and sealing can be performed and sealer application can be applied. Obtain Architect’s approval of test area prior to start of test. Clean area and apply sealer using materials and methods proposed for the project. Repeat sample applications until approval by Architect. After sample's acceptance by the Architect, sample will be regarded as the minimum standard of workmanship/finish acceptable for the project.

1.06 PROJECT CONDITIONS

A. Do not apply materials when temperature is expected to be below 40o F within 48 hours or when rain is imminent.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Store materials in a clean, dry area in accordance with manufacturer's instructions.

C. Keep product from freezing.

D. Avoid direct contact with this product as it may cause mild-to-moderate irritation of the eyes and/or skin.

E. Protect materials during handling and application to prevent damage or contamination.

F. Use product full strength from the container.

G. Dispose of material according to all local, state and federal regulations.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

A. Source Limitations: Obtain each color, grade, finish, type, and variety of product from single source with resources to provide products of consistent quality in appearance and physical properties. Verify compatibility of cleaner and sealer products.

B. General: Provide materials that comply with Project Sustainable Design Requirements and Low Emitting Material goals.

2.02 CONCRETE CLEANING MATERIAL

A. Description: Pre-mixed, non-acidic pre-packaged degreaser/stripper. Product to be effective in removing existing curing and sealing compounds

B. Manufacturer and Product: Citrex by L & M CHEMICAL or Ultrite Degreaser by W. R. MEADOWS. Products by CHEM MASTERS, DAYTON SUPERIOR; MASTER BUILDERS SOLUTIONS; SURE BUILDING CHEMICALS; H & C PRODUCTS or CONPROCO are acceptable providing they meet the requirements specified.

C. Properties
1. Appearance: Clear.
2. pH: 10.9.
3. Biodegradable: 100% after dilution.

2.03 CURE AND SEAL MATERIAL – FRESH AND EXISTING CONCRETE

A. Description: Spray on - clear, film forming, one component, transparent, acrylic copolymer cure and sealer that locks in moisture, and cures concrete. 2-coat application.

B. Primer: Type as recommended by sealer manufacturer.

C. Properties
1. VOC Content: Less than 170 g/L.
2. Solids: 30%.
3. ASTM C 1315, Type 1, Class A

D. Manufacturer and Product: Dress and Seal WB 30 by LATTICRETE - L & M CHEMICAL or equal products by CHEMMASTERS, DAYTON SUPERIOR; MASTER BUILDERS SOLUTIONS; SURE BUILDING CHEMICALS; W. R. MEADOWS or CONPROCO.

2.04 HARDENING SEAL MATERIAL – CURED CONCRETE

A. Description: Clear, film less, penetrating concrete densifier that increases the strength of the wear surface of concrete floors and seals, dustproofs, densifies, and hardens the surface and reduce absorptiveness.

B. Primer: Type as recommended by sealer manufacturer.

C. Properties
1. Abrasion Resistance (ASTM C779) 225%
2. Increased Wear Resistance Skid Resistance (NFSI Standard 101.A)
3. High Traction Static Coefficient of Friction Wet or Dry >0.6
4. Moisture Absorption, ASTM C642 % reduction in 24 hours 81%

D. Manufacturer and Product: Seal Hard by LATTICRETE - L & M CHEMICAL or equal products by CHEMMASTERS, DAYTON SUPERIOR; MASTER BUILDERS SOLUTIONS; SURE

BUILDING CHEMICALS; W. R. MEADOWS or CONPROCO.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive concrete degreaser. Notify architect if surfaces are not acceptable. Do not begin application until unacceptable conditions have been corrected.

B. Do not apply the sealer products until all surfaces are porous. Test for adhesion.

3.02 SURFACE PREPARATION

A. Protect adjacent surfaces not designated to receive concrete degreaser.

B. Follow ACI Guide 515.1R (Section 3.4.2) for severe oil and grease stains.

C. Clean surfaces of residual flooring adhesive, curing, previous sealers or compounds, if present, and other foreign deposits using warm water, scraping, adhesive removing chemicals or similar methods.

D. New Sealers to Cured Concrete: Remove all previous surface sealers and film forming curing compounds. Ensure surfaces are clean and free of all contaminants, and any film forming curing compounds or sealers.

3.03 APPLICATION

A. Cleaner
   1. Conform to manufacturer's requirements and recommendations. Apply in number of applications as required.
   2. Finish cleaned surface to match test sample area.

B. Sealer:
   1. Verify that slab surfaces have been cleaned and prepared in accordance with sealer manufacturer requirements.
   2. Conform to manufacturer's requirements and recommendations. Provide two coats. Apply first coat at approximately 300 square feet per gallon; second coat at approximately 400 square feet per gallon.
   3. Do not thin material.

3.04 CLEANUP

A. Dispose of material according to local, state, and federal regulations.

B. Clean all tools and equipment with water.

END OF SECTION 03 35 30

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SECTION 04 00 00
MASONRY

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide the following:
   1. Face brick.
   2. Concrete masonry units.
      a. Standard
      b. Fire-rated
      c. Split face
   3. Scored
   4. Glazed face concrete masonry units.
   5. Acoustic concrete masonry units; standard and glazed face.
   6. Ground face concrete masonry units; standard and acoustic.
   7. Glazed structural facing tile.
   8. Stone for lintels, sills and stools.
   9. Masonry lintels and setting of steel angles furnished under Section 05 50 00.
   10. Setting bearing plates supported and embedded with masonry furnished under Section 05 50 00.
   11. Provide masonry fill concrete and reinforcing steel where indicated on drawings. See Section 03 30 00.
   12. Wall reinforcing and accessories.
   13. Built-in collars, sleeves, inserts, anchors, ties, sockets, bolts, blocking, miscellaneous metal work, etc., in contact with, supported on or enclosed by masonry. When these items are furnished by others, they shall include information for setting.
   14. Through-wall flashing.
   15. Includes grouting solid all hollow metal door frames in masonry.
   16. Mortar and grout.
   17. Concrete block vents.

1.02 RELATED SECTIONS

A. Sustainable Design Requirements: Section 01 81 13.

B. VOC Limits: Section 01 81 16.

C. Architectural Precast Concrete: Section 03 45 11.

D. Limestone: Section 04 43 10.

E. Granite: Section 04 43 11.

F. Cast Stone: Section 04 72 00.

1.03 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.04 SUBMITTALS

A. Product Data: For each different masonry unit, accessory and other manufactured products specified.

B. Shop Drawings: Show fabrication and installation details for the following:
   1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, “Details and Detailing of Concrete Reinforcement”. Show elevations of reinforced walls.
   2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples: Provide samples of items specified herein to be used in the work.

D. Submit certification that fire resistant concrete units conform to the requirements specified herein for Fire Resistant Concrete Block.

E. Brick Cleaner
   1. Applicator Qualifications: Submit qualifications of applicator.
      a. Certification stating applicator is experienced in the application of the specified products.
      b. List of recently completed masonry cleaning projects, including project name and location, names of owner and Architect, description of cleaning products used and substrates, applicable local environmental regulations, and application procedures.
   2. Environmental Regulations: Submit description for testing, handling, treatment, containment, collection, transport, disposal, and discharge of hazardous wastes and cleaning effluents. Describe any hazardous materials to be cleaned from substrates. Submit applicable local environmental regulations.
   3. Protection: Submit description for protecting surrounding areas, landscaping, building occupants, pedestrians, vehicles, and nonmasonry surfaces during the work from contact with masonry cleaners, stain removers, residues, rinse water, fumes, wastes, and cleaning effluents.
   4. Surface Preparation: Submit description for surface preparation of substrates to be completed before application of masonry cleaners and stain removers.
   5. Application: Submit description for application procedures of masonry cleaners.

F. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated.

G. Each type of masonry unit required.
      a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
      b. Include test results, measurements, and calculations establishing net-area compressive strength of masonry units.
   2. Mortar complying with property requirements of ASTM C270.
   3. Grout mixes complying with compressive strength requirements of ASTM C476. Include description of type and proportions of grout ingredients.

H. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
   1. Each type of masonry unit required.
      a. Include test data, measurements, and calculations establishing net-area compressive strength of masonry units.
   2. Each combination of masonry unit type and mortar type. Include statement of net-area compressive strength of masonry units, mortar type, and net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
   3. Each material and grade indicated for reinforcing bars.
   4. Each type and size of joint reinforcement.
   5. Each type and size of anchor, tie, and metal accessory.

I. Cold-Weather Procedures: Detailed description of methods, materials and equipment to be used to comply with cold-weather requirements.

J. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.05 QUALITY ASSURANCE

A. Supervisor: A supervisory journeyman mason shall be appointed for the project and shall be present at all times masonry work is being performed and:
   1. have a minimum of 5 years experience on masonry projects of this type and size.

2. be thoroughly familiar with the design requirements, types of materials being installed, referenced standards and other requirements.

B. Use only skilled journeyman masons for cutting and placing of masonry; no allowance shall be made for lack of skill on the part of the workmen.

C. Consult other trades and make provisions that shall permit the installation of their work in a manner to avoid cutting and patching. Build-in work under other sections, as necessary, and as the work progresses.

D. Unit Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602, 2013 Edition “Specifications for Masonry Structures”. Maintain one copy of the standard in project field office at all times during construction. Contractor’s supervisory personnel shall be thoroughly familiar with the material as it applies to this Project.

E. Concrete Unit Masonry Construction: Comply with the National Concrete Masonry Association (NCMA) “TEK Bulletins”, and other requirements specified.
1. NCMA TEK Bulletin 3-02A “Grouting for Concrete Masonry Walls”.
2. NCMA TEK Bulletin 8-02A “Removal of Stains from Concrete Masonry Walls”.
3. NCMA TEK Bulletin 10-01A “Crack Control in Concrete Masonry Walls”.
4. NCMA TEK Bulletin 10-02C “Control Joints for Concrete Masonry Walls”.
5. NCMA TEK Bulletin 14-2 “Reinforced Concrete Masonry”.
6. NCMA TEK Bulletin 19-04A “Flashing Concrete Masonry”.
7. NCMA TEK Bulletin 19-05A “Use of Flashing in Concrete Masonry Walls”.

F. Brick Industry Association (BIA)
1. BIA Technical Notes No. 8 and 8B: Mortar for Brickwork.
2. BIA Technical Notes No. 20: Cleaning Brick Masonry.
3. BIA Technical Notes No. 28D: Brick Veneer.
4. BIA Technical Notes No. 18A: Expansion of Brickwork.

G. Sample Panels
1. Construct where approved by Architect.
2. Panel shall be at least 6 feet long by 6 feet high and shall show full color range, joint detail, reinforcement, air barrier, insulations, through-wall flashing and drips, cavity drainage material, weeps and all other details of construction that will be used in the completed work. Include at least one 90o corner.
   a. Include brick masonry, concrete masonry, cast stone; see Section 04 72 00, and architectural precast concrete; see Section 03 45 12
   b. Clean sample panel using the same methods and materials that will be utilized for cleaning the building masonry.
3. Construct additional panels as required by Architect if original panel construction is not acceptable.
4. Do not start masonry construction until the sample panel is approved by the Architect.
5. Retain acceptable sample as reference standard for the project.
6. Demolish and remove panel from site after acceptance of work.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store cement and lime materials and masonry units off the ground, under cover and protected from weather damage. If units become wet, do not install until they are dry. Do not use cementitious materials that have become damp.

B. Stockpile and store aggregates to prevent contamination from foreign materials, in locations where grading and other required characteristics can be maintained.

C. Use care in handling units to avoid chipping and breakage.

D. Locate storage areas where they will not be disturbed or damaged by construction operations.

E. Protect finished floor areas from damage.

1.07 COLD WEATHER CONSTRUCTION

A. Comply with recommended practices for cold weather construction of the International Masonry Industry All-Weather Council and requirements contained in ACI 530.1/ASCE 6/TMS 602.

B. Do not build on frozen or snow covered work. Remove and replace masonry work damaged by frost or freezing.

C. Requirements During Construction: Provide the following minimum requirements for the air temperatures listed:
   1. Above 40o F: Normal masonry procedures.
   2. 40o F to 32o F: Heat mixing water to produce mortar temperatures between 40o F and 120o F. Produce consecutive batches of mortar with the same temperatures falling within this range. Do not heat mortar to greater than 120o F.
   3. Below 32o F to 25o F: Heat sufficient mortar ingredients to produce mortar temperatures between 40o F and 120o F. Produce consecutive batches of mortar with the same temperatures falling within this range. Maintain mortar temperatures after mixing above 40o F. Do not heat mortar to greater than 120o F.
   4. Below 25o F to 20o F: Heat sufficient mortar ingredients to produce mortar temperatures between 40o F and 120o F. Produce consecutive batches of mortar with the same temperatures falling within this range. Maintain mortar temperatures after mixing above 40o F. Do not heat mortar to greater than 120o F. Maintain masonry above freezing using auxiliary heat. Provide enclosure when wind is in excess of 15 mph.
   5. Below 20o F: Heat sufficient mortar ingredients to produce mortar temperatures between 40o F and 120o F. Produce consecutive batches of mortar with the same temperatures falling within this range. Maintain mortar temperatures after mixing above 40o F. Do not heat mortar to greater than 120o F. Maintain masonry above freezing using enclosure and auxiliary heat.

D. Protection Requirements for Completed Masonry (and masonry not being worked on): Provide the following minimum requirements for the mean daily air temperatures listed:
   1. Above 40o F: Normal masonry procedures.
   2. 40o F to 32o F: Protect from rain or snow for 24 hours with weather-resistive membrane.
   3. Below 32o F to 20o F: Completely cover with weather-resistive membrane and maintain above freezing for 24 hours.
   4. Below 20o F: Provide weather-resistant enclosure and auxiliary heat to maintain above freezing for 24 hours.

E. Requirements During Grouting Operations (Vertically Reinforced Walls): Provide the following minimum requirements for the air temperatures listed:
   1. Above 32o F: Normal masonry procedures. Cover at end of work day with weather-resistive membrane.
   2. 32o F to 20o F: Heat grout materials to 90o F so grout has in-place temperature of 70o F at end of work day. Cover at end of work day with weather-resistive membrane and 1/2" thick insulating blanket.
   3. Below 20o F: Heat grout materials to 90o F so grout has in-place temperature of 70o F at end of work day. Cover at end of work day with weather-resistive membrane and 1" thick insulating blanket or maintain heated enclosure to 40o F for a period of 48 hours.
   4. Grout Containing Type III Cement: Maintain 40o F temperature for 24 hours.

1.08 HOT WEATHER CONSTRUCTION

A. Protect masonry construction from direct exposure to wind and sun when erected in an ambient air temperature of 90o F., or greater in shade with relative humidity less than 50%. Provide artificial shade and wind breaks and use cooled materials as required. Provide artificial shade, wind breaks, use cooled materials and other procedures outlined in BIA Tech Notes #1.

1.09 PROJECT CONDITIONS

A. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
   1. Brace unsupported and newly laid masonry walls. Maintain bracing in place until building structure provides permanent bracing.

B. 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 become in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread 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 on completed masonry.

PART 2 PRODUCTS

2.01 CLAY MASONRY UNITS

A. General: Provide materials that comply with Project Sustainable Design Requirements and Low Emitting Material goals.

B. Existing Brick: Close openings where indicated with face brick salvaged from removal operations. See Section 02 41 16 - Structure Demolition.

C. Face Brick
   1. Reference: Select exterior building brick conforming to ASTM C216, Grade SW.
   2. Size and Color: Standard size and of a color range and texture selected by the Architect.
   3. Cost Estimate
      a. In preparing the bid, estimate the cost of this brick at $480.00 per thousand, unloaded and stacked at the building site.
      b. If brick selected costs more or less than the amount specified, an amount equal to the difference in cost shall be added to, or deducted from, the contract price.
      c. The quantity of face brick required shall be the amount installed in the work as determined by the Architect.
   4. Size: Standard.
   5. Manufacturer/Color
      a. Field Brick: BELDEN BRICK Berwick Blend.
      b. Accent Brick: BELDEN BRICK Berwick Reds Range.
      c. Other Manufacturers: Brick by other manufacturers may be used providing the above requirements are met or exceeded. Color and texture must be equal as approved by the Architect prior to bid.
   6. Special Shapes: Provide solids, shelf angle bricks and other special shapes as indicated or required so as no brick cores are exposed to view. Color and texture to match face brick or accent brick as applicable.
      a. Cost Estimate
         1) In preparing the bid, estimate the cost of special shapes of brick at $6,000.00per thousand, unloaded and stacked at the building site.
         2) If special shape bricks selected costs more or less than the amount specified, an amount equal to the difference in cost shall be added to, or deducted from, the contract price.

D. Structural Glazed Facing Tile Units
   1. Size: Manufacturer's standard unit 6T Series with nominal face dimensions of 12” long by 5-1/3” high, 4W Series with nominal face dimensions of 8” long by 8” high, and 8W Series with nominal face dimensions of 16” long by 8” high.

2. Special Shapes
    a. Provide special corner, jamb, sash, control joints and other special conditions where shown and required.
    b. Provide bullnose edge tile for external corners, except where otherwise indicated.
    c. Provide coved base course.
3. General
    a. Comply with the following classifications, weights, grades, curing and other requirements as specified.
        1) ASTM C67.
        2) ASTM C126, Grade SS, Type I.
    b. For walls glazed both sides, provide two single glazed units.
    c. Provide manufacturer's standard factory finished ceramic glazed surface that is an integral part of clay unit.
    d. Color: Selected by Architect from manufacturer's full range of colors.
    e. Manufacturer: ELGIN-BUTLER BRICK COMPANY.

2.02 CONCRETE MASONRY UNITS

A. General
1. Curing: Cure for at least 7 days and units must be at least 28 days old when used in the work.
2. Corners (Interior Walls): Provide bullnose edges at all outside corners unless otherwise indicated or directed.
3. Colors
    a. Concealed and Interior Exposure (not indicated to be colored): Natural color.
    b. Exterior Exposed and Interior Exposed where indicated
        1) Color 1: Light brown range as selected by Architect.
        2) Color 2: Warmtone (tan) range as selected by Architect.
4. Colors (from second manufacturer):
    a. All Scored Units, All Split Face Units and Smooth Face Units (where indicated): Colors as follows:
        1) Scored Smooth Face, except as specified below: WELLNITZ Carey Warmtone or similar color by OBERFIELD'S or other block manufacturer as approved by Architect prior to bid.
        2) Scored Split Face Accent Bands and Smooth Face Base: WELLNITZ Charcoal or similar color by OBERFIELD'S or other block manufacturer as approved by Architect prior to bid.
        3) Other Areas Not Identified: WELLNITZ Carey Warmtone or similar color by OBERFIELD'S or other block manufacturer as approved by Architect prior to bid.
    b. All Other Units: Natural.
5. Integral Water Repellents: Use in units exposed to weather. Amount as recommended by water repellent manufacturer as approved by concrete block manufacturer.
    a. Type: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
    b. Products/Manufacturers: Subject to compliance with requirements, provide W. R. GRACE Dry-Block; MASTER BUILDERS' INC. Rheomix-Rheopel; ACME-HARDESTY CO. Acme-Shield; KRETE INDUSTRIES KreteControl 202 Internal Water Repellent; EUCLID CHEMICAL Hydrapel System.

B. Hollow Load Bearing, Solid Load Bearing (75%) and Fire Resistant Concrete Masonry Units
1. Type: Hollow, load bearing, standard modular size and shapes, thoroughly cured and dried.
2. References: ASTM C90.

3. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
4. Weight Classification: Normal weight, unless otherwise indicated.
5. Linear Shrinkage: Not to exceed 0.065 percent, ASTM C426.
6. Aggregate: ASTM C33 normal weight aggregates. Cinder aggregates not permitted.
7. Fire Resistant
    a. Rating: Design for fire ratings indicated on drawings.
    b. Manufacturer
        1) Listed in the Building Materials List published by the Underwriters' Laboratories, Inc.
        2) In lieu of above, provide a report from a nationally recognized testing agency stating that the units are equivalent in fire rating to those furnished by the producers as listed above.
    c. Location: Where indicated.

C. Split Face Units
1. Type: Standard weight, hollow core, load bearing, modular units conforming to ASTM C90. Nominal [4 x 16] [8 x 16] face size. Thickness as indicated.
2. Provide all special shapes, including split faces, ends, and top surfaces as required to complete the work.

D. Glazed Masonry Units
1. Reference: ASTM C744
2. Type: Spectra Glaze II, satin finish, as manufactured by THE SPECTRA GROUP; Astra-Glaze by TRENWYTH INDUSTRIES.
3. Special Shapes
    a. Provide special corner, jamb, and other special conditions where shown and required.
    b. Provide coved base course where indicated.
    c. Scored Pattern: As indicated.
4. For walls glazed both sides, provide two single glazed units.
5. Colors: Selected by Architect from manufacturer's full range of colors. Three colors will be selected. Layout pattern as indicated.
6. Glazed Acoustic Concrete Masonry Units: See "Acoustic Concrete Masonry" herein.

E. Ground Face Concrete Units
1. Type: Ground face, hollow, load bearing, thoroughly cured and dried.
2. References of Block for Grinding: ASTM C90.
3. Manufacturer: [Trendstone Plus] [Verastone Plus], filled units by TRENWYTH INDUSTRIES; NEW HOLLAND CONCRETE, READING ROCK or PREMIER.
4. Surface: Fill ground surfaces with cementitious grout with minimum cured strength and durability equal to basic block unit. After polishing filled surfaces, field apply heat treated acrylic coating.
5. Colors: As selected by Architect. Two colors will be selected. Layout as indicated.
6. Special Shapes
    a. Provide special corner, jamb, and other special conditions where shown and required.
    b. Provide coved base course where indicated.

F. Acoustic Concrete Units
1. Type: Hollow, load bearing, thoroughly cured and dried, and cast with normal weight aggregates. Provide with acoustic slots and insulation filler inserts.
    a. Filler inserts at glazed block to be moisture resistant insulation.
2. References: ASTM C90.
3. Color: Natural, except for glazed units.
4. Sizes: As indicated on drawings.

5. Manufacturer
    a. Basis of Design: Drawings and specifications are based on Soundblox units by THE PROUDFOOT COMPANY.
    b. Acceptable Manufacturers: Acousta-Wal units manufactured by TRENWYTH INDUSTRIES or equal are acceptable providing they meet or exceed the requirements specified.
6. Sound Absorption Coefficients: ASTM C423. (125/500/2000 Hertz)
    a. Type RSC - 12": 0.57 at 125 Hertz; 1.09 at 500 Hertz; 0.54 at 2000 Hertz.
    b. Type R - 4": 0.20 at 125 Hertz; 0.63 at 500 Hertz; 0.52 at 2000 Hertz.
7. Noise Reduction Coefficient: ASTM C423.
    a. Type RSC - 12": 0.85.
    b. Type R - 4": 0.65.

G. Precast Concrete Lintels
1. Mix: Minimum of 1 part cement to 3 parts aggregate.
2. Strength: Minimum compressive strength of 5000 psi at 28 days.
3. Finish: Thoroughly cured with exposed faces having a finish that approximates that of adjacent surfaces.
4. Provide for at least 8 in. bearing at each end unless otherwise indicated.
5. Color: Match adjacent concrete masonry.

H. Concrete Brick
1. Type: Solid, standard sizes and shapes, thoroughly cured and dried and cast with normal weight aggregates.
2. References: ASTM C55, Grade N.
3. Use as necessary to close openings in areas where concrete masonry is not exposed to view (i.e. close-off cavity of cavity walls at openings, work concealed behind drywall, etc.).

2.03 MISCELLANEOUS UNITS

A. Refractory Brick: Fireclay medium duty type in accordance with ASTM C27, Fireclay and High-Alumina Refractory Brick.
1. Provide in fireplace fire-box.

B. Flue Liner: Provide size and shape as indicated on drawings in conformance with ASTM C315, Clay Flue Linings.

2.04 MORTAR

A. Materials
1. Portland Cement: ASTM C150, 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 or selected.
2. Masonry Cement: ASTM C91, provide non-staining type for stonework.
3. Hydrated Lime: ASTM C207, Type S.
4. Aggregate: ASTM C144, clean masonry sand, not over 10% to pass No. 100 sieve for general use.
5. Water: Clean, fresh and free of deleterious amounts of acids, alkalis and foreign organic matter.
6. Water Repellent Admixture: W. R. GRACE Dry-Block, RHEOMIX - Rheopel Mortar Admixture; MASTER BUILDERS, INC., KRETE INDUSTRIES KreteGuard 390. Manufacturer must submit certification that water repellent admixture meets or exceeds requirements specified herein.
    a. Conformance: ASTM E514.
    b. Type: Integral polymeric water-repellents (IPWR).
7. Color Additive: Inorganic pigments as required to produce colored mortar as selected by Architect. SGS Colors by SOLOMON GRIND CHEM SERVICE; DAVIS COLORS or

equal.
   a. Resistant to alkali, light and weather
   b. Unaffected by cement and free of water soluble salts.
8. Cold Weather Additive: Non-chloride, non-corrosive, accelerating admixture complying with ASTM C494, Type C or ASTM C1384 and recommended by the manufacturer for use in masonry mortar of composition indicated.

B. Proprietary Mortar Cement: Conform to ASTM C91, containing hydrated lime.
1. Certification: Submit certified laboratory data substantiating conformance with structural requirements for mortars as specified; and that no adverse chemical reaction will occur with the specified masonry accessories and reinforcing. Certification must be received and approved by Architect prior to mortar use.
2. Suitable products are acceptable from the following manufacturers:
   a. MIAMI
   b. LEHIGH HANSON
   c. ESSROC MATERIALS, INC. (Brixment)
   d. QUIKRETE
   e. CEMEX INC.

C. Mixes - Unit Masonry
1. Provide water repellent admixture in all mortar used for exterior CMU masonry work. Add to mix in accordance with manufacturer's recommendations.
2. Type M Mortar
   a. Use: Provide for CMU work below grade or in contact with earth.
   b. Proportions: ASTM C270 proportions by volume. Minimum average compressive strength at 28 days of 2,500 psi.
   c. Color: Natural color.
3. Type S Mortar
   a. Use: Provide for all CMU work.
   b. Proportions: ASTM C270 proportions by volume. Minimum average compressive strength at 28 days of 1,800 psi.
   c. Colors
      1) Concealed work and natural colored concrete masonry units: Natural color.
      2) Colored concrete masonry units: As selected by Architect.
4. Type N Mortar
   a. Use: Provide for brick veneer and cast stone.
   b. Proportions: ASTM C270 proportions by volume. Minimum average compressive strength at 28 days of 750 psi.
   c. Colors: As selected by Architect.

D. Mix - Cut Stone: One part non-staining masonry cement, one part hydrated lime, and six parts damp, loose sand.

E. Cast Stone Pointing Mortar: One part non-staining masonry cement, one part hydrated lime, and four parts damp, loose sand. Add coloring pigment as required to match mortar color selected by Architect.

F. Grout - For Pointing Glazed Block Joints: Dry-set grout composed of Portland Cement and additives formulated for ceramic tile and glazed block. ANSI 118.7 with grout sealer per Section 09 30 00.
1. Colors: Selected by Architect from manufacturer's colors.
2. Manufacturer:
   a. MAPEI.
   b. CUSTOM BUILDING PRODUCTS.
   c. LATICRETE

2.05 GROUT

A. Masonry Grout - Mix
   1. Fine Grout for Reinforced Masonry: Mix with mechanical mixer with sufficient water to the desired consistency in accordance with ASTM C476 Proportion Specifications.
      a. Portland Cement: 1 part
      b. Hydrated Lime: 0 to 1/10 part
      c. Fine Aggregate: 2-1/4 to 3 times the sum of the volumes of the cementitious materials
   2. Coarse Grout for Reinforced Masonry: Mix with mechanical mixer with sufficient water to the desired consistency in accordance with ASTM C476 Proportion Specifications.
      a. Portland Cement: 1 part
      b. Hydrated Lime: 0 to 1/10 part
      c. Fine Aggregate: 2-1/4 to 3 times the sum of the volumes of the cementitious materials.
      d. Coarse Aggregate: 1 to 2 times the sum of the volumes of the cementitious materials.
   3. Hand Mixing: Not acceptable.

2.06 REINFORCING

A. Manufacturers: DUR-O-WALL; HECKMANN BUILDING PRODUCTS; HOHMANN & BARNARD; MASONRY REINFORCING CORPORATION OF AMERICA (WIREBOND). Where products are specified referencing a particular manufacturer, equal products from the manufacturers listed are acceptable providing the product meets the requirements indicated.
   1. Where a manufacturer is listed below for a specific product, it is to establish a level of quality. Similar products of equal quality from the above listed manufacturers are acceptable.

B. Horizontal Joint Reinforcement
   1. General

2.07 TYPE: LADDER TYPE, STANDARD WEIGHT, GALVANIZED.FROM TRUSS 8-17-2010

      a. Width: Approximately 2 in. less than nominal wall thickness.
      b. Spacing: Continuous along horizontal joint, spaced 16 inches on center vertically, unless otherwise indicated.
   2. Longitudinal Wire
      a. Single Wythe Walls: 2 wires.
      b. Multi-wythe Walls:
         1) Each wythe less than 6 inches wide: 1 wire.
         2) Each wythe 6 inches and wider: 2 wires.

B. Metal "Z" Ties: 3/16" galvanized steel "Z" shaped wire ties, 2" narrower than wall width. For use in block wythes at control joints.

C. Split face CMU veneer with CMU back-up (i.e. Book Depository): Use ladder type reinforcing; do not use systems under paragraph D.

D. Adjustable Veneer Anchor
   1. Steel Stud or Structural Steel Back-Up: Two piece, adjustable loop type anchor and tie. Anchors and ties shall be carbon steel, devices, hot dip galvanized after fabrication, coating conforming to ASTM A153, Class B2, 1.5 ounce coating per square foot. Manufacturer to provide oversized hole as required to accommodate diameter of screws without abrasion of zinc coating.
      a. Anchor: Provide anchors that allow vertical adjustment but resist a 100-lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
         1) Steel Stud Back-Up: Screw-on galvanized steel strap anchor, 12 gage by 3/4" wide by 9" long with 3/8" offset and 4" adjustment. Provide strap with 3/8" hole

at each end for fasteners. Provide self-tapping carbon steel screws with minimum 0.0005" of zinc coating. HECKMANN 315-C.

2) Steel Stud/ Sheathing Back-Up: Screw-on galvanized steel strap anchor with stand-off legs for insulation sheathing board in depths required. X-SEAL by HOHMANN & BARNARD or similar type design manufactured by HECKMANN, AA WIRE PRODUCTS, DUR-O-WAL, INC., NATIONAL WIRE PRODUCTS INDUSTRIES. Seal insulation face with reinforced polyolefin base, laminated to a polypropylene layer tape. Alternate design attachment must be specifically designed for insulated sheathing in depths required.
3) Structural Steel Back-Up: Weld-on steel strap anchors. Field prime after welding. 12 gage by 1/2" wide by 8' long with six 3/8" offsets to provide 7-3/4" vertical adjustment. HECKMANN 317-B.
4) Fasteners: Hot-dipped galvanized steel bolt, nut and washer.
5) Depth: Provide engineered analysis of anchors over 4 ½”.

b. Ties: Triangular tie, fabricated from 3/16" diameter galvanized cold drawn steel wire. Provide ties long enough to engage the anchor and be embedded not less than 2" into the bed joint of the masonry veneer. HECKMANN 316 Series.

2. Wood Stud Back-Up: Screw on anchor plate fabricated 14 gage hot dipped galvanized steel. 1 ¼” x 6” long. 315D from by HECKMANN or similar products.
   a. Ties: Triangular tie, fabricated from 3/16" diameter galvanized cold drawn steel wire. Provide ties long enough to engage the anchor and be embedded not less than 2" into the bed joint of the masonry veneer. HECKMANN 316 Series.
3. Concrete Masonry Back-Up (Tie and Anchor): Ladder type reinforcing with double eye ties welded at each cross wire 15” o.c. to extend into cavity of the two wythe wall. A two pronged hook tie shall be inserted into the eye holes creating a positive connection to restrain compression and tension. Lox All Adjustable Eye Wire HOHMANN & BARNARD.

E. Wire Mesh: Wire Mesh: 1/4" mesh of galvanized steel wire (min. 16 gage) or galvanized metal lath, cut into strips 1-1/2" narrower than wall width where used. For use at intersection of masonry walls.

F. Dovetail Anchors
1. Anchor Slots: 1 in. wide, 1 in. deep, 5/8 in. throat, 24 ga. galvanized steel. HECKMAN No. 100, HOHMANN & BARNARD, or equal.
2. Anchors: Brick, minimum 1 in. wide by 3-1/2 in long, flat or corrugated. HECKMAN No. 103 or 104; HOHMANN & BARNARD, or equal.

G. Reinforcing Steel - Bond Beam and Wall Reinforcement: Uncoated steel reinforcing bars; ASTM A615/A; ASTM A616, including Supplement 1; or ASTM A617/A, Grade 60.

H. Partition Top Anchors: 12 gage galvanized steel plate with 7/16-inch diameter holes. HOHMANN & BARNARD PTA 422 or equal.

2.08 MISCELLANEOUS ITEMS

A. Through-Wall Flashing: [Provide one of the following types:]
1. Copper Composite
   a. Characteristics:
      1) Type: Copper core with polymer fabric laminated to copper face on both sides with non-asphalt adhesive.
      2) Copper: ASTM B370, CDA Alloy 110
      3) Weight: 5 oz
      4) Fabric: polymer fabric; laminated both faces of copper core.
   b. Mastic/sealant: One part 100% solids, solvent-free formulated silyl-terminated polyether (STPE), ASTM C920, Type S, Grade NS, Class 50.
   c. Termination Strip: Provide metal type recommended by flashing manufacturer. Seal top edge.

d. Manufacturers/Products
    1) YORK MANUFACTURING, INC.; Multi-Flash
    2) STS COATINGS, INC.; Gorilla Flash GF-500
    3) WIRE-BOND, INC.; Copper Seal
    4) ADVANCED BUILDING PRODUCT; Copper Sealtite

2. Rubber Sheet include on Daimler, etc. type projects
    a. Material: Self-adhesive, cold-applied sheet consisting of 32 mil rubberized asphalt bonded to 8 mil polyethylene film. Provide with release film.
    b. Mastic: Rubberized asphalt-based mastic.
    c. Surface Primer (Conditioner): Type as recommended by manufacturer.
    d. Termination Strip: Provide metal type recommended by flashing manufacturer. Seal top edge.
    e. Manufacturer: Perm-A-Barrier by W. R. GRACE, IPCO Wall Flashing; ILLINOIS PRODUCTS CORPORATION, CCW 705 TWF; CARLISLE COATINGS AND WATERPROOFING, POLYGUARD 400 TWF, ADVANCED BUILDING PRODUCTS Strip –N -Flash
3. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy. Tensile Strength - ASTM D412C 14%, Puncture Resistance - ASTM E154 300 lbs. minimum
    a. Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 40 mil thick with thick coating of adhesive.
    b. Manufacturer: DUPONT; HOHMANN & BARNARD, INC; MORTAR NET SOLUTIONS; WIRE-BOND.
4. Stainless Steel Core Flexible Flashing with Drainage Fabric (SSCFF).
    a. Material: Composite with stainless steel with adhesive polymer fabric laminated to one stainless steel and non-woven drainage fabric laminated to opposing face with adhesive.
        1) Stainless steel: type 304, ASTM A240
        2) Polymer fabric; laminated back face to stainless steel core.
        3) Non-woven drainage fabric: Fabric laminated to front face stainless steel core.
    b. Manufacturer: YORK MANUFACTURING, INC.; York Flash-Vent SS, STS COATINGS, INC.; Wall Guardian Venting Stainless Steel TWF, BUILDING MATERIALS WEST COMPANY, INC.; Evacu-Flash SS
    c. Note: Eliminate cavity protection material if SSCFF used.
    d. Note: Eliminate drip edge by terminating at brick face and sealing down the flashing if SSCFF used. However, provide drip edges above windows and doors for replacement ease.

B. Sheet Metal Drip Edge: Fabricated from 0.015” thick by minimum 3” wide stainless steel with hemmed edge. Comply with requirements specified in Section 07 62 00 - Flashing and Sheet Metal.
    1. Product: HECKMAN BUILDING PRODUCTS, IPCO stainless steel drip edge, ILLINOIS PRODUCTS CORPORATION or HOHMANN & BARNARD, INC.

C. Preformed Masonry Control Joint Filler
    1. General: Extruded rubber complying with ASTM D2240, general purpose grade.
    2. Flange: Where applicable, locate as required for the particular joint configuration.
    3. Manufacturer: Rapid Regular Control Joint by DUR-O-WALL; HOHMANN & BARNARD, or equal.

D. Block Core Insulation - Contractor’s Option: Exterior concrete masonry walls and concrete masonry party walls: Contractor may use one of the insulation types as specified below. The same type must be used throughout the entire project. Provide one of the following insulation options:
    1. Foam-In-Place Insulation: See Section 07 21 00.

2. Insulating Block Units: Insul Bloc by INSUL BLOCK CORP. (with integral insulating units) using lightweight aggregate for masonry block units.
3. Block Core Inserts: Provide insulation inserts installed in block plant prior to shipment to job site.
    a. Material: Expanded polystyrene designed to fit proposed masonry units. Conform to ASTM C578 Insulation Board-Thermal Type I and Type II.
    b. Thickness and R-Value: 2" thick, minimum 7.8 R-value.
    c. Manufacturer: Blocfil by MILLER MATERIAL CO.; KORFIL INC.; W.R. GRACE.

E. Brick Cleaning Compound: PROSOCO Sure Klean 600 Detergent; or equal commercial cleaning solution by NATIONAL CHEMSEARCH or AMERICAN CALMAL that will not harm masonry or adjacent materials and is acceptable to the masonry manufacturer. Cleaners containing muriatic acid are not acceptable.

F. Cell Vent: Polypropylene Model #QV Quadro Vent by HOHMANN & BARNARD; Model D/A 1006 by DUR-O-WALL or equal by HECKMANN. Color as selected by Architect.

G. Isolation Liners: Locate between steel columns and masonry. Asphalt impregnated cellular paper, similar to WILLIAMS PRODUCTS Columns Boxboard, 1/4" single thickness or 1/2" double thickness. Use double thickness except where wall dimensions do not permit, then use single thickness.

H. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142” steel wire, hot-dipped galvanized after fabrication.
1. D/A 811 DUR-O-WALL
2. D/A 816 DUR-O-WALL
3. No. 376 Rebar Positioner HECKMAN
4. #RB Rebar Positioner HOHMANN & BARNARD
5. #RB-Twin Rebar Positioner HOHMANN & BARNARD
6. Double O-Ring Rebar Positioner MASONRY REINFORCING CORPORATION OF AMERICA
7. O-Ring Rebar Positioner MASONRY REINFORCING CORPORATION OF AMERICA

I. Adhesive Anchor Bolts
1. In hollow CMU: Adhesive anchor systems with nylon or stainless steel screen inserts. Use 1/2 inch diameter anchors with 4-1/4 inch embedment. (Minimum allowable shear 900 pounds; minimum allowable tension 250 pounds/anchor.)
2. In solid grouted CMU: Adhesive anchor systems. Use 1/2 inch diameter anchors with 4-1/4 inch embedment; (minimum allowable shear 2600 pounds; minimum allowable tension 2000 pounds/anchor).

J. Cavity Protection Material: Minimum 1” thick, reticulated, nonabsorbent mesh, made from polyethylene strands and shaped to maintain drainage at weep holes without being clogged by mortar droppings.
1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    a. Mortar Net; MORTAR NET USA, LTD.
    b. Mortar Break; ADVANCE BUILDING PRODUCTS
    c. Mortar Net; MASONRY REINFORCING CORPORATION OF AMERICA.
    d. Mortar Net; HOHMANN & BARNARD, INC.
    e. CavClear Masonry Mat; ARCHOVATIONS
    f. Mortar Stop; POLYTITE MANUFACTURING CORP.
    g. Mortar Grab: IPCO PRODUCTS.

K. Concrete Block Vents: Extruded aluminum; nominal 8” high x 16” long x 4” deep; clear aluminum finish. SUNVENT INDUSTRIES Model EX or equal by AIROLITE or INDUSTRIAL LOUVERS, INC.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine the substrates, structure, and installation conditions. Do not proceed with unit masonry work until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Brick
   1. Wet brick having ASTM C67 absorption rates greater than 0.025 oz. per square inch per minute. Use wetting methods which ensure that each masonry unit is nearly saturated, but surface dry when laid. During freezing weather, comply with the recommendations of BIA.
   2. Except for absorbent units specified to be wetted, lay masonry units dry.

B. Concrete Masonry Units: Lay masonry units dry. Do not wet concrete masonry units.

C. Establish lines, levels, and coursing.

D. Coordination: Identify items that are to be built-in to masonry wall as specified in other section of these specifications. Verify that these items are available prior to commencing masonry work in these areas. Coordinate sizes of required openings. Items include, but are not necessarily limited too:
   1. Access doors
   2. Recessed fire extinguisher cabinets
   3. Recessed toilet accessories

3.03 INSTALLATION - GENERAL

A. Build walls to the full thickness shown. Build single wythe walls to the actual thickness of the masonry units, using units of nominal thickness shown or specified.

B. Cut masonry units using motor-driven masonry saws to provide clean, sharp, unchipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full-size units without cutting wherever possible. Provide 100% solid units where webs would be exposed.

C. Construction Tolerance: Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:
   1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than ¼” in 20 feet, nor ½” maximum.
   2. For vertical alignment of exposed head joints, do not vary from plumb by more than ¼” in 10 feet, nor ½” maximum.
   3. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than ¼” in 20 feet, nor ½” maximum.
   4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8”, with a maximum thickness limited to ½”. Do not vary from bed-joint thickness of adjacent courses by more than 1/8”.
   5. For exposed head joints, do not vary from thickness by more than plus or minus 1/8”. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8”.

D. Openings: Form all chases and openings required for piping and other trades. After work is completed, close openings with masonry and seal around penetration.

E. Seal all anchor penetrations and tears in the vapor barrier as a result of the work installed under this section.

3.04 ERECTION - BRICK AND CONCRETE MASONRY

A. Masonry

1. Layout walls in advance for accurate spacing of surface bond patterns, with uniform joint widths, and to properly locate returns and offsets. Avoid the use of less than half-size units at corners, jambs and other locations.
2. Lay up walls plumb and true to comply with specified tolerance. Provide courses level, accurately spaced and coordinated with other work.
3. Pattern Bond: Lay exposed masonry in running bond with vertical joint in each course centered on units in courses above and below. Bond and interlock each course of each wythe at corners. Do not use units with less than 4" of horizontal face dimensions at corners.
4. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and slabs. Maintain 3/8" joint widths, except for minor variations required to maintain bond alignment.

3.05 JOINTS

a. Exposed: Cut flush and finish (tool) with hardened metal tool to form a concave compressed joint. Same methods and types of tools to be used by all masons working on project.
b. Concealed: Cut flush and trowel point.

2. Compress and cut joints flush for masonry foundation walls.
3. Lay brick masonry units with completely filled bed and head joints. Butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.

B. Horizontal Wall Reinforcement: Provide continuous masonry joint reinforcement as indicated. 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.
a. Reinforcement above is in addition to continuous reinforcement.
4. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
5. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.
6. Provide additional reinforcement continuous in first joint above openings and in first joint below openings not extending to floor. Extend additional reinforcement a minimum of 4'-0" beyond opening.

C. Brick Veneer/Metal Stud Wall Ties: Install in accordance with manufacturer's instructions. Locate one tie per every two square feet of wall surface and in accordance to BIA Technical Notes No. 44B.

D. Cavity Wall Construction
1. Keep the air space clear and clean of all mortar droppings and other debris.
2. Provide weeps spaced 24 inches apart.
3. Provide cavity drainage protection or similar methods to ensure that weeps are clear of mortar droppings and drain to the building exterior.
4. Make weep holes by methods subject to Architect's approval
a. Gray Mortar: Louvered PVC weep, similar to HOHMANN & BARNARD #343 located in brick head joints.
b. Colored Mortar: Cellular weep vents located in brick head joints.
c. Tube and Cotton Wick: Medium Density Polyethylene
5. Provide top of wall weep ventilation with cellular vent at 24 inches apart.

E. Door Frames: Fill all frames installed in masonry with mortar.

F. Bearing Points

1. Lintels and Bar Joists: Where a lintel, bar joist or similar member bears directly on concrete masonry, fill the cores of the two blocks courses directly under the member with grout to a limit of 16 inches beyond the end of the member.
2. Precast Concrete Deck: Where precast concrete deck units bear directly on concrete masonry, fill the cores of the top two block courses with grout.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

H. Control and Expansion Joints: Provide control joints for exterior and interior masonry construction in accordance with NCMA-TEK Bulletins 10-1A and 10-2B and BIA Technical Notes 18A. Verify control
1. Unless otherwise indicated, provide control joints in masonry walls at maximum 24 foot intervals for exterior walls, maximum 30 foot intervals for interior walls, and at intersections of walls, except corners.
2. Exact locations as determined by the Architect if not specifically dimensioned. Verify locations do not conflict with structural shear wall requirements.
    a. If drawings do not indicate all control joints based on these maximums, allow for additional joints to be determined by the Architect prior to commencement of masonry work.
    b. Locate control at steel columns.
3. Provide 3/8" wide control joints, unless otherwise indicated. For joints in exterior walls, build in control joint filler strips as masonry wall is laid up allowing 3/4" for sealant and backup on each side of wall. For interior control joints, no filler is required; rake joint approximately 3/4" deep and install sealant and backup. See Section 07 92 00, Sealants.
4. Do not carry horizontal joint reinforcement through control joint.
5. Maintain lateral support of continuous wall at control joint in concrete block backup walls by using control joint filler, tongue and groove type control joint block, or similar type approved method. In cavity walls, place metal “Z” wall ties 16" on-center vertically in brick on each side of control joint.
6. Maintain lateral support of intersecting interior masonry walls with wire mesh ties placed across joint between walls, spaced 16" on-center vertically.

I. Thru-Wall Flashing
1. Provide at the following locations:
    a. In first course above steel supports and shelf angles.
    b. In first course above lintels at louvers, windows and doors.
    c. In first course above grade around entire building perimeter.
    d. In exterior walls that project above adjacent lower roof.
    e. Below sills of window, louver and similar type wall openings.
    f. Below parapet wall caps.
    g. Other through wall flashing conditions where indicated.
2. Ensure that flashings drain to exterior.
3. Prepare masonry surfaces smooth and free of projections which could puncture flashing.
4. Lay on slurry of fresh mortar and cover with mortar.
5. End Dams: Provide end dams at all locations where flashing terminates within a wall. Over openings, carry minimum 6" beyond end of steel lintel and turn up edges to form pan. All corners folded, not cut.
6. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
7. Top Edge Concealed Terminations: 8 inch minimum above drainage plane.
8. Seal around all penetrations with mastic before covering with mortar.
9. Joints
    a. Install in longest lengths and with fewest joints possible but not less than 20 feet between joints.

   b. Lap ends minimum 6 inches and seal with full bed of mastic.
10. Continue flashings around corners and other gaps in shelf angles to prevent discontinuity.
11. Continue flashing through expansion joints.
12. Provide weeps at all thru-wall flashing locations. Space weeps as specified hereinbefore.

J. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material specified herein.

K. Masonry, non-bearing walls carried to structure above: Terminate at normal joint width below surface and leave joint open for sealants.
   1. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above to comply with Section 07 84 00, Firestopping.

L. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.

M. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

N. Steel Lintels: Install steel lintels at all masonry opening, whether indicated on the drawings or not. Provide minimum bearing of 8” an each jamb, unless otherwise indicated.

O. Insulation Fill
   1. Place where indicated on the Drawings.
   2. Pour directly into the wall from the bag or from a hopper.
   3. Pours may be made at any convenient interval; however, extreme care shall be exercised to be sure that all cores are full of insulation.
   4. Place temporary signs on walls and warn other trades to use caution in cutting into wall to avoid loss of insulation.

P. Removal of Masonry Units
   1. Limits: As shown on the Drawings or as directed in writing by the Architect.
   2. Method
      a. Remove to first full masonry unit beyond limits.
      b. Remove all old mortar from existing masonry units adjacent to new construction.
      c. Sufficiently brace opening when necessary until construction is completed.

Q. Patching Existing Walls
   1. Location: Where indicated on the Drawings.
   2. Closure Limits
      a. As required to install door or window frame in larger opening.
      b. As required to fill entire opening.
      c. To limits indicated on Drawings.
   3. Materials: Use new masonry units conforming to existing wall section in color, size and characteristics.
   4. Method
      a. Tooth-in new masonry units.
   5. Apply mortar to all vertical and horizontal surfaces of units forming joints in new wall section.
      a. Use half units when necessary to make square openings of complete closure.

R. Limestone Belt Course: Set limestone with completely filled bed and head joints. Butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.

S. Brick Arches
   1. Construct arches so that the following applies:
      a. length of span remains constant
      b. elevations of the ends are unchanged

c. The inclination of the skewback (inclined surface on which the arch joins the supporting wall) is fixed.

2. Care must be taken to insure that the preceding requirements are maintained and, that sliding, settlement or rotation of the abutments does not occur.
3. Construct arches with aid of temporary shoring or centering.
4. Do not remove centering until masonry is capable of carrying all imposed loads and in no case less than seven days after the completion of the arch.
5. Use units of uniform shape, vary joint thickness to obtain desired curvature.
6. Construct arches with all mortar joints completely filled, except hold mortar on underside of arches back from face of brick a minimum of 5/8".
7. After removing centering, tuck point joints on underside of arches to match adjacent joints in masonry walls.

T. Soldier Courses: Construct soldier courses where indicated on drawings.
1. Projection: 1/2" from face of wall.
2. Corner: Provide "queen closures" at 90o corners.

3.06 MORTAR

A. General
1. Batch Size: Controlled so that all material used within two (2) hours.
2. Mortar on Board
a. Keep well tempered with water so long as its cementing material has not started to set.
b. Do not retemper if initial set of cementing material has been reached, or if mortar has stiffened greatly.
3. Anti-freeze Admixture: Not permitted.
4. Water Repellent Admixture: Use with brick and concrete block exposed to exterior, mix as recommended by manufacturer.

B. Mixing
1. Machine mix dry in a batch mixer with care taken in adding water to mix to avoid overwetting.
2. Do not retamper in mixer at any time.
3. Continue mixing for a minimum of five (5) minutes after all materials are in mixer.

C. Recharging: Completely empty and clean mixer before recharging.

3.07 PROTECTION

A. Brace all walls while in green condition.

B. 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 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.

3.08 REINFORCED MASONRY INSTALLATION

A. Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602.
1. General: Clean reinforcement of loose rust, mill scale, earth, ice or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.

B. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

1. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Use "Fine Grout" per ASTM C 476 for filling spaces less than 4" in one or both horizontal directions.
3. Use "Coarse Grout" per ASTM C 476 for filling spaces 4" to 10" in both horizontal directions.
4. Use 3000 psi concrete for filling spaces 10" or larger in both horizontal directions.

C. Bond Beams: Reinforce as indicated and fill with grout. Position reinforcement accurately at the spacing indicated. Place horizontal reinforcement as the masonry work progresses.

D. Reinforced Concrete Masonry Walls: Install and align grout block units to provide continuous vertical voids in walls. Install reinforcing steel as work progresses. Use horizontal bars to position vertical bars. Fill grout block units cores solid with concrete fill.
1. Place concrete fill in maximum 4’-0” vertical lifts. Recess top of fill minimum 1-1/2” below top of course to form a key with the following lift. Comply with NCMA TEK Bulletins 3-2, 3-3A and 14-2 recommendations.
2. Coordinate placement of reinforcement and concrete fill with cast-in-place concrete and precast concrete work to provide continuous vertical and horizontal reinforcement full height of indicated walls.

3.09 FIELD QUALITY CONTROL

A. Owner will engage a qualified independent testing agency to perform source quality-control testing indicated below:
1. Retesting of materials failing to meet specified requirements shall be done at Contractor’s expense.

B. Testing Frequency: Tests and Evaluations listed in this Article will be performed during construction for each 5000 sq. ft. of wall area or portion thereof.

C. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.

D. Grout will be sampled and tested for compressive strength per ASTM C1019.

E. Brick Tests: For each type and grade of brick indicated, units will be tested according to ASTM C67.

F. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C140.

G. Prism-Test Method: For each type of wall construction indicated, masonry prisms will be tested per ASTM C1314, and as follows:
1. Prepare 1 set of prisms for testing at 7 days and 1 set for testing at 28 days.

3.10 REPAIR, POINTING AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged. Provide new units to match adjoining units and install in fresh mortar pointed to eliminate evidence of replacement.

B. During the tooling of joints, enlarge all voids or holes, and completely fill with mortar. Point up all joints at corners to provide a neat, uniform appearance.

C. Cleaning - Brick Masonry: Clean all exposed brick masonry. Cleaning agents and methods subject to Architect's approval. Protect all stone. Damaged materials and work replaced at Contractor's expense.
1. Before full-scale application, review manufacturer's product data sheets to determine the suitability of each product for the specific surfaces. Apply each masonry cleaner to test panel areas to determine dilution rates, dwell times, number of applications, compatibility, effectiveness, application procedures, effects of pressure rinsing, and desired results.
2. Apply masonry cleaners and stain removers to test panels in accordance with manufacturer's written instructions. Allow 48 hours or until test panels are thoroughly dry

before evaluating final appearance and results. Do not begin full-scale application until test panels are inspected and approved by the Architect.

3. Test Area Requirements:
   a. Size: Minimum 5 feet by 4 feet each.
   b. Locations: As determined by the Architect.
   c. Masonry Cleaners: Number of test panels as required to completely test each masonry cleaner with each type of substrate to be cleaned.
4. Test all cleaning effluents generated by the masonry cleaning of the test panels to determine any hazardous characteristics. Comply with applicable federal, state, and local environmental regulations including testing, handling, treatment, containment, collection, transport, disposal, and discharge of hazardous wastes.
5. Muratic acid cleaning of brick masonry not permitted. Install and protect installed brick masonry so that acid cleaning is not required at completion of the work.

D. Cleaning – Concrete Masonry: During construction of exposed CMU, minimize mortar and grout smears on exposed surfaces. Dry brush CMU surfaces at the end of each days work and after final pointing. Remove mortar stains and dirt from exposed surfaces.
   1. Cleaning Solutions: Where cleaning solutions are required, they shall be provided at no additional cost to the Owner. Cleaning solutions must be approved by Architect and spot tested prior to use.

E. Area Cleaning: Clean floors of all mortar droppings, including floor surfaces of accessible chases.

3.11 MASONRY WASTE DISPOSAL

A. Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Disposal as Fill Material: When approved by Geotechnical Engineer, dispose of clean masonry waste, including broken masonry units, waste mortar, and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.

3.12 CRUSH MASONRY WASTE TO LESS THAN 4 INCHES IN EACH DIMENSION.

A. 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 30 00, Earthwork. All fill material must be approved by Geotechnical Engineer.

B. Disposal as Fill Material: When approved by Geotechnical Engineer, dispose of clean masonry waste, including broken masonry units, waste mortar, and excess or soil-contaminated sand, 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 30 00, Earthwork. All fill material must be approved by Geotechnical Engineer.
   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.

3.13 REPOINTING EXISTING WALLS

A. Remove mortar to a depth of at least 1/2" with hand or power tool.

B. When cutting is complete, remove all loose material with a brush or hose stream.

C. Point joints with prehydrated Type N mortar consisting of 1 part Portland cement, 1 part Type S hydrated lime, 6 parts sand.

D. Wet raked mortar joints thoroughly before applying fresh mortar. Allow water to soak into wall so no free-standing water is visible.

E. Pack mortar tightly in thin layers until joint is filled, then tool to a smooth concave surface.

END OF SECTION 04 00 00

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SECTION 04 72 00
CAST STONE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Design and fabricate cast stone elements as indicated on the drawings. Work includes, but is not necessarily limited to the following:
   1. Wall caps.
   2. Wall panels.
   3. Water table bands and window sills.
   4. Column wraps.
   5. Other shapes as indicated.
   6. Non-staining setting mortar and joint sealant.
   7. Accessories to complete the work.
   8. Connection details.

1.02 RELATED SECTIONS

A. Cast-in-Place Concrete: Section 03 30 00.

B. Architectural Precast Concrete: Section 03 45 00.

C. Mortar: Section 04 00 00.

D. Sealant: Section 07 92 00.

E. Sustainable Design Requirements: Section 01 81 13.

F. VOC Limits: Section 01 81 16.

1.03 REFERENCE STANDARDS

A. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete; 2021.

B. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2023.

C. PCI MNL-117 - Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products; 2013.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Submit for all items; include the following as applicable:
   1. Details and sizes of stones.
   2. Arrangement of joints.
   3. Connection details.
   4. Bonding.
   5. Inserts.
   6. Joints.
   7. Reinforcing.
   8. Method of installation and anchoring.

C. Samples: Submit samples representative of finished stone pieces showing full range of color and texture. Resubmit until acceptance by the Architect. Approved samples will be used in the field as a basis of quality for cast stonework submitted on the project.

D. Design Calculations: Submit calculations for each type, shape, loading condition and span of cast stone units indicated on the drawings, and all related supports and connections. Design of cast stone shapes and connections shall be under the direct supervision of a Professional Engineer, registered in the State of [Ohio], and calculations shall bear engineer's seal and signature.

E. Qualification Data: For manufacturer.

F. Existing Stone Shapes: Where new shapes are being reproduced to match existing profiles and shapes, existing items can be removed and used to fabricate cast stone molds. Remove items by hand and take cautionary methods so as not to damage item being removed and adjacent materials.

G. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.05 QUALITY ASSURANCE

A. Acceptable Manufacturers: Minimum of five (5) years continuous production experience in cast stone work of quality and scope required on this project , and is a plant certified by the Cast Stone Institute.

B. Installer Qualifications: Experienced mason regularly engaged for at least five (5) years in installation of cast stone elements similar to those required on this project.

C. Comply with ASTM C1364.

1.06 JOB MOCK-UP

A. General
   1. After standard samples are accepted for color and texture, submit full scale pieces meeting design requirements.
   2. A mock-up panel for the exterior masonry is to be built on the site, as specified in Section 04 00 00.
      a. Water Table Bands and Wall Caps: Submit full size samples of shapes that will be utilized in the finished work. Samples of water table band and wall cap will be used in constructing the sample panel specified in Section 04 00 00.
   3. Mock-up to be standard quality for cast stone work when accepted by the Architect.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling
   1. Transport and handle cast stone with equipment to protect units from dirt and damage.
   2. Do not place on ground.
   3. Place nonstaining resilient spacers of even thickness between each element.
   4. Support cast stone during shipment on expanded polystyrene or similar nonstaining shock-absorbing material.

B. Storage
   1. Store to protect from contact with soil and from other damage.
   2. Store in same position as transported with nonstaining resilient supports located in same position as when transported.
   3. Store on firm, level and smooth surfaces.
   4. Place stored cast stone so that identification marks are discernible.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cement: White Portland Cement, ASTM C150, Type I or III containing not more than 0.60 percent total alkali when tested according to ASTM C114. .
   1. Use same brand, type and source of supply throughout.

B. Fine Aggregate: Graded and washed manufactured limestone sand meeting ASTM C33; gradation and colors as needed to produce required cast stone textures and colors.
   1. Use same type and source of supply throughout.

C. Course Aggregate: Graded and washed crushed limestone meeting ASTM C33; gradation and colors as needed to produce required cast stone textures and colors.
   1. Use same type and source of supply throughout.

D. Color: Inorganic, natural or inorganic iron oxide pigments meeting ASTM C979 excluding the use of a cement grade of carbon black pigment.
   1. Pigment manufacturer must certify that pigment is lime-proof.
   2. Amount: Not to exceed 10% by weight of cement.
   3. Manufacturer: SGS Colors by SOLOMON GRIND CHEM SERVICE; DAVIS COLORS or equal.
   4. Color: Where required, as selected by Architect.
      a. Match existing stone. Color match will be determined after cleaning the existing stone.

E. Admixtures: Use only admixtures specified or approved in writing by Architect.
   1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.
   2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
   3. Water Repellent Admixture: MASTERBUILDERS Rheomix 235, EUCLID CHEMICAL, SONNEBORN. Cast stone fabricator must submit certification that proposed water repellent admixture has been used in cast stone work similar to that used on this project.
   4. Air-Entraining Admixture: ASTM C260. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 4 to 6 percent, except do not add to zero-slump concrete mixes.
   5. Water-Reducing Admixture: ASTM C494, Type A.

F. Water: Potable.

G. Mortar: Type N; see Section 04 00 00.

H. Anchors (Embedded in Cast Stone): Stainless steel, AISI Type 302/304 of type and size determined by fabricator to provide permanent anchorage. Minimum capacity 3 kips.

I. Reinforcing
   1. Bars: ASTM A615, Grade 40 or Grade 60, when required, as determined by manufacturer, for safe handling, setting and structural stress. Provide galvanized or epoxy coated.
      a. Fiber reinforced polymer bars or fiber reinforcement is acceptable per ASTM D7957/D7957M.
   2. Wire: ASTM A82 Cold-drawn steel wire, ASTM A185 or ASTM A497 welded wire fabric reinforcement, or ASTM A184 steel bar or rod mat reinforcement may be used.
   3. Cast Stone Panels: Reinforce as required for handling and to allow for temperature changes and structural stress. Provide a minimum steel reinforcement of 1/4% of the sectional area of the panel; place temperature in both directions when panel is greater than 12" in any direction.

2.02 MIXES

A. Manufacturer: Responsible for mix design as required to achieve strength and surface finish desired.

B. Compressive Strength - 28 Day: Minimum of 6500 psi per ASTM C1194.
   1. Tests: Perform in accordance with ASTM C31, ASTM C39 and ASTM C642, except that 2" cube specimens shall be used, oven dried in accordance with ASTM C97.
   2. Results: Determined by averaging three specimens per test.
   3. Divide compression test results by a factor of 0.8 when saw-cut or core drilled specimens are used.

C. Water Absorption - Average: Maximum 6% dry weight per ASTM C1195.

D. Air Content - ASTM C173 or C 231, for wet cast product shall be 4-8% for units exposed to freeze-thaw environments. Air entrainment is not required for VDT products.

E. Freeze-thaw - ASTM C666 as modified by ASTM C1364: The CPWL shall be less than 5% after 300 cycles of freezing and thawing.

F. Linear Shrinkage - ASTM C 426: Shrinkage shall not exceed 0.065%.

2.03 COLOR AND FINISH

A. Color and Texture: Submit cast stone samples for final selection of color and texture.
   1. Color: Natural limestone.
   2. Finish: As achieved by acid etch method. Natural limestone appearance.
   3. Color: Match existing building stone as approved by Architect.
   4. Finish: Match existing stone as approved by Architect.

2.04 CAST STONE UNITS

A. Regional Materials: Cast stone units shall be manufactured within 500 miles of Project site from aggregates that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Provide cast stone units complying with ASTM C1364 using either the vibrant dry tamp or wet-cast method.
   1. Provide units that are resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666, Procedure A, as modified by ASTM C1364.

C. Fabricate units with sharp arrise and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
   1. Provide suitable washes on all exterior copings, projecting courses and pieces with exposed top surfaces.
   2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
   3. Provide drips on projecting elements unless otherwise indicated.

D. Fabrication Tolerances:
   1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.
   2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than 1/4 inch.
   3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, whichever is greater.
   4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch on formed surfaces of units and 3/8 inch on unformed surfaces.

E. Cure units as follows:
   1. Cure units in enclosed moist curing room at 95 to 100 percent relative humidity and temperature of 100 deg F for 12 hours or 70 deg F for 16 hours.
   2. Keep units damp and continue curing to comply with one of the following:
      a. No fewer than five days at mean daily temperature of 70 deg F or above.
      b. No fewer than six days at mean daily temperature of 60 deg F or above.
      c. No fewer than seven days at mean daily temperature of 50 deg F or above.
      d. No fewer than eight days at mean daily temperature of 45 deg F or above.

F. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive cast stone and do not proceed until defects detrimental to the finished work are corrected, including the moisture protection, structural supports, provisions for expansion, or any other conditions which might affect the finished work in appearance, watertightness or integrity of the complete installation.

B. Verify all measurements and dimensions; coordinate the installation of inserts for this work; and coordinate and schedule this work with the work of other trades.

C. Review shop drawings of items or assemblies related to the support or anchorage of cast stone work, including requirements for clearances for proper installation.

3.02 INSTALLATION

A. Do not use cast stone with chips, cracks, voids, stains or other defects which would be visible in the finished work. The setting of any damaged or defective stone is at Contractor's risk of removal.

B. Set cast stone work accurately, straight, level, plumb and square in accordance with Shop Drawings.

C. Unless otherwise indicated, set stone in full mortar bed with vertical joints flushed full. Anchors and dowels shall be firmly placed and all anchor holes and dowel holes and similar holes filled completely with mortar.
   1. Copings, projecting belt courses, and in general, all stone areas either partially or totally horizontal: Set with unfilled vertical joints. After setting, insert back-up material or backer rod, prime stone ends and seal, all in accordance with Section 07 92 00.
   2. Joints Between Cast Stone and Masonry: Rake joints ¾" deep and seal with non-staining joint sealant in accordance with Section 07 92 00. This requirement takes precedence over joint conditions indicated on drawings.

D. Thoroughly wet stones prior to setting.

E. At sealed or pointed joints, rake joints to a depth of 3/4". Sponge off face of stones to remove excess mortar.

3.03 TOLERANCES

A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.

B. Variation from Level: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.

C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.

D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch, except where variation is due to warpage of units within tolerances specified.

3.04 PATCHING AND CLEANING

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect. Repair of cast stone shall be done only by mechanics skilled in this type of repair work, with materials furnished by manufacturer and under manufacturer's direction

B. Before pointing, clean face of cast stone with a fiber brush, soap powder and water, and thoroughly rinse with clean running water.
   1. Remove excess mortar from face of stone.
   2. No acids or prepared cleaners are permitted without the approval of cast stone manufacturer and Architect.

3.05 POINTING AND SEALING

A. Dampen joints prior to pointing.

B. Point stone joints to a concave surface with pointing mortar. See Section 04 00 00 for mortar.
   1. Pointing in freezing weather or in locations exposed to hot sun, unless properly protected, is not permitted.

C. Seal head joints, where left open for sealing, with sealant in accordance with Section 07 92 00.

3.06 INSPECTION AND ACCEPTANCE

A. Cast stone shall show no obvious repairs or imperfections other than normal color variations when viewed with the unaided eye at a 20 foot distance in good typical daylight illumination.

B. Applicable Standards for Inspection and Quality Control: ACI Committee 311 Manual of Concrete Inspection and PCI MNL-117 Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.

3.07 PROTECTION

A. Protect cast stone at all times from drippings, welding spatter and damage by other trades during construction. Where necessary or directed, substantial non-staining wooden or other approved covering shall be placed to protect the work. Heavy polyethylene film or similar type material shall be used between cast stone and wood. Maintain all protection until removed to permit final cleaning of cast stone work.

1. Protect cast stone during brick cleaning operations, unless cleaning solution has been approved for cast stone and tested in the field on actual cast stone samples.

END OF SECTION 04 72 00

SECTION 04 73 10
MANUFACTURED STONE VENEER

PART 1 GENERAL

1.01 WORK INCLUDED

A. Manufactured stone veneer and shapes, metal anchors, lath and accessories.

1.02 RELATED SECTIONS

A. Mortar: Section 04 00 00.

B. Sealant: Section 07 92 00.

C. Sustainable Design Requirements: Section 01 81 13.

D. VOC Limits: Section 01 81 16.

1.03 REFERENCES

A. ASTM C150 - Specifications for Portland Cement.

B. ASTM C177 - Test Method for Thermal Conductivity by Means of the Guarded Hot Plate.

C. ASTM C270 - Specification for Mortar for Unit Masonry.

D. Underwriters' Laboratories, UL723 - Test for Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

A. Product Data: Submit for all items.

B. Samples: Submit samples for selection by Architect.

C. Submit manufacturer's written installation instructions. Include instructions for each type of substrate and mounting conditions encountered on Project.
   1. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   2. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.]

1.05 QUALITY ASSURANCE

A. Applicator: Approved by manufacturer with a minimum of three years experience in the installation of manufactured veneer of the type specified.

1.06 SAMPLE PANEL

A. Construct where approved by Architect.

B. Panel shall be at least 4 feet long by 4 feet high and shall show full color range, joint detail, all other details of construction that will be used in the completed work. Include at least one 90 degree corner.

C. Construct additional panels as required by Architect if original panel construction is not acceptable.

D. Do not start simulated masonry application until the sample panel is approved by the Architect.

E. Retain acceptable sample as reference standard for the project.

F. Demolish and remove panel from site after completion and acceptance of simulated masonry work.

1.07 DELIVERY, STORAGE AND HANDLING

A. Conform to the requirements of the stone manufacturer. Ship materials in their original cartons or wrappings.

B. Store moisture sensitive materials in protected enclosures; handle by methods which avoid exposure to moisture.

1.08 PROJECT CONDITIONS

A. Maintain materials and surrounding air temperature at minimum 40 degrees F prior to, during, and for 48 hours after application.

B. Protect materials from rain, moisture, and freezing temperatures prior to, during, and for 48 hours after application.

C. Allow no construction work on opposite side of wall to which work is being applied during and for 48 hours after application.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Basis of Design: HERITAGE STONE Santee Ledgestone.

B. Other Manufacturers: Subject to compliance with requirements, products by the following manufacturers are acceptable::
   1. CORONADO PRODUCTS
   2. ELDORADO STONE
   3. BORAL STONE PRODUCTS
   4. BOULDER CREEK STONE PRODUCTS

2.02 MATERIALS

A. Description: Thin veneer sections comprised of noncombustible lightweight aggregates, Portland cement and natural iron oxide colorings.

B. Bonding Mortar: Type N as specified in Section 04 00 00. Natural color.

C. Grouting Mortar: Type N as specified in Section 04 00 00. Colors as selected by Architect.

D. Metal Lath: ASTM C847; 3.4 pound flat diamond mesh, galvanized. Provide galvanized steel anchor plates (similar to RODENHOUSE Grip-Plate Lath and Plaster Washer) and galvanized fasteners as recommended by stone manufacturer for substrate conditions and insulation/sheathing thicknesses.

E. Cleavage Membrane/Water Resistive Barrier: Provide type as recommended by stone manufacturer.

2.03 MANUFACTURED UNITS

A. Physical Properties
   1. Compressive Strength: ASTM C192 and ASTM C39, 1800 psi, 5 specimen average, 1500 psi minimum for individual unit.
   2. Bond Between Stone Unit, Type S Mortar, and Backing: ASTM C 482, 50 psi
   3. Freeze-Thaw Test: ASTM C 67: Less than 3%
   4. Water Absorption: UBC Standard 15-5: 22 percent
   5. Density: ASTM C 567 (Dry density): 75 pcf

B. Burning Characteristics
   1. Smoke Developed: 0.
   2. Fuel Contributed: 0.
   3. Flame Spread: 0.

C. Colors: As selected by Architect.

D. Provide all trim pieces as indicated

E. Provide plaster ring at surface mounted fixtures and similar items. Type as recommended by stone manufacturer. Thickness to match stone.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates upon which manufactured masonry will be installed.

B. Coordinate with responsible entity to correct unsatisfactory conditions.

C. Commencement of work by installer is acceptance of substrate conditions.

3.02 PREPARATION

A. Protection: Protect adjacent work from contact with mortar.

B. Surface Preparation: Prepare substrate in accordance with manufacturer’s installation instructions for the type of substrate being covered.

3.03 INSTALLATION

A. Install system complete in accordance with manufacturer's instructions and recommendations for the types of substrates encountered and the Masonry Veneer Manufacturers Association's (MVMA) Installation Guide and Detailing Options for Compliance with ASTM C1780.

B. Expansion and Control Joints: Locate joints in accordance with ASTM C1780.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide the services of manufacturer’s field representative during installation.

END OF SECTION 04 73 10

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SECTION 04 73 13
CALCIUM SILICATE MANUFACTURED STONE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Calcium Silicate Building Units. Work includes building blocks indicated in pattern on the elevations and all indicated trim shapes. Provide for the following conditions:
   1. Load bearing with ties and air space. Full depth units.
   2. Mortared veneer to cement board substrate. 1” depth (cut) units.

1.02 RELATED SECTIONS

A. Cast-in-Place Concrete: Section 03 30 00.

B. Sealant: Section 07 92 00.

C. Sustainable Design Requirements: Section 01 81 13.

D. VOC Limits: Section 01 81 16.

1.03 REFERENCE STANDARDS

A. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2019.

B. ASTM C73 - Standard Specification for Calcium Silicate Brick (Sand-Lime Brick); 2023.

C. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

D. ASTM C482 - Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste; 2020.

E. ASTM C1780 - Standard Practice for Installation Methods for Cement-Cased Adhered Masonry Veneer; 2020.

1.04 SUBMITTALS

A. Shop Drawings: Submit for all items; include the following:
   1. Details and sizes of stones.
   2. Arrangement of joints.

B. Connection details.
   1. Bonding.
   2. Inserts.
   3. Joints.
   4. Reinforcing.
   5. Method of installation and anchoring.

C. Provide for the following:
   1. Suitable washes on all exterior copings, projecting courses and pieces with exposed top surfaces.
   2. Drips under the outer edge of projecting pieces.
   3. Setting mark on each stone and its location on the structure. Stone when delivered shall bear the same corresponding setting mark on an unexposed surface.

D. Samples: When requested by Architect, submit samples representative of finished stone pieces showing full range of color and texture.

E. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.05 QUALITY ASSURANCE

A. Acceptable Manufacturers: The following manufacturers are acceptable:

1. ARRISCRAFT CORPORATION

B. Installer Qualifications: Experienced mason regularly engaged for at least five (5) years in installation of manufactured stone elements similar to those required on this project.

1.06 JOB MOCK-UP

A. General
   1. After standard samples are accepted for color and texture, submit full scale pieces meeting design requirements.
   2. A mock-up panel for the exterior masonry is to be built on the site, as specified in Section 04 00 00.
   3. Full scale sample pieces of each type of stone shall be incorporated into mock-up panel.
   4. Mock-up to be standard quality for manufactured stone work when accepted by the Architect.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling
   1. Transport and handle stone with equipment to protect units from dirt and damage.
   2. Do not place on ground.
   3. Place nonstaining resilient spacers of even thickness between each element.
   4. Support stone during shipment on expanded polystyrene or similar nonstaining shock-absorbing material.

B. Storage
   1. Store to protect from contact with soil and from other damage.
   2. Store in same position as transported with nonstaining resilient supports located in same position as when transported.
   3. Store on firm, level and smooth surfaces.
   4. Place stored stone so that identification marks are discernible.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cast Building Units
   1. Manufacturer: Renaissance units by ARRISCRAFT CORPORATION
   2. Sizes and Pattern: As indicated on drawings.

B. Limestone Marble Starter Course: Dolomitic Limestone ASTM C568, Category III High Density; having the following typical average properties when tested to the identified standard:
   1. Compressive Strength: 22,900 psi, to ASTM C170.
   2. Absorption: 0.75 percent, to ASTM C97.
   3. Density: 167 lbs/ft3, to ASTM C97.
   4. Modulus of Rupture: 2,250 psi, to ASTM C99.
   5. Flexural Strength: 1,600 psi to ASTM C880.
   6. Abrasion Resistance: 18.0 to ASTM C241.
   7. Size: Varies see drawings
   8. Manufacturer: Adair by ARRISCRAFT CORPORATION
      a. Color: Blue/gray.

2.02 MIXES AND PERFORMANCES

A. Cast Building Units (CBU) Calcium Silicate Units: ASTM C73, Grade SW; solid units that have been pressure formed and autoclaved.
   1. Manufacturer: Responsible for mix design as required to achieve strength and surface finish desired.
   2. Compressive Strength: ASTM C170; minimum 7750 psi or ASTM C140 5000 psi.
   3. Modulus of Rupture: ASTM C99; minimum 658 psi.

4. Density: ASTM C97; minimum 139 pcf or ASTM C140 120 pcf..
5. Water Absorption - Average: ASTM C97; maximum 10% dry weight or ASTM C1195 maximum 5%.

2.03 COLOR AND FINISH

A. Color and Texture: Submit samples for final selection and/or approval of color and texture.
   1. Colors: As selected and approved by Architect.
   2. Finish: Texture as selected by Architect.

2.04 MORTAR

A. Polymer Modified Mortar for Adhered Veneer: Water resistant, high bond specifically designed for thin veneer applications for substrates encountered.
   1. Comply with ASTM C270, ASTM C482, ANSI A118.4 and ACI 530

2.05 ADHERED VENEER ACCESSORIES

A. Cementitious Backer Units: ASTM C 1325, Type A.
   1. Thickness: 5/8”

B. Mortar for Adhered Veneer: ASTM C270 and ASTM C482 LATTICRETE MVIS or equal.

PART 3 EXECUTION

3.01 CONDITION OF SURFACES

A. Prior to installation, examine surfaces to receive manufactured stone and do not proceed until defects detrimental to the finished work are corrected, including the moisture protection, structural supports, provisions for expansion, or any other conditions which might affect the finished work in appearance, watertightness or integrity of the complete installation.

B. Verify all measurements and dimensions; coordinate the installation of inserts for this work; and coordinate and schedule this work with the work of other trades.

C. Review shop drawings of items or assemblies related to the support or anchorage of cast stone work, including requirements for clearances for proper installation.

3.02 INSTALLATION

A. Do not use stone with chips, cracks, voids, stains or other defects which would be visible in the finished work. The setting of any damaged or defective stone is at Contractor's risk of removal.

B. Set stone work accurately, straight, level, plumb and square in accordance with Shop Drawings.

C. Unless otherwise indicated, set stone in full mortar bed with vertical joints flushed full. Where applicable, anchors and dowels shall be firmly placed and all anchor holes and dowel holes and similar holes filled completely with mortar.
   1. Copings, projecting belt courses, and in general, all stone areas either partially or totally horizontal: Set with unfilled vertical joints. After setting, insert back-up material or backer rod, prime stone ends and seal. All in accordance with Section 07 92 00.

D. Thoroughly wet stones prior to setting.

E. Rake joints indicated to receive sealant to a depth of 3/4". Sponge off face of stones to remove excess mortar.

F. Mortared Veneer Applications: Install system complete in accordance with manufacturer's instructions and recommendations for the types of substrates encountered and the Masonry Veneer Manufacturers Association's (MVMA) Installation Guide and Detailing Options for Compliance with ASTM C1780.
   1. Cut veneer units to depth required.
   2. Cementitious Sheathing Substrate: Comply with requirements in section 09 29 00. Comply with manufacturer’s recommendations and instructions for substrate and conditions.
   3. Mortar: Comply with manufacturer’s recommendations and instructions for substrate and conditions. Apply in coats as recommended.

4. Accessories: Provide all flexible flashings, attachments and accessories for complete adhered system.
5. Expansion and Control Joints: Locate joints in accordance with ASTM C1780.

3.03 TOLERANCES

A. Stone Dimensions: The numerically greater of plus or minus 1/8 inch or length/360.

B. Setting Tolerances: Plus or minus 1/8" allowable out of plane from adjacent unit.

3.04 PATCHING AND CLEANING

A. Repair of chipped or damaged stone shall be done only by mechanics skilled in this type of repair work, with materials furnished by manufacturer and under manufacturer's direction

B. Before pointing, clean face of stone with a fiber brush, soap powder and water, and thoroughly rinse with clean running water.
   1. Remove excess mortar from face of stone.
   2. No acids or prepared cleaners are permitted without the approval of stone manufacturer and Architect.

3.05 POINTING AND SEALING

A. Dampen joints prior to pointing.

B. Point stone joints to a concave surface with pointing mortar. See Section 04 00 00 for mortar.
   1. Pointing in freezing weather or in locations exposed to hot sun, unless properly protected, is not permitted.

C. Seal head joints, where left open for sealing, with sealant in accordance with Section 07 92 00.

3.06 INSPECTION AND ACCEPTANCE

A. Manufactured stone shall show no obvious repairs or imperfections other than normal color variations when viewed with the unaided eye at a 20 foot distance in good typical daylight illumination.

B. Applicable Standards for Inspection and Quality Control: ACI Committee 311 Manual of Concrete Inspection and PCI MNL-117 Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.

END OF SECTION 04 73 13

SECTION 05 12 00
STRUCTURAL STEEL

PART 1 GENERAL

1.01 WORK INCLUDED

A. Section Includes
   1. Structural steel framing
   2. Base plates and anchor bolts
   3. Grouting under steel base plates
   4. Design of connections not indicated on drawings
   5. Shop finishes
   6. Field testing

1.02 RELATED SECTIONS

A. Steel Joists: Section 05 21 00.

B. Steel Decking: Section 05 31 00.

C. Painting: Section 09 91 00.

D. Installation of Lintels in Masonry: Section 04 00 00.

E. Cementitious Fireproofing: Section 07 81 16.

F. Miscellaneous Metals: Section 05 50 00.

G. Testing: Section 01 45 29.

H. Sustainable Design Requirements: Section 01 81 13

1.03 SUBMITTALS

A. Shop Drawings
   1. Submit for all items.

1.04 INDICATE PROFILES, SIZES, SPACING AND LOCATIONS OF STRUCTURAL MEMBERS, CONNECTIONS, ATTACHMENTS, FASTENERS AND CAMBERS.

1. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.

B. Certification of Experience: Submit, on request only, written description of personnel, projects and equipment which document the experience and qualifications required of the fabricator, erector and welders.

C. Proof of Compliance of Materials: Submit, on request only, the following:
   1. Mill reports for properly identified material.
   2. Certificates of compliance for;
      a. Structural Steel Shapes.
      b. High Strength threaded fasteners.

D. Submit erector's affidavit that frame has been erected plumb and level within tolerances in the Code of Standard Practice.

1.05 QUALITY ASSURANCE

A. Reference Standards
   1. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished; 2018.

ASTM E164 - STANDARD PRACTICE FOR CONTACT ULTRASONIC TESTING OF WELDMENTS; 2019.

ASTM E709 - STANDARD GUIDE FOR MAGNETIC PARTICLE TESTING; 2021.

1. American Institute of Steel Construction (AISC):
   a. Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

b. Specification for Structural Joints using ASTM A325 or A490 bolts.
c. Code of Standard Practice for Steel Buildings and Bridges.

2. American Welding Society (AWS).
a. Structural Welding Code - Steel (D1.1).
b. Symbols for Welding and Non-Destructive Testing (A2.4).

B. Fabricator's Qualifications: Minimum five years' continuous experience in the fabrication of steel for projects of similar quality and scope.

C. Erector's Qualifications: Minimum five years' continuous experience in similar steel erection.

D. Welders' Qualifications: Personnel and procedures are to be qualified in accordance with AWS D1.1.

3.02 DELIVERY, HANDLING AND STORAGE

A. Delivery of material installed under other Sections.
1. Comply with ASTM A6. Non-compliance will be cause for rejection.
2. Deliver anchor bolts and other anchorage devices which are embedded in cast-in-place concrete or masonry construction to the job site in time to be installed before the start of cast-in-place concrete operations or masonry work.
3. Provide setting drawings, templates and directions for the installation of the anchor bolts and other devices.

B. Storage of Materials
1. Structural steel members which are stored at the project site shall be above-ground on platforms, skids or other supports.
2. Protect from corrosion.
3. Store other materials in a weathertight and dry place until ready for use in the work.
4. Store packaged materials in their original unbroken package or container.

PART 2 PRODUCTS

4.01 MATERIALS

A. Steel Shapes, Bars and Plates: ASTM A36.

B. Structural Steel Tubing
1. Square and Rectangular: ASTM A500, Grade B.
2. Round: ASTM A501 or ASTM A53, Grade B.

C. High-Strength Threaded Fasteners (Bolts, Nuts and Washers)
1. Bolts: ASTM A325 or A490, of domestic manufacture, except that A325 Type 2 and A490 Type 3 are prohibited. All bolts are to be cold-formed with rolled threads.
2. Nuts: ASTM A194, Type 2H. No other nuts are acceptable; nuts must show manufacturer's name and the 2H symbol.
3. Washers: ASTM F436.

D. Anchor Bolts, Standard Bolts and Nuts: ASTM 307, or A36. Provide heavy washers for anchor bolts (both ends where shown).

E. Expansion Anchors
1. Type: "Kwik-Bolt" by HILTI; "Parabolt" by MOLLY; WEJ-IT, or equal, will be acceptable, provided the published strengths equal or exceed those of "Kwik-Bolt" by HILTI.
2. Material: Compatible with the item being attached or as indicated on the Drawings.

F. Welding Materials: AWS D1.1; Series E70 electrodes, appropriate for materials being welded.

G. Headed Studs: ASTM A108, Grades 1010 through 1020 inclusive.

H. Masonry Anchors: 11 gage channel slots or 3/16 inch diameter wires, shop welded to structural steel.

I. Bearing Pads: Self-lubricating bearing elements designed to allow rotation and horizontal movement. Standard shall be Fluorogold FC-1010-CS with elastomeric backing manufactured

by FLUOROCARBON.

4.02 FABRICATION

A. General: Meet the requirements of the AISC "Steel Construction Manual" as supplemented and modified herein.

B. Field Measuring: Field Measure all items as required to obtain proper fit.

C. Connections: Details on Drawings are to illustrate location, type, general arrangement only, and to establish minimum requirements.
   1. General: Contractor shall design all connections per AISC Standards for forces and moments indicated on Drawings. Where none are given, design for full strength of member.
   2. Shop Connections: Weld or bolt as indicated.
   3. Field Connections: Bolt unless otherwise indicated.
   4. Column Base Plates: Mill and shop attach to columns.
   5. Bearing Plates: Attach or ship loose as required.
   6. Standard bolts and nuts are permitted only for connections of secondary members, unless noted otherwise. High strength threaded fasteners are required for all other bolted connections.
   7. Trusses
      a. Fabrication and Construction: Shop weld or field bolt.
      b. Splices: Do not splice top and bottom chords except third point splices are permitted when necessary to avoid special handling and shipping problems.

D. Finishing: Ends of members in direct contact bearing, such as columns at their bases and splices, are to be "finished", as defined in the Code of Standard Practice.

E. Finishes
   1. Preparation: Grind all exposed cut surfaces as required to remove burrs and sharp edges.
   2. Galvanizing: Where specified, hot dip galvanize after fabrication in accordance with ASTM A123 or ASTM A153; provide minimum of 2 ounces of galvanizing per square foot of surface. Do not weld after galvanizing.
      a. Galvanizing Repair Paint: Minimum 79% zinc dust by weight in dried film. TNEMEC COMPANY, INC., No. 92 Tneme-Zinc; ZRC Cold Galvanizing Compound by ZRC.
   3. Shop Painting (Non-Galvanized Ferrous Metals): Steel not exposed to view in the finished structure need not be painted.
      a. Cleaning: After fabrication, clean all items of loose scale, rust, oil, dirt and other foreign matter.
      b. Surface Preparation: Conform to SP-6 or SP-8 prior to prime coat, except that SP-3 procedures may be used on the job site when approved by the Architect.
      c. Solvent Cleaning (SSPC Spec. No. SP-1): Perform where necessary.
      d. Paint
         1) Use modified alkyd or alkyd-oil primers, equal in quality to 10-99 TNEMEC Primer, 10-99W TNEMEC Primer or 4-55 TNEMEC Versare Primer.
         2) Primer to be compatible with the finish paint system.
      e. Do not paint surfaces to be encased in concrete or to receive sprayed fireproofing, or contact surfaces in friction type connections, or surfaces to be field welded, or tops of crane rails.
      f. Minimum dry film thickness to be 2.0.
      g. Apply two coats to surfaces which will be inaccessible after assembly, including lintels and columns in exterior masonry walls.

PART 3 EXECUTION

5.01 GENERAL

A. Reference Specifications: AISC "Steel Construction Manual" as supplemented and modified herein.

B. Field Correction: Field Correction by gas cutting shall not be permitted on any primary framing member. Cutting of secondary framing members, not under stress, will be permitted only with the prior approval of the Architect. Finish cut sections, when permitted, equal to a sheared appearance.

C. Erection Tolerances: Per AISC Code of Standard Practice.

5.02 ERECTION

A. This structure is designed to be self-supporting and stable after the building is fully completed. It is solely the Contractor's responsibility to determine erection procedures and sequence; and to insure the stability of the building and its component parts, and of the adequacy of temporary or incomplete connections, during erection. This includes the addition of whatever temporary bracing, guys, or tie-downs that might be necessary. Such material is not shown on the Drawings. If applied, they shall be removed as conditions permit, and shall remain the Contractor's property.

B. General
   1. Accurately assemble structural steel frames to the lines and elevations indicated, within the specified erection tolerances.
   2. Align and accurately adjust the various members forming parts of a complete frame or structure after being assembled and before being fastened.
   3. Fasten splices of compression members after the abutting surfaces have been brought completely into contact.
   4. Clean bearing surfaces and surfaces which will be in permanent contact before the members are assembled.
   5. Splices shall be permitted only where indicated.
   6. Field connections are specified in Article 2.02 herein.
   7. Erection bolts used in welded construction may be either tightened securely and left in place or removed and the holes filled with plug welds.
   8. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment until completion of erection and installation of permanent bracing.

C. Bolts and Nuts: Must be lightly oiled prior to installation.

D. Column Bases and Bearing Plates.
   1. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surfaces of base and bearing plates.
   2. Align attached column bases and bearing plates for beams and similar structural members with wedges and shims.
   3. Loose column bases and bearing plates which are too heavy to be placed without a crane shall be set and wedged or shimmed.
   4. The use of leveling plates is prohibited.

E. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
   1. Comply with grout manufacturer's instructions.

F. Touch-up Painting: After erection, touch-up field connections and abrasions in the shop coat with same paint used for shop coat. Do not paint welds until they have been cleaned in accordance with AWS D1.1. Apply paint to a minimum dry mil thickness of 2.5.

G. Galvanizing Repair: After erection, touch-up field connections and abrasions in the galvanizing finish with repair compound specified herein. Conform to manufacturer’s instructions for

surface preparation and application.

5.03 FIELD QUALITY CONTROL

A. Owner will obtain and pay for the services of an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.
   1. Testing agency must be acceptable to and approved by the Architect prior to hiring.
   2. Retesting: When initial tests indicate non-compliance with the Contract Documents, all subsequent retesting occasioned by the non-compliance shall be performed by the same testing agency and the costs thereof will be paid by the Contractor.

B. Testing Agency
   1. Examine mill test reports and verify that material being used is the same as the mill test reports.
   2. Inspections performed by an AWS Certified Inspector.
   3. Conduct and interpret tests and state in each report whether test specimens comply with requirements; specifically state deviations therefrom.

C. Fabricator: Provide access for testing agency to places where structural steel is being fabricated or processed so that required inspection and testing can be accomplished.

D. Testing agency may inspect structural steel at plant prior to shipment. This, however, does not negate the Architect's right to reject material not complying with specified requirements. This right is maintained until final acceptance of structural steel.

E. Field Bolted Connections: Inspect in accordance with AISC Specifications.

F. Field Welding: Inspect and test during erection of structural steel as follows:
   1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
   2. Perform visual inspection of all welds.
   3. Perform tests of welds as follows for all moment connections:
      a. Liquid Penetrant Inspection: ASTM E165.
      b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.
      c. Radiographic Inspection: ASTM E94 and ASTM E142; Minimum quality level "2-2T".
      d. Ultrasonic Inspection: ASTM E164.

G. Correct Deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractors expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

END OF SECTION 05 12 00

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SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide miscellaneous metals as indicated on the drawings and specified herein. Work includes, but is not limited to:
   1. Steel railings and handrails; work includes design.
   2. Miscellaneous steel framing and supports which are not indicated as part of structural steel work.
   3. Counter supports.
   4. Anchors and fasteners.

1.02 RELATED SECTIONS

A. Painting: Section 09 90 00.

1.03 REFERENCE STANDARDS

A. ASME B18.2.1 - Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series); 2012 (Reaffirmed 2021).

B. ASME B18.6.1 - Wood Screws (Inch Series); 1981 (Reaffirmed 2016).

C. ASME B18.6.3 - Machine Screws, Tapping Screws, and Metallic Drive Screws (Inch Series); 2024.

D. ASME B18.21.1 - Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series); 2009 (Reaffirmed 2016).

E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

F. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2022.

G. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

H. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

I. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip; 2017.

J. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2024.

K. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

L. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

M. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.

N. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

O. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel; 2020.

P. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric); 2021a.

Q. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

R. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

S. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates; 2015 (Reapproved 2021).

T. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023, with Editorial Revision.

U. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

V. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

W. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

X. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube; 2020.

Y. ASTM B632/B632M - Standard Specification for Aluminum-Alloy Rolled Tread Plate; 2018.

Z. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

AA. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2022.

BB. ASTM F594 - Standard Specification for Stainless Steel Nuts; 2022.

CC. ASTM F1941/F1941M - Standard Specification for Electrodeposited Coatings on Mechanical Fasteners, Inch and Metric; 2016.

DD. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2023.

EE. AWI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).

FF. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

GG. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).

HH. NAAMM AMP 510 - Metal Stairs Manual; 1992.

II. NAAMM MBG 531 - Metal Bar Grating Manual; 2024.

JJ. SSPC-PA 1 - Shop, Field, and Maintenance Coating of Metals; 2024.

KK. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

LL. SSPC-SP 2 - Hand Tool Cleaning; 2024.

MM. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

NN. SSPC-SP 11 - Power-Tool Cleaning to Bare Metal; 2020.

1.04 SUBMITTALS

A. Shop Drawings - General: Submit for all items.

B. Shop Drawings – Stairs and Handrails: Indicate in detail construction, gages of metals, jointing, methods of installation, fastening and supports, location and sizes of welds, anchors, hangers and other pertinent information and data.
   1. In addition, submit plans and details of stairs and handrails, drawn to scale not less than 1/4 inch per foot.
   2. Shop drawings shall contain design, type of steel and load assumption, bearing the seal of a licensed professional engineer registered in the State of Ohio.

C. Samples: Submit samples of materials or workmanship, if requested by the Architect.

D. Stair manufacturer's certificate of compliance with the Architectural Products Division of NAAMM AMP 510.

E. Grating manufacturer's certificate of compliance with NAAMM MBG 531 .

F. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.05 QUALITY ASSURANCE

A. Fabricate and install metal items in accordance with applicable standards of AISC and NAAMM. Welding and related procedures in accordance with AWS.

B. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M - Structural Welding Code - Steel.
   2. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.

C. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

D. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry for installation of miscellaneous metal work. Provide setting drawings, templates, instructions and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

1.06 PROJECT CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

1.07 COORDINATION

A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry for installation of miscellaneous metal work. Provide setting drawings, templates, instructions and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

1.08 STORAGE AND HANDLING

A. Protect from corrosion.

B. Store materials in a weathertight and dry place until ready for use in the work.

C. Store packaged materials in their original unbroken package or container.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Provide materials that comply with Project Sustainable Design Requirements and Low Emitting Material goals.

B. Ferrous Metals
   1. Steel Shapes, Bars and Plates: ASTM A36/A36M.
   2. Steel Plates to be Bent or Cold Formed: ASTM A283/A283M, Grade C.
   3. Steel Pipe: ASTM A53/A53M, Type E or S, Grade B, black standard weight.
      a. Pipe Bollards: Heavy weight, schedule 80.
   4. Steel for Gratings: ASTM A1011/A1011M or ASTM A36/A36M.
      a. Wire Cross Bars for Gratings: ASTM A510/A510M.
   5. Steel Tubing: ASTM A500/A500M, Grade A, cold-formed; or ASTM A501/A501M, hot-formed.
   6. Steel Sheets: Hot-rolled ASTM A1011/A1011M, Class 1, Grade 36; or cold-rolled ASTM A1008/A1008M, Grade C, Type 1. Cold-rolled sheet has a smoother surface than hot-rolled.

7. Galvanized Steel Sheets: ASTM A653/A653M Grade 33, G90 coating.

C. Aluminum
1. Structural Shapes, Plates and Bars: ASTM B209/B209M, 6061-T6.
2. Non-Structural Plates: ASTM B209/B209M, 3003.
3. Extruded Structural Pipe and Tube: ASTM B429/B429M, 6063-T6.
4. Aluminum Extrusions: ASTM B221, Alloy 6063-T6

D. Stainless Steel
1. Bar Stock: ASTM A276/A276M, Type 302 or 304.
2. Plate: ASTM A167, Type 302B.

E. Gray Iron Castings: ASTM A48/A48M, minimum Class 30B.

F. Floor Plate
1. Steel: ASTM A786/A786M, Pattern No. 1, 2, 3, 4, or 5; hot-dip galvanized ASTM A123/A123M, Thickness Grade 85.
2. Steel; ASTM A786/A786M, hot-dip galvanized ASTM A123/A123M, Thickness Grade 85.
   a. Finish: Aluminum oxide granules set in epoxy adhesive to provide non-slip surface. Similar to Mebac by McNICHOLS COMPANY.
3. Aluminum: ASTM B632/B632M, 6061-T6 alloy.

G. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded

2.02 FASTENERS

A. General
1. Provide fasteners of types as required for assembly and installation of fabricated items.
2. Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M; Class Fe/Zn 5; at exterior walls.

B. Bolts, Nuts and Washers: Regular hexagon head type, externally and internally threaded fasteners; include necessary nuts and plain hardened washers. Provide the following materials/finishes:
1. Steel: ASTM A307 Grade A bolts; ASTM A563/A563M. For members for support of structural members or connection thereto, provide ASTM F3125/F3125M bolts.
2. Stainless Steel: ASTM F593 for bolts and ASTM F594 for nuts, Alloy Group 1

C. Expansion Anchors: Stainless steel "DH Bolts" or "Ankr Tite" devices by WEJ-IT or similar by REDHEAD, HILTI or SIMPSON. Length as required to provide minimum 2-1/2" embedment into sound masonry.

D. Adhesive Type Anchor Bolts – In Hollow CMU: Chemically grouted adhesive anchor systems with nylon or stainless steel screen inserts. Use 1/2 inch diameter anchors, unless otherwise noted.
1. HIT HY-70 Adhesive Anchors, HILTI, INC.
2. EPCON System, ITW/RAMSET/RED HEAD
3. Chem-Stud Adhesive Anchors, RAWLPLUG COMPANY, INC.
4. Simpson Set Epoxy- Tie Adhesive Anchors, SIMPSON STRONG- TIE COMPANY, INC.

E. Adhesive Type Anchor Bolts - In solid grouted CMU and Concrete: Chemically grouted adhesive anchor systems. Use ¾ inch diameter anchors, unless otherwise noted.
1. HIT HY 200 or RE-500 V “Safe Set System” Adhesive Anchors, HILTI, INC.
2. EPCON System, ITW/RAMSET/REDHEAD
3. Chem-Stud Adhesive Anchors, POWERS FASTENERS, INC.
4. Simpson Set Epoxy-Tie Adhesive Anchors, SIMPSON STRONG-TIE COMPANY, INC.

F. Cast-In Place Anchors: Steel internally threaded headed cast-in inserts which receive threaded insert elements such as threaded rods and bolts ½-inch, 3/8-inch, ½-inch, 5/8-inch and ¾-inch diameters.

1. Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel anchors with zinc plating equivalent to minimum 5.1 µm (.0002 inch) zinc coating.

G. Miscellaneous Fasteners
1. Lag Bolts: ASME B18.2.1 ANSI B18.2.1.
2. Machine Screws: Cadmium plated steel, ASME B18.6.3.
3. Wood Screws: Flat head carbon steel, ASME B18.6.1.
4. Plain Washers: Round, carbon steel, ASME B18.21.1
5. Toggle Bolts: Tumble-wing or spring wing type, FS FF-B-588, type, class, and style as required.
6. Lock Washers: Helical spring type carbon steel, ASME B18.21.1.

2.03 MANUFACTURED ITEMS

A. Steel Pipe Guards:
1. Material: 3/16" steel plate construction. Provide with standard flange mounts to flat walls and 45 degree flange mounts to exterior corner walls.
2. Size: to accommodate pipes indicated
3. Color: Powder coated yellow paint
4. Manufacturer: BEACON BPGW Series or equal.
5. Locations: Roof drains in garage and where indicated.

2.04 FABRICATION

A. General
1. Workmanship
a. Construct all items to ensure ease of installation and minimal field adjustment.
b. Use materials of size and thickness shown, or, if not shown, of required size and thickness to produce strength and durability in finished product. Ease exposed edges to a radius of approximately 1/32 inch. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
c. Weld corners and seams continuously, complying with AWI (AWS) recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces. Grind crotches to 1/8” radius.
d. Form exposed connections with hairline joints, flush and smooth.
2. Field Measuring: Field measure all items required to obtain proper fit.
3. Exposed mill names and logos not permitted in finished work.

B. Handrail/Guardrail: Fabricate as indicated on the drawings.

C. Material: Steel pipe or shapes as detailed; meeting the requirements specified herein for the specific material.
1. Loadings: Steel guardrails and handrails shall meet the following load requirements:
a. Welded construction, fabricated, complete with connectors to structure designed for a concentrated load of 200 pounds applied at any point and in any direction on the handrail and at the top of the guardrail and in compliance with Ohio Building Code.
b. Guardrails: Designed and constructed for a load of 50 pounds per lineal foot applied horizontally at the required guardrail height and a simultaneous load of 100 pounds per lineal foot applied vertically downward at the top of the guardrail.
c. Guardrails: Designed and constructed to resist a 200 pound concentrated horizontal load applied on a one foot square area at any point in the system including intermediate rails or other elements serving this purpose.
d. Handrails: Designed and constructed for a load of 50 pounds per lineal foot applied in any direction and in compliance with the Ohio Building Code.
e. Loading conditions in above paragraphs shall not be applied simultaneously, but each shall be applied to produce maximum stress in each of the respective components or any of the supporting components.
2. Verify dimensions on site prior to shop fabrication.

3. Railing system shall be assembled in a shop in largest sizes for delivery to site and for installation; to minimize field-splicing and assembly.
    a. Rails shall be disassembled only as necessary for shipping and handling.
    b. Rails shall be marked for re-assembly and coordinated installations.
4. Close open ends of railings, not scheduled to be closed with finials, with close fitting steel plates welded in place and ground smooth.
5. Welded Connection: Cope intersections of rails and posts, weld joints and grind smooth. Butt weld end-to-end joints of railings, or use welding connections at fabricator's option.
6. Form simple and compound curves by bending pipes in jigs to produce uniform curves.
    a. Maintain profile of pipes throughout entire bend without buckling, twisting or otherwise deforming exposed surfaces.
7. Space posts and wall brackets as indicated. If not indicated, 7'-0" maximum center to center.
8. Brackets, Flanges and Anchors: Provide for railing posts and handrail supports. Provide inserts and sleeves as required for anchorage to concrete or masonry.
9. Provide wall returns at ends of wall mounted rails.
10. For Exterior Installations: Provide weepholes or other means for evacuation of water trapped in pipe rails.
11. Expansion Joints: Provide expansion joints at locations indicated. If not indicated, locate at intervals not to exceed 40 feet.
    a. Provide slip-joint interval sleeve extending beyond joint on each side; secure sleeve to one side.
    b. Do not locate expansion joints closer than 6" from post.
12. Toe Boards: Where indicated, provide toe boards around openings and at edge of open-sided floors and platforms.
    a. Fabricate to dimensions and details shown.

D. Miscellaneous Framing and Supports
1. Provide as indicated on drawings.
2. Fabricate members and assemblies to size, shape and dimensions detailed with provisions to receive adjacent construction supported by such items.

E. Miscellaneous Loose Steel Items: Provide steel shapes such as channels, angles, plates, protection posts, etc., as indicated on drawings.

F. Accessories: Provide all clips, bolts, anchors, fasteners, etc., as required for completion of miscellaneous metal work. Type, size and strength as noted or as suitable for conditions and construction involved.

G. Counter Supports:
1. and wire run clearance.
    a. Load to Deformation: 1500 lbf/pair minimum.
    b. Finish: Powder coated paint.
    c. Manufacturer: A&M HARDWARE or approved equal
2. sizes indicated or as required.
    a. Load to Deformation: 650 lbf/pair minimum.
    b. Finish: Powder coated paint.
3. Accessories: Provide all required fasteners to structure type provided.

2.05 FINISHES

A. Preparation: Grind all exposed cut surfaces as required to remove burrs and sharp edges.

B. Galvanizing
1. Galvanize all ferrous metal items exposed to weather, embedded in masonry or concrete, and where indicated.
2. Hot-dip galvanize after fabrication in accordance with ASTM A123/A123M; provide minimum of 2 oz. of galvanizing (Grade 85) per sq. ft. of subsurface. Prepare and pretreat

surfaces as recommended by galvanizer. Do not weld after galvanizing.

3. Galvanizing Repair Paint: Minimum 79% zinc dust by weight in dried film. TNEMEC COMPANY, INC., No. 92 Tneme-Zinc; Zinc-rich Galvax by ALVIN PRODUCTS. Provide ZRC Cold Galvanizing Compound by ZRC. where galvanizing is not to receive finish primer or paint.
4. Do not use stainless steel or other non-galvanized fasteners in the assembly of galvanized components.

C. Shop Painting (Non-galvanized Ferrous Metal)
1. Cleaning: After fabrication, clean all items of loose scale, rust, oil, dirt or other foreign matter.
2. Minimum Surface Preparation: Hand tool cleaning SSPC-SP 2 or SSPC-SP 11. Where required, blast clean in accordance with SSPC-SP 6/NACE No.3.
3. Solvent Cleaning (SSPC-SP 1): Perform where necessary.
4. Paint: One shop coat of paint compatible with the finish paint system. Section 09 91 00.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate and furnish anchorages, settings drawings, diagrams, templates, instructions and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.02 INSTALLATION

A. General
1. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.
2. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and level. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry or similar construction.
3. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.
4. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work. Comply with the following requirements:
    a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
    b. Obtain fusion without undercut or overlap.
    c. Remove welding flux immediately.
    d. 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.
5. Protection from Dissimilar Materials: Coat all aluminum surfaces in contact with steel, concrete or masonry with one coat of heavy bodied bituminous paint. Where aluminum contacts steel surfaces, and only where specifically approved, the painting required on the steel surface may be substituted for the bituminous paint.

B. Handrail

1. Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or specified herein. Plumb posts in each direction. Secure posts in each direction. Secure posts and railing ends to building construction as follows.
2. Anchor posts to concrete as indicated on the drawings.
3. Weld posts to channels as indicated.
4. Secure handrails to wall with wall brackets. Provide brackets with not less than 1-1/2" clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required for design loading. Secure wall brackets and wall return fittings to concrete or masonry with expansion bolts.

3.03 ADJUSTING AND CLEANING

A. Touchup Painting: 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.
   1. 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 A780/A780M.

END OF SECTION 05 50 00

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Fire-Retardant-Treated Materials
    a. Wood furring, grounds, nailers, blocking, and UL Assemblies.
2. Wood-Based Structural-Use Panels
    a. Backing Panels
3. Framing with dimension lumber.
4. Framing with engineered wood products
    a. Parallam parallel strand lumber (PSL),
    b. Microllam laminated veneer lumber (LVL)
    c. Timberstrand laminated strand lumber (LSL)
5. Framing with preservative-treated wood products
6. Rooftop equipment bases and support curbs
7. Wood furring, grounds, nailers, and blocking
8. Fasteners and metal framing anchors
9. Sheathing
    a. Wall Sheathing
    b. Roof Sheathing
10. Subflooring

B. Related Sections:

1. Section 06 20 00 - Finish Carpentry for nonstructural carpentry items exposed to view and not specified in another Section.
2. Section 07 27 26 - Fluid Applied Membrane Air Barrier
3. Section 08 71 00 - Door Hardware
4. Section 10 28 00 - Toilet, Bath, and Laundry Accessories
5. Section 12 30 00 - Architectural Woodwork

1.02 References

1. C2 "Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes"

2. C9 "Plywood - Preservative Treatment by Pressure Process Document Number"
3. M4 "Standard for the Care of Preservative-Treated Wood Products Document Number"

B. ASTM International Publications:

1. A153 "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware"
2. A307 "Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength"
3. A563 "Standard Specification for Carbon and Alloy Steel Nuts"
4. A653 "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process"
5. C208 "Standard Specification for Cellulosic Fiber Insulating Board"
6. C578 "Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation"
7. C846 "Standard Practice for Application of Cellulosic Fiber Insulating Board for Wall Sheathing"
8. C954 "Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness"
9. C1177 "Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing"
10. D2559 "Standard Specification for Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions"
11. D5055 "Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists"
12. E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"
13. E699 "Standard Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components"
14. F1667 "Standard Specification for Driven Fasteners: Nails, Spikes, and Staples"

C. The Engineered Wood Association (APA) Publications:

1. Form No. E30, "APA Engineered Wood Construction Guide"

1.03 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise specified.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

C. Exposed Framing: Dimension lumber not concealed by other construction and indicated to receive a stained or natural finish.

1.04 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product Data: For the following products submit “Letter of Conformance” in accordance with Section 01 33 00 indicating specified items selected for use in Project:

1. Engineered wood products
2. Underlayment
3. Metal framing anchors
4. Construction adhesives

D. 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's (ALSC) Board of Review.

E. Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials:

1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.

F. Material test reports from a qualified independent testing agency indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with requirements indicated.

G. Warranty of chemical treatment manufacturer for each type of treatment.

H. Shop Drawings: For Engineered Wood Framing Systems provide layout drawings indicating materials, member sizes, member spacing and accessories required for proper installation. Drawings shall clearly reference construction details, loading assumptions (including location of loads transferred from other levels), and minimum live load and total load deflection criteria.

1. Where installed products are indicated to comply with certain design loadings, include structural computations, materials properties, and other information needed for structural analysis that has been signed and sealed by a qualified professional engineer responsible for their preparation.

I. Research or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence the following products' compliance with building code in effect for Project.

1. Engineered wood products
2. Metal framing anchors
3. Power-driven fasteners

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: To qualify for approval, an independent testing agency must demonstrate to Owner's Representative satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

B. Single-Source Responsibility for Engineered Wood Products: Obtain each type of engineered wood product from one source and by a single manufacturer.

C. Engineering Responsibility: Engineered Wood Framing Systems shall be engineered by qualified professional engineer legally authorized to practice in jurisdiction where Project is located.

D. Product Identification: All Engineered Wood Products System members shall be clearly marked with manufacturer's name, product series, plant identification, date of manufacture, and code compliance.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.

1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

2. Store Engineered Wood materials on dry surfaces supported on raised wood sticks located every 10 feet. Store TJI joists in an upright position.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Preferred Manufacturers:

1. Laminated-Veneer Lumber (LVL):

a. iLevel by Weyerhaeuser (800-456-4787)

2. Parallel-Strand Lumber (PSL):

a. iLevel by Weyerhaeuser (800-456-4787)

3. Prefabricated Wood I-Joists (TJI):

a. iLevel by Weyerhaeuser (800-456-4787)

4. Laminated Strand Lumber (LSL):

a. iLevel by Weyerhaeuser (800-456-4787)

5. Oriented Strand Board (OSB)

a. "Structurwood Sheathing"; iLevel by Weyerhaeuser (800-456-4787)

B. Approved Manufacturers:

1. Wood-Preservative-Treated Materials:

a. Hoover Treated Wood Products, Inc. (877-722-6292, ext. 211)

b. Osmose, Inc. (800-241-0240)

2. Fire-Retardant-Treated Materials, Interior Type A:
   a. Hoover Treated Wood Products, Inc. (877-722-6292, ext. 211)
   b. "FirePRO"; Osmose, Inc. (800-241-0240)
3. Fire-Retardant-Treated Materials, Exterior Type:
   a. Hoover Treated Wood Products, Inc. (877-722-6292, ext. 211)
4. Laminated-Veneer Lumber (LVL):
   a. "VERSA-LAM"; Boise Building Solutions (800-232-0788)
   b. "Gang-Lam LVL"; Louisiana-Pacific Corp. (800-999-9105)
   c. “RedLam LVL” RedBuilt (866-859-6757)
5. Parallel-Strand Lumber (PSL & LSL):
   a. Approved Substitutions
6. Prefabricated Wood I-Joists (TJI):
   a. Boise Building Solutions (800-232-0788)
   b. Louisiana-Pacific Corp. (800-999-9105)
   c. “RedLam LVL” RedBuilt (866-859-6757)
7. Oriented Strand Board (OSB)
   a. Approved Substitution
8. Glass-Fiber-Surfaced Gypsum Sheathing Board:
   a. “DensGlass Gold Exterior Guard”; Georgia-Pacific Corp. (800-284-5347)
   b. “GlasRoc Enhanced Glass Reinforced Gypsum Sheathing”; CertainTeed Corporation, a subsidiary of Saint-Gobain (800-233-8990)
   c. “Securock Glass-Mat Sheathing”; United States Gypsum Co. (800-950-3839)
   d. “Gold Bond Brand e^{2}XP Extended Exposure Sheathing”; National Gypsum Company. (800-628-4662)
9. Metal Framing Anchors:
   a. Hilti, Inc. (800-879-8000)
   b. Cleveland Steel Specialty Co. (800-251-8351)
   c. USP Lumber Connectors (800-328-5934)
   d. Simpson Strong-Tie Company, Inc. (800-999-5099)
   e. EMCO/Southeastern Metals/A Gibralter Co. (800-690-7235)

2.02 LUMBER, GENERAL

A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.
2. NLGA - National Lumber Grades Authority (Canadian).
3. RIS - Redwood Inspection Service.
4. SPIB - Southern Pine Inspection Bureau.
5. WCLIB - West Coast Lumber Inspection Bureau.
6. WWPA - Western Wood Products Association.

C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps and provide grade-compliance certificates issued by inspection agency.

D. 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.

1. Provide dressed lumber, S4S, unless otherwise indicated.
2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.
3. Provide lumber with 15 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

2.03 WOOD-PRESERVATIVE-TREATED MATERIALS

A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.

1. Do not use chemicals containing chromium or arsenic.
2. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

B. Pressure treat above ground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing members less than 18 inches above grade.

4. Wood floor plates installed over concrete slabs directly in contact with earth.

C. Pressure treat wood members in contact with ground or freshwater with waterborne preservatives to a minimum retention of 0.40 lb/cu. ft.

D. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

2.04 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated wood is indicated, comply with applicable requirements of ASTM E84 (lumber) and ASTM C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL; U.S. Testing; Timber Products Inspection, Inc.; or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Non-combustible Construction Types: Provide fire treated wood in all concealed areas of construction and as shown, or indicated on the drawings, and as required by code.

2. Combustible Construction Types: Provide fire treated wood in fire rated construction as required by the UL Designation number(s) indicated on the drawings, and as required by code.

3. Research or Evaluation Reports: Provide fire-retardant-treated wood acceptable to authorities having jurisdiction and for which a current model code research or evaluation report exists that evidences compliance of fire-retardant-treated wood for application indicated.

4. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

B. Interior Type A: For interior locations, use chemical formulation that produces treated lumber and plywood with the following properties under conditions present after installation:

1. Bending strength, stiffness, and fastener-holding capacities are not reduced below values published by manufacturer of chemical formulation under elevated temperature and humidity conditions simulating installed conditions when tested by a qualified independent testing agency.

2. No form of degradation occurs due to acid hydrolysis or other causes related to treatment.

3. Contact with treated wood does not promote corrosion of metal fasteners.

C. Exterior Type: Use for exterior locations and where indicated. Comply with ASTM D2898.

D. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively

E. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

2.05 DIMENSION LUMBER

1. General: Refer to Structural Drawings for information.

2.06 BOARDS

A. Concealed Boards: Where boards will be concealed by other work, provide lumber with 15 percent maximum moisture content and of following species and grade:

1. Species and Grade: Spruce-pine-fir, Standard per WCLIB rules or No. 3 Common per WWPA rules.

2.07 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

C. Moisture Content: 15 percent maximum for lumber items not specified to receive wood preservative treatment.

D. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

2.08 ENGINEERED WOOD PRODUCTS

A. General: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that evidence compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. Laminated-Veneer Lumber: Lumber manufactured by laminating wood veneers in a continuous press using an exterior-type adhesive complying with ASTM D2559 to produce members with grain of veneers parallel to their lengths. Comply with the following requirements:

1. Extreme Fiber Stress in Bending: 2,600 psi for 12-inch nominal-depth members.

2. Modulus of Elasticity: 1,900,000 psi

3. Tension Parallel to Grain: 1,555 psi

4. Compression Parallel to Grain: 2,510 psi

5. Compression Perpendicular to Grain: 750 psi perpendicular to and 480 psi parallel to glue line.

6. Horizontal Shear: 285 psi perpendicular to and 190 psi parallel to glue line.

C. Parallel-Strand Lumber: Lumber manufactured by laying up wood strands using an exterior-type adhesive complying with ASTM D 2559, and cured under pressure to produce members with grain of strands parallel to their lengths and complying with the following requirements:

1. Extreme Fiber Stress in Bending: 2900 psi for 12-inch nominal-depth members.
2. Modulus of Elasticity: 2,000,000 psi
3. Tension Parallel to Grain: 2,025 psi
4. Compression Parallel to Grain: 2,900 psi
5. Compression Perpendicular to Grain: 750 psi perpendicular to and 475 psi and parallel to wide face of strands.
6. Horizontal Shear: 210 psi perpendicular to and 290 psi and parallel to wide face of strands.

D. Prefabricated Wood I-Joists: Units manufactured by bonding stress-graded lumber flanges to wood-based structural-use panel webs with exterior-type adhesives complying with ASTM D 2559, produce I-shaped joists complying with the following requirements:

1. Provide continuous "Microllam LVL flanges", by iLevel by Weyerhaeuser or approved substitution by other listed manufacturers free from finger or scarf joints for the length of the joists.
2. Provide webs manufactured from "Performance Plus Panels", by iLevel by Weyerhaeuser, or approved substitution by other listed manufacturers, with saw tooth edge detail interlocked and glued at panel joints. Joist web material must not exceed 12% tested average thickness swell due to moisture.
3. Structural Capacities: Establish and monitor structural capacities according to ASTM D5055.
4. Sizes: Depths and widths as indicated, with flanges not less than 1-1/2 inches in actual width.

E. Microllam LVL Beams:

1. “Microllam LVL” as manufactured by iLevel by Weyerhaeuser or approved substitution by other listed manufacturers.
2. Construction: Continuous laminated veneer lumber free from finger or scarf joints. Stress graded veneers bonded with waterproof adhesive with face grain parallel to each adjacent layer. Provide Watershed Overlay coating and edge seal to prevent cupping and moisture damage.
3. Design Values:
    a. Refer to Structural Drawings for Information

F. Parallam PSL Beams:

1. “Parallam PSL” as manufactured by iLevel by Weyerhaeuser, or approved substitution by other listed manufacturers.
2. Construction: Continuous parallel strand lumber bonded with waterproof adhesives and formed into billets. Beams shall be of single ply construction and free from finger joints or splices for full length of span.
3. Design Values:
    a. Refer to Structural Drawings for Information

G. Laminated Strand Lumber (LSL) Headers:

1. "Timberstrand LSL Headers" as manufactured by iLevel by Weyerhaeuser, or approved substitution by other listed manufacturers.
2. Construction: Laminated strand lumber; strands of aspen or yellow poplar bonded with waterproof resins; cured using a steam injection process.

2.09 WOOD-BASED STRUCTURAL-USE PANELS, GENERAL

A. Refer to Structural Drawings for Information.

2.10 CONCEALED, PERFORMANCE-RATED STRUCTURAL-USE PANELS

A. General: Where structural-use panels are indicated for the following concealed types of applications, provide APA-performance-rated panels complying with requirements designated under each application for grade, span rating, exposure durability classification, and edge detail (where applicable).
   1. Thickness: Provide panels meeting requirements specified but not less than thickness indicated.
   2. Span Ratings: Provide panels with span ratings required to meet "Code Plus" provisions of APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial."

B. Combination Subfloor-Underlayment: APA-rated Sturd-I-Floor Plywood Sheathing.
   1. Exposure Durability Classification: Exposure 1.
   2. Span Rating: As indicated.
   3. Minimum Thickness: 23/32 inches.
   4. Edge Detail: Square edge, tongue and groove
   5. Surface Finish: Fully sanded face.
   6. Refer to Section 01 23 00 - ALTERNATES.

C. Sub-Floor Sheathing – OSB rated Sturd-I-Floor.
   1. Exposure Durability Classification: Exposure 1
   2. Span Rating: As indicated.
   3. Minimum Thickness: 23/32 inches.
   4. Edge Detail: Square edge, tongue and groove.
   5. Refer to Section 01 23 00 - ALTERNATES.

D. Wall Sheathing - Oriented-Strand-Board:
   1. Exposure Durability Classification: Exposure 1
   2. Span Rating: 32/16
   3. Minimum Thickness: As shown on Drawings.

E. Roof Sheathing - Oriented-Strand-Board:
   1. Exposure Durability Classification: As shown on Drawings
   2. Span Rating: As shown on Drawings
   3. Minimum Thickness: As shown on Drawings.

2.11 STRUCTURAL-USE PANELS FOR BACKING

A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade, C-D Plugged Exposure 1, in thickness indicated or, if not otherwise indicated, not less than 15/32 inch thick.

2.12 GYPSUM SHEATHING

A. Glass-Fiber-Surfaced Gypsum Sheathing Board: Gypsum sheathing board consisting of noncombustible gypsum core incorporating a water-resistant material, surfaced on face and back with glass-fiber mats with alkali-resistant coating, and with unsurfaced square edges; complying with ASTM C71177, and requirements indicated below:

1. Type: Type X or as noted on the drawings.

2. Thickness: 5/8” unless indicated otherwise.

2.13 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, contains preservative treatment, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating G185 per ASTM A153 or of Type 304 stainless steel.

B. Nails, Wire, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117.

F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117. Attach sheathing to comply with ASTM C954.

G. Lag Bolts: ASME B18.2.1.

H. Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers.

2.14 METAL FRAMING ANCHORS

A. General: Provide galvanized steel framing anchors of structural capacity, type, and size indicated and as follows:

1. Research or Evaluation Reports: Provide products for which model code research or evaluation reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with building code in effect for Project.

2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653, G60 coating designation; structural, commercial, or lock-forming quality, as standard with manufacturer for type of anchor indicated.

C. Joist Hangers: U-shaped joist hangers with 2-inch-long seat and 1-1/4-inch-wide nailing flanges at least 85 percent of joist depth.

1. Thickness: As indicated on the Structural Drawings.

D. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.

1. Strap Width: As indicated on the Structural Drawings.

2. Thickness: As indicated on the Structural Drawings.

3. Designed for connection of engineered wood products, sized to support design loads.

E. Bridging: Rigid, V-section, nailless type, 0.064 inch thick, length to suit joist size and spacing.

F. Post Bases: As indicated on Structural Drawings

G. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.

1. Width: As indicated on the Structural Drawings.

2. Thickness: As indicated on the Structural Drawings.

3. Length: As indicated on the Structural Drawings.

H. Rafter Tie-Downs (Hurricane Ties): As indicated on the Structural Drawings.

I. Floor-to-Floor Ties: Flat straps as indicated on the Structural Drawings.

2.15 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.

B. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturers.

C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbonate (IPBC) as its active ingredient.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.

B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.

C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

D. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. "Table 2304.9.1 - Fastening Schedule" of the International Building Code.

F. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. 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.

G. Use hot-dip galvanized or stainless-steel nails where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity.

H. Countersink nail heads on exposed carpentry work and fill holes with wood filler.

3.02 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

C. Install permanent grounds of dressed, preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.03 WOOD FURRING

A. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

1. Firestop furred spaces of walls at each floor level and at ceiling with wood blocking or noncombustible materials, accurately fitted to close furred spaces.

B. Furring to Receive Plywood Paneling: Install 1-by-3-inch nominal-size furring at 24 inches o.c., horizontally and vertically. Select furring with no knots capable of producing bent-over nails and damage to paneling.

C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal-size furring at 16 inches o.c., vertically.

3.04 WOOD FRAMING, GENERAL

A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Install framing members of size and at spacing indicated.

D. Do not splice structural members between supports.

E. Firestop concealed spaces of wood-framed walls and partitions at each floor level and at ceiling line of top story. Where firestopping is not inherent in framing system used, provide closely fitted wood blocks of 2-inch nominal-thickness lumber of same width as framing members.

F. Comply with Table 2304.9.1 and Section 2304 of the International Building Code for minimum fastening requirements of wood members, and published requirements of metal fastener manufacturer, whichever is more stringent.

3.05 WALL AND PARTITION FRAMING

A. General: Arrange studs so that wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel. Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs; except single top plate may be used for non-load-bearing partitions. Nail or anchor plates to supporting construction, unless otherwise indicated.

B. Construct corners and intersections with “California corner framing” where possible. Provide miscellaneous blocking and framing as shown and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide continuous horizontal blocking at midheight of single-story partitions and multistory partitions, using members of 2-inch nominal thickness and of same width as wall or partitions.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs.

1. For non-load-bearing partitions, provide double-jamb studs with headers not less than 4-inch nominal depth for openings 36 inches and less in width, and not less than 6-inch nominal depth for wider openings.

2. For load-bearing walls, refer to Structural Drawings.

3.06 FLOOR JOIST FRAMING

A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:

1. Where supported on wood members, by toe nailing or by using metal framing anchors.

2. Where framed into wood supporting members, by using wood ledgers as shown or, if not shown, by using metal joist hangers.

B. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.

C. Do not notch in middle third of joists; limit notches to 1/6 depth of joist, 1/3 at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches from top or bottom.

D. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.

E. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.

F. Anchor members paralleling masonry with 1/4-by-1-1/4-inch metal strap anchors spaced not more than 96 inches o.c. extending over and fastening to 3 joists. Embed anchors at least 4 inches into masonry with ends bent at right angles 4 inches into grouted masonry.

G. Under jamb studs at openings, provide solid blocking between joist.

H. Prefabricated Wood I-Joists:

1. Comply with manufacturer's written instructions for design, installation, and fastening.

2. Design Loads: Joists shall be sized to support loads indicated on drawings and reviewed by a Registered Engineer in the employ of the joist manufacturer.

3. Allowable deflection:

a. Floor Joists: L/360 live load deflection; L/240 total load deflection.

4. Permanently bond the subfloor to the joists using waterproof construction adhesive and nails.

5. End Bearing: 1-3/4" minimum bearing with Timberstrand LSL rim joist.

6. Intermediate bearing: 3-1/2" minimum bearing. Blocking panels shall be installed between the joists when load bearing walls are located above the bearing point.

I. Engineered Wood Beams

1. Comply with manufacturer's written instructions for design, installation, and fastening.

2. Design Loads: Beams shall be sized to support loads indicated on drawings.

3. Allowable deflection:

a. Floor Beams: L360 live load deflection; L240 total load deflection.

b. Roof Beams: L/180 total load deflection.

4. Protect wood members from direct contact with concrete or masonry.

5. Refer to manufacturers literature for connection of multiple plies of side loaded beams.

3.07 RAFTER AND CEILING JOIST FRAMING

A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.

1. Where ceiling joists are at right angles to rafters, provide additional short joists perpendicular to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal-size or 2-by-4-inch nominal-size stringers spaced 48 inches o.c. crosswise over main ceiling joists.

B. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

1. At valleys, provide double-valley rafters of size shown or, if not shown, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.

2. At hips, provide hip rafter of size shown or, if not shown, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.

C. Provide special framing as shown for eaves, overhangs, dormers, and similar conditions, if any.

D. Engineered Wood Beams

1. Comply with manufacturer’s written instructions for design, installation, and fastening.

2. Design Loads: Beams shall be sized to support loads indicated on drawings.

3. Allowable deflection:

a. Floor Beams: L360 live load deflection; L240 total load deflection.

b. Roof Beams: L/180 total load deflection.

4. Protect wood members from direct contact with concrete or masonry.

5. Refer to manufacturers literature for connection of multiple plies of side loaded beams.

3.08 INSTALLATION OF STRUCTURAL-USE PANELS

A. General: Comply with applicable recommendations contained in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.

1. Comply with "Code Plus" provisions of above-referenced guide.

B. Securely attach to substrate by fastening as indicated, complying with the following:

1. ICC NER-272 for power-driven fasteners.

2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

C. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

D. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

E. Fastening Methods: Fasten panels as indicated below:

1. Combination Subflooring-Underlayment: Glue and nail to framing throughout.

2. Subflooring: Glue and nail to framing throughout.

a. Space panels 1/8 inch at edges and ends.

3. Sheathing:

a. Nail to wood framing.

b. Space panels 1/8 inch at edges and ends.

4. Underlayment: Nail to subflooring.

a. Space panels 1/32 inch at edges and ends.

b. Fill and sand edge joints of underlayment receiving resilient flooring just before installing flooring.

5. Plywood Backing Panels: Nail or screw to supports.

6. Lay-out panels with face grain oriented perpendicular to the supporting members.

7. Install roof sheathing with panel clips at all edges.

3.09 GYPSUM SHEATHING

A. General: Install gypsum sheathing to comply with manufacturer's instructions, GA-253, and the following:

1. Cut boards at penetrations, edge, and other obstructions of the work. Fit tightly against abutting construction, except provide a 3/8" setback where non-load-bearing construction abuts structural elements.

2. Coordinate sheathing installation with flashing and joint sealant installation so that these combined materials are installed in the sequence and manner that prevents exterior moisture from passing through completed exterior wall assembly.

3. Apply fasteners so that screw heads bear tightly against face of gypsum sheathing boards, but do not cut into face paper.

4. Do not bridge building expansion joints with gypsum sheathing. Cut and space edges to match spacing of structural support elements.

B. Vertical Installation: Install four-foot-wide gypsum sheathing boards vertically with vertical edges centered over flanges of studs. Abut ends and edges of each board with those of adjoining boards. Screw-attach boards at perimeter and within field of board to each steel stud a follows:

1. Fasteners spaced approximately 8" o.c. and set-back 3/8" minimum from edges and ends of boards.

END OF SECTION

SECTION 06 16 00
SHEATHING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide sheathing work as shown and specified. Work includes:
   1. Exterior wall sheathing.
      a. Gypsum
      b. Plywood
      c. Oriented-Strand-Board (OSB)
   2. Parapet gypsum sheathing.
   3. Wood roof sheathing.
      a. Plywood
      b. Oriented-Strand-Board (OSB)
   4. Wood subflooring
   5. Air-barrier and water-resistant gypsum sheathing.
   6. Air-barrier and water-resistant wood sheathing.

1.02 RELATED SECTIONS

A. Sustainable Design Requirements: Section 01 81 13.

B. Rough Carpentry: Section 06 10 00.

C. Cold Formed Framing: Section 05 40 00

D. Air Barrier Option: Section [07 27 26] [07 27 19].

1.03 REFERENCES

A. Standards
   1. American Plywood Association (APA): Grades and Standards
      a. APA Plywood Design Specification, Form No. Y510T.
      b. APA Engineered Wood Construction Guide, Form No. E30R.
   2. American Wood Protection Association (AWPA): Treatment Standards.
      a. AWPA U1 - Use Category System: User Specification for Treated Wood
   3. PS - U.S. Product Standard: Softwood Lumber and Plywood Standards
      a. PS-1 - Construction and Industrial Plywood.
   4. American Society for Testing and Materials (ASTM)
      a. A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
      b. D3498 - Standard Specification for Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems
      c. D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing
      d. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
   5. DOC PS 2 - Performance Standard for Wood-Based Structural Panels
   6. ASTM C1280 Standard Specification for Application of Gypsum Sheathing.
   7. ICC ES AC212 Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing.
   8. Provide wall sheathing products meeting requirements for water-resistive barrier in accordance with ICC-ES AC310
   9. ASTM C1280 Standard Specification for Application of Gypsum Sheathing.
   10. ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

1.04 SUBMITTALS

A. Shop Drawings: Submit shop drawings indicating framing connection details, fastener connections and dimensions.

1. Air Barrier Sheathing: Submit shop drawings indicating locations and extent of Air Barrier system, including details of typical conditions, special joint conditions, intersections with other building envelope systems and materials; counter flashings and details showing bridging of envelope at substrate changes, details of sealing penetrations, and detailed flashing around windows and doors
2. Product Test Reports: For each air-barrier and water-resistant sheathing assembly, indicating compliance with specified requirements, for tests performed by a qualified testing agency.

B. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

C. Preservative Treated Wood: Submit certification by treating plant stating chemical and process used and conformance with applicable standards.

D. Fire-Retardant Treatment: Submit certification by treating plant that fire retardant treatment materials comply with governing ordinances and that treatment will not bleed through finished surfaces.

E. Submit manufacturer's certification that fire-rated assemblies proposed meet project requirements, including evidence of approved test reports acceptable to governing building code enforcing authorities, that assemblies when installed with proposed materials, will meet or exceed fire ratings required.
1. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.

1.05 QUALITY ASSURANCE

A. Softwood Plywood: Grading rules and wood species shall conform with Product Standard PS 1.

B. Grade Marks
1. General: Identify all lumber and plywood by official grade mark.
2. Softwood Plywood: Appropriate grade trademark of the American Plywood Association.
a. Type, grade, class and identification index.
b. Inspection and testing agency mark.

C. Air Barrier Sheathing:
1. Build integrated mockups of exterior wall assembly, incorporating backup wall construction, window, storefront, door frame and sill, ties and other penetrations, and flashing to demonstrate crack and joint treatment and sealing of gaps, terminations, and penetrations of air-barrier sheathing assembly.
a. Subject to compliance with requirements, approved mockups may become part of the completed Work.
2. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer of air-barrier and water-resistant sheathing.

D. Gypsum Board Systems: Comply with ASTM C840 "Application and Finishing of Gypsum Board", and as specified.

E. Fire-Rated Construction: Comply with fire resistance ratings indicated on drawings and as required by governing authorities and codes. Provide materials, accessories and application procedures that have been listed by Underwriters Laboratories or tested in accordance with ASTM E119 for the type of construction shown.

1.06 STORAGE AND HANDLING

A. Store off the ground.

B. Protect from direct contact with the weather.

C. Provide proper ventilation.

1.07 JOB CONDITIONS

A. Time delivery and installation of carpentry work to avoid delaying trades whose work is dependent on, or affected by, the carpentry work and to comply with protection and storage

requirements.

B. Installer must examine the surfaces and supporting structure and the conditions under which the carpentry work is to be installed, and notify the Contractor in writing of conditions detrimental to the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

C. Correlate location of furring, nailers, blocking, grounds and similar supports so that attached work will comply with design requirements.

1.08 WARRANTY

A. Air Barrier Sheathing Warranty: Manufacturer's standard form in which sheathing manufacturer agrees to repair or replace sheathing products that demonstrate deterioration or failure under normal use due to manufacturing defects within warranty period specified, when installed according to manufacturer's instructions.
   1. Warranty Period: 10 years following date of Substantial Completion.

PART 2 PRODUCTS

2.01 WOOD SHEATHING

A. Plywood: Provide exterior grade plywood for exterior use and interior type with exterior glue for interior use. Formaldahyde free.
   1. Exterior Concealed Use: APA-CD-EXT.
   2. Roof Sheathing: APA RATED SHEATHING EXT, square edge.
   3. Subfloor: APA RATED STURD-I-FLOOR EXP 1 or 2.

B. OSB Panels (Oriented Strand Board): Conform to PS-2 and HUD/FHA Materials Bulletin 40C. Formaldahyde free.
   1. Roof Sheathing
      a. Thickness: 9/16”.
      b. Exposure Durability Classification: Exposure 1.
   2. Wall Sheathing
      a. Thickness: 7/16”.
      b. Exposure Durability Classification: Exposure 1.
   3. Subfloor
      a. Thickness: 3/4 inch, tongue and groove.
      b. Exposure Durability Classification: Exposure 1.

C. Integral Water-Resistive Barrier and Air Barrier Sheathing: Oriented-Strand-Board Exposure 1 sheathing with factory-laminated water-resistive barrier facer with printed fastener location symbols.
   1. Basis-of-Design Product: Provide sheathing products manufactured by HUBER ENGINEERED WOODS LLC, ZIP System Sheathing.
   2. Span Rating, Panel Grade and Performance Category: See Structural
   3. Facer: Medium-density, phenolic-impregnated sheet material qualifying as a Grade D weather-resistive barrier in accordance with ICC AC38.
   4. Oriented Strand Board: DOC PS 2, made with binder containing no added urea formaldehyde.
   5. Air-Barrier Assembly Air Leakage: Less than 0.04 cfm/sq. ft. at 1.57 lbf/sq. ft. (0.2 L/s x sq. m at 75 Pa), per ASTM E2375.
   6. Water-Vapor Permeance, Facer: Minimum 12 perms (689 ng/Pa x s x sq. m), ASTM E96/E96M.

2.02 EXTERIOR GYPSUM BOARD AND SHEATHING

A. Exterior Sheathing: Use for exterior sheathing and where indicated on drawings. Provide in conformance with ASTM C1177, water repellent treated core and fiberglass face sheets.
   1. Thickness: 5/8" thickness unless otherwise indicated.

2. Fire Rating: Type “C” or "X" (special fire retardant) to meet fire ratings for construction shown..
3. Acceptable Products: Dens-Glas by GEORGIA-PACIFIC, GlasRoc by CERTAINTEED, Weather Defense by CONTINENTAL BUILDING PRODUCTS, EXP Sheathing by NATIONAL, or Secure Rock by USG.
4. Roof Parapets and Similar Roof Conditions:
   a. Where used as roofing substrate, provide high density, water repellent treated core with fiberglass mat and specifically designed for roofing membrane adhesion. Dens-Deck Prime Roof Board by GEORGIA-PACIFIC, USG Gypsum Fiber or equal by other gypsum board manufacturers listed in 2.01A. Coordinate with roofing assembly.
5. Exterior Joint Treatment Materials: ASTM C475. As recommended by sheathing board manufacturer. Provide materials compatible with air barriers required.

B. Air-Barrier and Water-Resistant Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M, Type X, coated or treated fiberglass mat gypsum sheathing with integral weather-resistant barrier and air barrier complying with ASTM E 2178.
1. Thickness: 5/8 inch (15.9 mm) thick.
2. Edges: Square.
3. Flashing and Transitions Strips: As acceptable to sheathing manufacturer.
4. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference when tested according to ASTM E 2178.
5. Vapor Permeance: Minimum 15 perms minimum when tested according to ASTM E 96/E 96M, Desiccant Method, Procedure A.
6. Sheathing Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. when tested according to ASTM E 2357.
7. Fire Propagation Characteristics: Complies with NFPA 285 testing as part of an approved assembly.
8. Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by sheathing manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.
9. Manufacturers:
   a. DensElement Barrier System by GEORGIA-PACIFIC GYPSUM.
   b. Securock ExoAir 430 by USG/TREMCO.

2.03 FIRE-RETARDANT WOOD TREATMENT

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.

C. After treatment, kiln-dry lumber to maximum 19% moisture content and plywood to maximum 15% moisture content . Inspect each piece of lumber and plywood after drying and discard damaged or defective pieces.

D. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

2.04 PRESERVATIVE WOOD TREATMENT

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC3b. for exterior construction not in contact with the ground, Category UC2 for interior construction not in contact with the ground, and Category UC4a for items in contact with the ground.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
   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.

2.05 HARDWARE AND ACCESSORIES

A. Provide all necessary screws, nails, bolts and other hardware for satisfactory installation of work.
   1. Fasteners, General: Size and type complying with manufacturer's written instructions for Project conditions and requirements of authorities having jurisdiction.

B. Self-Adhering Seam and Flashing Tape: Pressure-sensitive, self-adhering, cold-applied, seam tape consisting of polyolefin film with acrylic adhesive, meeting and tested as part of an assembly meeting performance requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A. Examine substrates and installation conditions. Do not proceed with sheathing work until unsatisfactory conditions have been corrected.
   1. Protrusions of framing, twisted framing members, or unaligned members must be repaired before installation of sheathing is started.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 GYPSUM EXTERIOR SHEATHING

A. Comply with GA-253 and with manufacturer's written instructions.
   1. Install exterior sheathing board perpendicular to supports, stagger end joints over supports, use maximum lengths possible to minimize joints.
   2. Install with 1/4 inch open space where boards abut other work.
   3. Space screws 4 inches o.c. around perimeter of board and 8 inches o.c. on intermediate framing members and on diagonal braces. Locate fasteners minimum 3/8 inches from edges and ends of sheathing panels. Drive fasteners to bear tight against and flush with sheathing surface. Do not countersink.
   4. Apply sealant around sheathing perimeter at interface with other materials.
   5. Board Joints: Provide seam sealing tape or joint sealant at Contractor's option, as follows:
      a. Seam Sealing Tape, Horizontal Applications.
         1) Apply primer to joints and fasteners, allow to dry.
         2) Seal joints using tape specified herein or other similar type method recommended by board manufacturers for application indicated. Apply at time of sheathing, to sealed, dry, dust-free joints. Apply seam sealing tape along all edges, overlapping at intersections by width of tape.
         3) Apply sealant to exposed fasteners with a trowel so fasteners are completely covered.
         4) Seal other penetrations and openings.
         5) Coordinate sheathing and placement of through-wall flashing. Tape top of through-wall sealant to sheathing to provide a water-tight joint.
      b. Sealant

1) Apply minimum 3/8" bead of sealant to joints and trowel to provide a layer approximately 2" wide by 1/16" thick spanning the joint. Apply enough to each fastener to cover completely when troweled flat. Use backer rod for openings larger than 1/8".
2) Apply sealant to exposed fasteners with a trowel so fasteners are completely covered.
3) Seal other penetrations and openings.
4) Coordinate sheathing and placement of through-wall flashing. Tape top of through-wall flashing to sheathing to provide a water-tight joint.

B. Air-Barrier and Water-Resistant Gypsum Sheathing
1. Install and fasten sheathing according to manufacturer's installation instructions
2. Fastener and penetration treatment: Treat all countersunk fasteners with specified fluid applied flashing for sealing joints.
3. Coordinate installation of sheathing with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
4. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
5. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip and or preformed silicone extrusion, so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.
6. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of sheathing material with foam sealant.
7. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
8. Seal top of through-wall flashings to sheathing with transition strip.
9. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
10.

3.03 WOOD WALL SHEATHING, ROOF SHEATHING AND SUBFLOORING

A. General Comply with applicable recommendations contained in Form No. E30R "APA Engineered Wood Construction Guide", for types of plywood products and applications indicated.
1. General
a. Install sheathing panels in accordance with manufacturer's written instructions, requirements of applicable Evaluation Reports, and requirements of authorities having jurisdiction.
b. Nail at 6" on center along panel ends and 12" on center at intermediate supports.
2. Nail to comply with the recommendations of the American Plywood Association and OBC 2304.9.
3. Subflooring
a. Use adhesives complying with APA Specification AFG-01, applied in accordance with manufacturers' recommendations. Apply to all framing member/plywood panel joints.
b. Provide ply-clips or similar Architect approved support methods at unsupported panel edges.

B. Air-Barrier and Water-Resistant Wood Sheathing
1. Install sheathing panels in accordance with manufacturer's written instructions, requirements of applicable Evaluation Reports, and requirements of authorities having jurisdiction.
2. Air and Moisture Barrier: Coordinate sheathing installation with flashing and joint sealant sequencing and installation and with adjacent building air and moisture barrier components to provide complete, continuous air- and moisture- barrier.

3. Apply system tape at all panel seams, penetrations, and facer defects or cracks to form continuous weathertight surface. Apply tape according to manufacturer's written instructions and requirements of ICC-ES applicable to tape application.
4. Apply liquid-applied flashing membrane at penetrations, gaps, and cracks to form continuous weathertight surface. Apply liquid membrane according to manufacturer’s written instructions. Follow manufacturer’s recommendation for integration with system tape.
5. Apply System Stretch Tape around window and window frames, door frames, radius fenestrations and wall penetrations to form continuous weathertight surface. Apply tape according to manufacturer’s written instructions and requirements.

END OF SECTION 06 16 00

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SECTION 06 16 01
SHEATHING - SAP BOARD

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Combination subflooring/underlayment.

1.02 RELATED SECTIONS

A. Section 06 00 00 - Wood, Plastics, and Composites.

B. Section 06 10 00 - Rough Carpentry.

C. Section 06 11 16 - Mechanically Graded Lumber.

D. Section 07 10 00 - Damp proofing and Waterproofing.

E. Section 07 21 19 - Foamed-In-Place Insulation.

F. Section 07 27 19 - Plastic Sheet Air Barriers .

G. Section 07 27 00 - Air Barriers

1.03 REFERENCE STANDARDS

A. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing; 2019a.

B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

C. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

D. ASTM E492 - Standard Test Method for Laboratory Measurement of Impact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine; 2022.

E. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. ICC (IRC) - International Residential Code for One- and Two-Family Dwellings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. PS 2 - Performance Standard for Wood Structural Panels; 2018.

H. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.04 ADDITIONAL REFERENCES

A. APA The Engineered Wood Association (APA):
   1. APA AFG-01 - Adhesives for Field-Gluing Plywood to Wood Framing.

B. ICC Evaluation Service, Inc. (ICC-ES):
   1. ICC-ES AC182 - Acceptance Criteria for Wood Structural Panel Products.
   2. ICC-ES ESR-1785 - Evaluation Report for Engineered Panels.
   3. ICC-ES ESR-1472 - Evaluation Report for Wood Screws.
   4. ICC-ES VAR-1012 - Verification of Attributes Environmental Report.

C. Sustainable Forestry Initiative (SFI):
   1. SFI 2010 - 2014 Standard.

1.05 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data:
   1. Manufacturer's data sheets on each product to be used.
   2. Preparation instructions and recommendations.

3. Storage and handling requirements and recommendations.
4. Typical installation methods.

C. Evaluation Reports: From ICC-ES, for wood sheathing products

D. Verification Samples: Two representative units of each type, size, pattern, and color.

E. Shop Drawings: Include details of materials, construction, and finish. Include relationship with adjacent construction.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.

C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

D. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
3. Retain mock-up during construction as a standard for comparison with completed work.
4. Do not alter or remove mock-up until work is completed or removal is authorized.

1.07 PRE-INSTALLATION CONFERENCE

A. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

B. Protect from damage due to weather, excessive temperature, and construction operations.

1.09 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.

1.10 WARRANTY

A. Manufacturer's standard limited warranty unless indicated otherwise.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: RSP INDUSTRIES, INC., 5461 Dunham Rd., Maple Heights, OH 44137; Tel: 440-241-3401; Web: https://sapproductsllc.com

B. Basis-of-Design Product: Provide floor sheathing/underlayment products manufactured by RSP INDUSTRIES, INC.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: Provide approved products that are part of fire-resistance-rated assemblies tested for fire resistance per ASTM E119/UL 263.

B. Acoustic Performance: Provide approved products that are part of acoustically tested floor/ceiling assemblies tested for as follow:
   1. Sound transmission loss (STC) in accordance with ASTM E90: Not less than 60.
   2. Impact sound transmission, (IIC) in accordance with ASTM E492: Not less than 55.

2.03 WOOD PANEL PRODUCTS

A. Provide combination floor sheathing/underlayment product by RSP Industries, Inc.:

B. Oriented Strand Board: Comply with the following Product Standards:
   1. DOC PS 2, made with binder containing no added urea formaldehyde, with visible grade stamp and field identification.
   2. ICC-ES AC182.

C. Code Compliance Standard: ICC-ES ESR-1785 for basis of design product, or ICC-ESR of comparable product acceptable to Architect.

D. Panel Exposure: Warranted by manufacturer to resist weather exposure for 300 days.

E. Fastener Marking: On top panel surface with pre-spaced fastening symbols for 16 inches (406.4 mm) and 24 inches (609.6 mm) on center spacings

F. The first viable alternative to cementitious underlayments in wood frame construction. SAP Board floor/ceiling assemblies provide sound dampening abilities while eliminating disruptive use of wet cementitious underlayments.

G. Sound Transfer: SAP Board allows sound barriers to be incorporated into the structure as the building is framed, providing continuity of installation without the need to demobilize trades while pouring and curing gypcrete. Sound absorption rates as high as 58 IIC and 62 STC.

H. Fire Resistance: SAP Board is a component of several commonly used floor/ceiling fire-resistance rated assembly designs including the following ANSI/UL 263 and CAN/ULC-S101 certifications:
   1. UL L501, UL L510, UL L511, UL L528, UL L538, UL L570, UL L577, UL M510, and UL M539.

I. Reduce Risk of Mold: Because SAP Board eliminates introduction of wet cementitious underlayments into an otherwise dry environment. The risk of mold development during the construction process is reduced or eliminated.

J. Quality: SAP Board features a robust design with exceptional strength and stiffness as well as easy machining and adhesion, allowing for a hassle-free installation. Additionally, the exceptional dimensional stability resists warping, twisting, and bowing.

K. Environmentally Friendly: Manufactured with yellow pine from renewable sources and recycled rubber, SAP Board has a near zero carbon footprint. The water-based adhesive system is resistant to moisture and creates a strong, stable product that is free from solvents and other harmful emissions. SAP Board may contribute to credit points in green certification programs including:
   1. Earth Craft House,
   2. LEED for Homes; LEED for New Construction,
   3. ENERGY STAR,
   4. NAHB Model Green Home Building Guidelines,
   5. National Green Building Standard,

L. Ease of Installation: SAP Board is available in 4x8 sheets. Installed in the same manner as traditional subfloor, saving time and reduces schedule duration by as much as 3 weeks on a typical 4 story, 80,000 sq ft multifamily building and more on larger projects.

M. Cost Savings: In addition to competitive installation costs, SAP Board offers savings resulting from schedule improvements, reduced general conditions and floor prep time for finish floor contractors.

2.04 SUBFLOOR-UNDERLAYMENT

A. Composite Acoustical Subfloor-Underlayment: One sheet of 23/32 inches (18.26 mm) and one sheet of 7/16 inches (11.11 mm) oriented strand board Exposure 1 floor panels pressure and adhesive laminated with acoustically insulating recycled rubber membrane interlayer.
   1. Basis-of-Design Product: Provide RS Panels, Inc., SAP Board.
   2. Size: 48 by 96 inches (1219 by 2438 mm).
   3. Thickness: Nominal 1-3/16 inches (30 mm).
   4. Edge Profile: Tongued-and-grooved.
   5. Surface Finish: Fully sanded face.

2.05 FASTENERS

A. Fasteners, General: Size and type complying with manufacturer's written instructions for Project conditions and requirements of authorities having jurisdiction.

B. Power-Driven Fasteners: ICC-ES ESR-1472.

C. Subflooring Panel Adhesive: Product complying with ASTM D3498 or APA AFG-01 and recommended by floor panel manufacturer and adhesive manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly constructed and prepared.
   1. Examine framing spacing and alignment to determine if work is ready to receive sheathing.

B. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION, WOOD STRUCTURAL PANEL

A. Sheathing Installation, General: Install sheathing panels in accordance with manufacturer's written instructions, requirements of applicable Evaluation Reports, and requirements of authorities having jurisdiction.
   1. Do not bridge expansion joints; allow joint spacing equal to spacing of structural supports.
   2. Stagger end joints of adjacent panel runs.
   3. Continuously support panel edges without tongue-and-groove edge profile where indicated.
   4. Attach sheathing panels securely to substrate with manufacturer-approved fasteners in compliance with the following:
      a. ICC-ES ESR-1472 for power-driven fasteners.
   5. Optimize joint arrangements resulting in minimum number of joints. Cut panels cleanly at penetrations.

B. Combination Subfloor-Underlayment Fastening:
   1. Wood Framing: Glue and screw. Penetrate wood framing members at least 1 inch (25.4 mm).
   2. Space Panels: 1/8 inch (3.18 mm) apart at supported panel ends.
   3. Install fasteners 1 inch (25.4 mm) from tongued and grooved panel edges and 3/8 inch (9.52 mm) from square panel edges.
   4. Space fasteners 6 inches (152.4 mm) on centers on supported panel ends and 12 inches (304.8 mm) on centers at intermediate support locations.

3.04 FIELD QUALITY CONTROL

A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.

B. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.

3.05 CLEANING AND PROTECTION

A. Clean products in accordance with the manufacturers recommendations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 06 16 01

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SECTION 06 17 53

SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications, apply to this section.

1.2 DESCRIPTION

A. Work included: All labor and materials required to furnish and install wood trusses, connectors, bridging, bracing, and accessories as shown on the Drawings and required by these specifications.

B. Related work specified elsewhere: The general provisions of the Contract apply to the work of this Section, as though reproduced herein. Carefully examine all other Sections and all Drawings for related work.

1.3 QUALITY ASSURANCE

A. Reference standards:
   1. By the National Forest Products Association (NFPA):
      a. National Design and Specification for Stress-Grade Lumber and Its Fastenings.
      b. National Design Specification for Wood Construction.
   2. By American Wood Protection Association (AWPA)
      a. AWPA Book of Standards
   3. Reference Standards by the Truss Plate Institute:
      a. Design Specifications for Light Metal Plate Connected Wood Trusses.
      b. Quality Control Manual
      c. Bracing Wood Trusses Manual.
      d. Handling and Erecting Wood Trusses Manual.

B. Manufacturer’s qualifications: regularly engaged in the design and manufacture of wood trusses for a minimum of 5 years.
   1. Pre-engineered metal truss manufacturer must adhere to the Special Inspection requirements for fabricated items.

C. Where indicated on the Contract Documents, Fire-Retardant-Treated Wood (FRTW) trusses shall be pressure treated with fire retardant chemicals in accordance with AWPA C20.

D. Shop fabricated items to require special inspections under section 1704.2.5 of the Ohio Building Code, unless the fabricator is registered per section 1704.2.5.1.

1.4 SUBMITTALS

A. Shop Drawings:
   1. Indicate design and fabrication data.
   2. Indicated metal connectors, gauge of plates, nominal lumber size, and location of trusses.
   3. Indicate lumber specifications, pitch, span, spacing, species, size, stress grades, and dimensions of each member.
   4. Design loads including:
      a. Top chord live load (for roof trusses, this shall be the controlling case of Live, Rain, or Snow load).
      b. Top chord dead load.
      c. Bottom chord live load.
      d. Bottom chord dead load.
      e. Additional loads and locations.
      f. Environmental load design criteria (wind speed, snow, seismic, and all applicable factors as required to calculate the truss loads).
      g. Other lateral loads including drag strut forces.
   5. Adjustments to wood member and metal connector plate design values for conditions of use.
   6. Indicate design loads, allowable stress increases, and maximum axial compression and tension forces in the truss members.
   7. Indicate any camber to be fabricated within the trusses.
   8. Calculated span to deflection ratio and/or maximum vertical and horizontal deflection for live and for live plus dead and KCR (creep factor) as applicable.
      a. Floor trusses shall be designed to meet the following deflection criteria when the total design loads are applied:
         i. L/360 when supporting a suspended ceiling.
         ii. L/480 when supporting a finished ceiling directly applied to the bottom chord, with or without metal furring channels.
         iii. L/600 when supporting operable walls and partitions. Coordinate design loads and stacking requirements with the wall supplier.
      b. Roof trusses shall be designed to meet the following deflection criteria when the total design loads are applied:
         i. L/180 when not supporting a ceiling.
         ii. L/240 when supporting a suspended ceiling.
         iii. L/360 when supporting a finished ceiling directly applied to the bottom chord, with or without metal furring channels.
         iv. L/600 when supporting operable walls and partitions. Coordinate design loads and stacking requirements with wall supplier.

9. Indicate the locations, sizes, and connections of all permanent bracing required to prevent the buckling of individual truss web and chord members.
10. Provide all truss to truss connections and provide manufacturer's standard published literature which indicates allowable capacities.
11. Provide truss field assembly requirements, if any.
12. Provide an erection plan which indicates the truss layout, identification marks, hanger designations, and location of each type of truss provided.
13. Indicate truss to truss connection hangers and provide manufacturer's standard published literature which indicates allowable capacities.
14. These drawings shall be sealed by a Professional Engineer registered in the state where the project is located.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Store fabricated trusses and sub-assemblies to ensure proper drainage and ventilation. Protect from damage, exposure to weather, or standing water.

B. Schedule delivery of trusses to minimize job site storage. If storage is required on the site, place trusses on blocking off the ground and in upright position. Cover with waterproof membrane.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lumber:
1. Lumber used shall be identified by grade mark of lumber inspection bureau or agency approved by the American lumber standards committee, and shall be the size, species, and grade as shown on the Truss Design Drawings, or equivalent as approved by the Truss Designer.
2. Lumber shall be kiln dried and moisture content of lumber shall not e more than 15% or less than 7% at the time of fabrication.
3. Adjustment of value for duration of load or conditions of use shall be in accordance with ANSI/TPI 1.
4. Fire Retardant Treated (FRT) Lumber, if applicable, shall meet the specifications of the fire-retardant chemical manufacturer, the truss design, and ANSI/TPI 1 and shall be re-dried after treatment to 19% maximum moisture content at temperatures not to exceed 160°F (71°C) in accordance with AWPA Standards C20. FRT lumber design values shall be developed from approved test methods and procedures that consider potential strength-reduction characteristics, including the effects of elevated temperature and moisture. Design values shall be approved by the Authorities Having Jurisdiction. Lumber treater shall supply certificate of compliance.

B. Metal Connector Plates:

1. Connector plates shall be deformed plate type, 20 gauge minimum steel, ASTM A446, Grade A, and galvanized ASTM A663, Coating G60.
2. Hangers and connectors in contact with pressure-treated lumber are to be Batch/Post Hot Dipped Galvanized per ASTM A123 with a minimum G185 coating or Stainless Steel with chemical composition conforming to AISI 303/304 or AISI 316.
3. In highly corrosive environments, special applied coatings or stainless steel may be required, as specified in the Construction Documents.

C. Pressure Treated Lumber Fasteners:
1. Fasteners which includes nails, anchor rods, bolts, wedge anchors, sleeve anchors, etc. that are in contact with pressure treated lumber are to be Hot Dipped Galvanized per ASTM A153 with a minimum G185 coating or stainless steel with chemical composition conforming to AISI 303/304 or AISI 316.

2.2 DESIGN CRITERIA

A. Design loading: refer to Contract Documents.

B. During entire construction period, distribute concentrated loads adequately so that carrying capacity of any one truss or other component is not exceeded.

C. Design the sizes and connections of all permanent bracing required to prevent buckling of truss members is the responsibility of the Truss Supplier and is to be included within the shop drawing submittal.

2.3 FABRICATION

A. Cut truss members accurately to length, angle, and true to line to ensure tight joints for finished truss.

B. Fabricate truss members in special jigs with members tightly clamped in place until connector plates have been installed.

C. All joints shall be designed as set forth in the TPI standards. Open joints which depend on the stiffness of the metal connector plate to transmit stresses and improperly fitted joints are not permitted.

D. Lumber defects, such as wane and knots, occurring in the connector plate area must not affect more than 10% of required plate area or number of effective teeth required for each truss member. Apply connector plates to both faces of truss at each joint, making firm, even contact. Cut wood members accurately. Fabricate with wood members in good contact with all trusses uniform. Field connections of truss subassemblies, where necessary, shall be in accordance with details shown on reviewed truss-engineering drawings.

E. Build camber into the trusses, as required for dead load deflections, by properly positioning the members in the fabricating jig.

F. Where field connections of the truss subassemblies are necessary, special nail-on splice plates are acceptable, providing the plate sizes and positions are shown on the truss-engineering design as approved by a Professional Engineer.

G. Multi-ply trusses or girders shall be properly attached together (by nailing, screwing, or bolting) to ensure the trusses are able to perform according to their design as stipulated by the Truss Designer. Follow all requirements provided on the Truss Design Drawings. Whenever possible, connect multi-ply trusses together prior to erection/installation.

H. Provide framing anchors as shown on the engineering design drawings.

I. Stamp each truss with the name and address of the Truss Fabricator.

PART 3 - EXECUTION

3.1 HANDLING, INSTALLATION, AND BRACING

A. Trusses shall be handled during manufacturing, delivery, and by the Contractor at the job site so as not to be subjected to excessive bending.

B. Trusses shall be unloaded in a manner so as to minimize lateral strain. Trusses shall be protected from damage that might result from on-site activities and environmental conditions. Trusses shall be handled in such a way as to prevent toppling when banding is removed.

C. Contractor shall be responsible for the handling, installation, and temporary restraint/bracing of the trusses in a good workmanlike manner and in accordance with the recommendation set forth in SBCA/TPI's Building Component Safety Information (BCSI): Guide to Good Practice for Handling, Installing, Restraining & Bracing of Metal Plate Connected Wood Trusses.

D. Apparent damage to trusses, if any, shall be reported to the Truss Manufacturer prior to erection. Repair as required.

E. Trusses shall be set and secured level and plumb, and in correct location. Each truss shall be held in correct alignment until specific permanent restraint and bracing is installed.

F. Cutting and altering of trusses is not permitted. If any truss should become broken, damaged, or altered, written concurrence and approval by a Registered Design Professional is required.

G. Concentrated loads shall not be placed on top of trusses until all specified restraint and bracing has been installed and structural sheathing is permanently nailed in place. Specifically avoid stacking full bundles of construction materials or other concentrated loads on top of trusses.

H. The truss submittal package and any supplementary information provided by the Truss Manufacturer shall be provided by the Contractor to the individual or organization responsible for the installation of the trusses.

I. Trusses shall be permanently restrained and braced in a manner consistent with good Building practices as outlined in BCSI and in accordance with the requirements of the Construction Documents. Trusses shall furthermore be anchored or restrained to prevent out-of-plane movement to keep all truss members from simultaneously buckling together in the same direction. Such permanent latera l restrain shall be accomplished by: (a) anchorage to solid end walls; (b) permanent diagonal bracing in the plane of the web members; or (c) other suitable means.

J. Install permanent braces on members as required and noted in the shop drawings to prevent buckling of the members.

K. Provide continuous “strong back” through all floor trusses equivalent to a 2x8 at center of trusses spanning greater than 15 feet. Attach to each truss with a minimum of five 10d nails. Lap 2x8’s across two trusses minimum.

3.2 FIELD QUALITY CONTROL

A. Inspection and testing shall be in accordance with Special Inspections designated for this project as approved by the Building Official. Special Inspections must be documented with all corrective measures completed to satisfy compliance certificates as deemed necessary by the Jurisdiction.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide finish carpentry as indicated and specified. Work includes:
   1. Hardwood running and standing trim.
   2. Softwood trim.
   3. Exterior trim.
   4. Shelving and accessories.
      a. Utility shelving (janitor closets), painted finish.
      b. Adjustable shelving, painted finish.
      c. Fixed shelving and coat rod, painted finish.
   5. Interior wood ceilings.
   6. Prefinished wood paneling.
   7. Wall/door mounted coat hooks.
   8. Wood benches, wall mounted.
   9. Installation of shop fabricated millwork.
   10. Installation of door hardware, door frames and doors.
   11. Miscellaneous fasteners and hardware.

1.02 RELATED SECTIONS

A. Rough Carpentry: Section 06 10 00.

B. Wood Blocking: Section 06 10 50.

C. Architectural Woodwork: Section 06 40 00.

D. Hollow Metal Doors and Frames: Section 08 11 13.

E. Wood Doors: Section 08 14 00.

F. Door Hardware: Section 08 71 10.

G. Painting and Finishing: Section 09 91 00.

H. Plastic Laminate Casework: Section 12 33 55.

I. Sustainable Design Requirements: Section 01 81 13.

J. VOC Limits: Section 01 81 16.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

B. AWI 100 - Submittals; 2018.

C. AWI 200 - Care & Storage; 2018.

D. AWI 300 - Materials; 2018.

1.04 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

B. Submit samples of all finish materials, include the following:
   1. Lumber with transparent finish for each species and cut. (three pieces, 12")
   2. Lumber with opaque finish. (12")
   3. Prefinished wood paneling (12" x 12").
   4. Hardwood plywood with transparent finish for each species (three pieces, 12” x 12”)

C. Manufacturer's product data describing type and quality of items specified herein.

D. Certification that fire-retardant treatment materials comply with governing ordinances and meet or exceed ASTM E84 tests. Include certification by treating plant that treatment will not bleed through finish surfaces. Materials shall bear UL label showing Flame Spread 25 or less and smoke developed 40 or less. Mill certification is not acceptable.

E. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.05 QUALITY ASSURANCE

A. Installation: Performed only by experienced skilled finish carpenters.

B. Provide lumber factory marked with type, grade, mill and grading agency identification on concealed surfaces. Omit marking and submit mill certificates for materials to receive transparent finishes that cannot be marked on a concealed surface.

C. Fire-retardant treated wood shall conform to applicable requirements of AWPA and NFPA.

D. Quality Grade: Materials and fabrication shall be "custom grade" in accordance with "Quality Standard Illustrated," of the AWI conforming to the following sections:
   1. Section 100: Solid wood members.
   2. Section 300: Standing and running trim.
   3. Section 500: Paneling.
   4. Section 600: Closet and storage shelving.
   5. Section 1700: Installation of architectural woodwork.

E. Bench Mark: Before beginning both prefinished paneling work and custom paneling work, construct full scale corner condition extending 6'-0" each direction for custom type and full column width each direction for prefinished type; demonstrating joint construction, materials and general workmanship, including trim work.
   1. Approved bench mark will establish minimum standards of quality and workmanship for Architectural Woodwork.
   2. Construction Manager will coordinate location of bench mark for each type of paneling. When Construction Manager approves bench mark, construction on the paneling can continue and bench mark can be incorporated into the final work.

1.06 DELIVERY, STORAGE AND HANDLING

A. Do not deliver materials until concrete, masonry and other similar wet work has been completed and is thoroughly dry, outside door openings are permanently watertight, exterior windows are glazed and, in case of temperature dropping below 60 degrees F., until temporary heating and ventilating systems are in operation.
   1. Do not store adhesives with materials that have a high capacity to absorb VOC emissions (i.e., materials which are woven, fibrous or porous in nature, such as acoustical ceilings, carpets, textiles, etc.).
   2. Do not store adhesives in occupied spaces.

B. Protect finish carpentry during delivery, storage and handling to prevent damage, soiling and deterioration.

C. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

1.07 PROJECT CONDITIONS

A. Provide and maintain a constant temperature and humidity before, during and after installation as required to maintain optimum moisture content of installed materials.

B. Obtain measurements and verify dimensions and details before proceeding with finish carpentry.

C. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Provide materials that comply with Project Sustainable Design Requirements and Low Emitting Material goals.

B. Lumber
   1. Provide lumber surfaced four sides (S4S) and worked to profiles and patterns shown. Nominal sizes are as shown, except where detailed dimensions are indicated.
   2. Moisture Content: Provide materials kiln-dried to moisture content complying with AWI Standards, Section 100-G-3.
   3. Softwood Lumber: Comply with PS-20, "American Softwood Lumber Standard", and with applicable rules of grading and inspection agency for species indicated.
      a. Western Red Cedar, Ponderosa Pine, White Pine: Western Lumber Grading Rules, published by Western Wood Products Association (WWPA), or Standard Grading Rules for West Coast Lumber, No. 16, published by West Coast Lumber Inspection Bureau (WCLIB).

C. Wood Trim - Stained Finish: In accordance with AWI 300, "Custom" Grade, and AWI 100, Grade I, except no checks will be allowable on visible surfaces. [Rift sawn] [Quarter sawn][Plain sliced] [white oak] [red oak]. Well seasoned and kiln dried. Moisture content at time of fabrication shall not exceed 12%.

D. Wood Trim - Painted Finish: In accordance with AWI 300, "Custom" Grade, and AWI 100, Grade I, except no checks will be allowable on visible surfaces. Plain sliced poplar. Well seasoned and kiln dried. Moisture content at time of fabrication shall not exceed 12%.

E. Softwood Plywood: Thickness as indicated. Formaldehyde free.
   1. Concealed Use: APA-BB-EXPOSURE I, with exterior glue.
   2. Exposed Interior Use - Painted Finish: APA MEDIUM DENSITY OVERLAY (MDO).

F. Hardwood Plywood: "Custom" Grade, in accordance with AWI 200, Grade I (one-side or two side as required). MDF fiberboard core typical except veneer core permitted for thickness less than 1/2". Species to match hardwood finish lumber, [quarter sawn][plain sliced]. Thickness as indicated. Maximum moisture content of 6%. Formaldehyde free.

G. Prefinished Wood Paneling System: Provide system consisting of system design, panels, extruded aluminum mounting system and trim, and accessories for a complete installation. No exposed joint trim is permitted at panel-to-panel horizontal and vertical joints. Formaldehyde free.
   1. Finish
      a. Class A Smoke Spread and Smoke Developed in accordance with ASTM E84.
      b. Federal Specification LLL-B-805 Class I Finish A.B.P.A. PS 59.
      c. Meets ANSI and AHA Standards for pre-finishing paneling
   2. AWI Finish System TR-4 Custom grade finish.
   3. Panel Colors and Wood Species: As indicated on the drawings.
   4. Exposed Trim Finish: [Aluminum; finish as indicated on the drawings] [Clear anodized aluminum].
   5. Manufacturer
      a. Basis of Design: Drawings and specifications are based on Wood Veneer Panels on MAP System 10 Concealed Horizontal and Vertical Spline System by MARLITE.
      b. Other Manufacturers: Products and systems by ARMSTRONG (WoodWorks Custom), LAMIN-ART, VENTEC LTD., GAGECAST or CUSTOM INTERIOR DYNAMICS are acceptable provided the materials and systems meet the

requirements of the specifications and the design intent indicated on the drawings.

H. Accessories
   a. Molding and Trim: Extruded aluminum; pre-finished at the factory; types and shapes as recommended by manufacturer for installation system specified and substrate conditions.
   b. Adhesive: ASTM Specification C557
   c. Silicone Sealant: See Section 07 92 00.

I. Exterior Wood Trim: Western Red Cedar, A Grade.
   1. Shapes and Profiles: As indicated on drawings.
   2. Clarification: Cedar member sizes as indicated on the drawings may be achieved by building shapes using multiple 2x members or facing alternate species with 2x cedar members. Unless otherwise detailed, the face of a built-up member should read as a solid member.

J. Nails
   1. Provide steel nails with diamond point for soft woods and blunt point for hardwoods.
   2. Interior Work - Finishing Nails: 6d for 3/4" material; 9d or 10d for 5/4" material; and 12d for 1-1/2" material.

K. Cork Board: 1/2" thick; flame retardant type.

L. Wood Decking: Kiln dried S4S No. 1 Southern Pine or Douglas Fir; nominal 2 x 6. Provide exterior wood decking and stairs preservative treated in accordance with Section 06 10 00 requirements.

M. Interior Ceiling: Kiln dried No. 2 White Pine; 1 x 6 S4S; ship-lap “V”-groove joints.

N. Wood Benches
   1. Material: Select Northern grown hard maple, kiln dried and seasoned before fabrication.
   2. Fabrication: Edge grain laminated 1” x 1-1/4” strips. Glued under pressure with low VOC water-resistant glue and biscuits. Sanded both surfaces. Round all exposed edges ¼” radius.
   3. Thickness: 1-1/4”.
   4. Finish: Transparent sealer and varnish.
   5. Support Brackets: Section 05 50 00.

2.02 ACCESSORIES

A. Wood Filler: Oil or solvent base, tint to match surface color.

B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
   1. Wood glue shall have a VOC content of 30 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Paneling Adhesive: Comply with paneling manufacturer's written recommendations for adhesives.
   1. Adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.
   1. Adhesive shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Utility Shelf Supports: KNAPE & VOGT (KV); NEWTECH HARDWARE; SUGATSUNE AMERICA; SPUR, steel cadmium plated heavy duty double slotted supports.
   1. Standards: Equivalent to KV #85; unless otherwise indicated 48 inches high, maximum 30 inch spacing.
   2. Brackets: Equivalent to KV #185; unless otherwise indicated, 3 per standard, for 10 inch shelf.

F. Coat Rods: 1-1/16" o.d. chrome plated steel with escutcheons; provide for clear span as follows:
   1. 4 feet: 20 gage.
   2. Over 4 feet to 7 feet: Wall thickness 0.12".
   3. Over 7 feet: Provide suitable intermediate support.

G. Coat Hooks - Individual Wall/Door Mounted: Similar to Model EU by SUGATSUNE or equal by or EMCO, VOGEL PETERSON; satin finish.

2.03 FABRICATION

A. General: Except as specified hereinafter, fabricate all work in accordance with AWI quality standards as specified. Work not specified with a level of quality shall be not less than "Custom" quality per AWI.

B. Utility Shelving – Painted Finish: Fabricate from 3/4" MDO plywood; provide [plastic T-edging] [softwood trim edging] on all edges.

C. Adjustable Shelving – Painted Finish: Fabricate from 3/4" MDO plywood; provide softwood trim edging on all edges.

D. Fixed Shelving and Coat Rod – Painted Finish: Fabricate from 3/4" MDO plywood; provide softwood trim edging on all edges.

E. Standing and Running Trim: Fabricate to dimensions, profiles and details indicated.
   1. Cut moldings, wood door and window frames, trims and stops clean and sharply defined. Ease edges to approximately 1/16" radius, unless otherwise shown.
   2. Machine sand all flat work, except items to receive resawn surfaces.
   3. Trim in areas where existing trim remains shall match size and profile of existing trim.]

F. Coat Hooks: Provide one coat hook mounted on wall or back side of door to all private toilet rooms and offices, as directed by Architect. Provide hooks mounted to wood trim where indicated.

G. Wood Paneling: Mill and assemble pieces to conform to the profiles and shapes indicated on the drawings. Field stain in accordance with section 09 91 00.

PART 3 EXECUTION

3.01 PREPARATION

A. Condition finish carpentry materials and products to average prevailing humidity conditions in installation areas before installing.

B. Install blocking and anchoring devices built into substrates for anchorage of finish carpentry items.

C. Verify mechanical, electrical, and building items affecting this Section are placed and ready to receive this work.

D. Verify field dimensions.

E. Backprime lumber for painted finish exposed on the exterior or to moisture and high relative humidity on the interior. Comply with requirements of Section 09 91 00.

F. Ventilation for Adhesives: Comply, at a minimum, with the adhesive manufacturers' recommendations for space ventilation during and after installation. Maintain the following ventilation conditions during the adhesive curing period or for 72 hours after installation (whichever is longer): 1) supply 100% outside air 24 hours a day; 2) supply airflow at a rate of 6 air changes per hour, when outside air temperatures are between 55o F and 85o F and humidity is between 30% and 60%; and 3) supply airflow at a rate of 1.5 air changes per hour, when outside air conditions are not within the range stipulated in the previous item 2.

3.02 INSTALLATION

A. Discard material which is unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing

arrangements.

B. Install finish carpentry materials and products plumb, level, true and straight with no distortion. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level, and with 1/16" maximum offset in flush adjoining surfaces, 1/8" maximum offsets in revealed adjoining surfaces.

C. Scribe and cut work to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

D. Standing and Running Trim: Install with minimum number of joints possible; using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners and comply with Quality Standards for joinery.

E. Anchor woodwork to anchors or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk concealed fasteners and blind nailing as required for a complete installation. Use fine finishing nail for exposed nailings, countersunk and filled flush with woodwork.

F. Benches
   1. Install wood cleats at each end and back edge of benches.
   2. Secure bench top to wood cleats.

3.03 CLEANING AND PROTECTION

A. Repair damaged and defective finish carpentry materials to eliminate functional and visual defects. Where not possible to repair properly, replace finish carpentry as directed by the Architect.

B. Protect installed work during remaining construction operations.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch-up shop applied finishes to restore damaged or soiled areas.

END OF SECTION 06 20 00

SECTION 06 40 00
ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide architectural woodwork as indicated and specified. Work includes:
   1. Custom Casework. Include the following: use the following if no Section 12 33 55 work
      a. Reception Desk XXX
      b. Circulation Desk XXX
      c. Custom type [plastic laminate] clad casework and countertop components as detailed on the drawings.
      d. All other plastic laminate casework: Section 12 33 55 for modular type plastic laminate clad casework and components. Work includes fabrication and installation of standard base and wall cabinet components, shelving, fillers and panels.]
   2. Plastic laminate window stools.
   3. Plastic laminate countertops.
   4. Solid surfacing countertops.
   5. Solid surfacing window stools.
   6. Quartz composition countertops.
   7. Slatwall panels and assembly.
   8. Shelving and accessories.
      a. Adjustable shelving, plastic laminate finish.
      b. Fixed shelving and coat rod, plastic laminate finish.
   9. Miscellaneous fasteners and hardware.

1.02 RELATED SECTIONS

A. Rough Carpentry: Section 06 10 00.

B. Wood Blocking: Section 06 10 50

C. Finish Carpentry: Section 06 20 00.

D. Painting and Finishing: Section 09 91 00.

E. Plastic Laminate Casework: Section 12 33 55.

F. Sustainable Design Requirements: Section 01 81 13.

G. VOC Limits: Section 01 81 16.

1.03 REFERENCES

A. Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard:
   1. ANSI: American National Standards Institute.
   2. AWI: Architectural Woodwork Institute.
   3. NEMA: National Electrical Manufacturer's Association.
   4. P.S.: U.S. Product Standard.

1.04 SUBMITTALS

A. Product Data: Submit for all items.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Provide large scale details.
   2. Indicate methods of fabrication, edging, location and construction of joints.
   3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections

C. AWI Quality Standards: A photo-copy of the applicable portions of the AWI publication "Architectural Woodwork Quality Standards", latest edition, shall be submitted with each set of

shop drawings.

1. Each copy must be marked to clearly show all details, specifications and finishes proposed for this work.

D. Submit samples of all finish materials, including the following:
   1. Plastic laminate for texture and color selections. (8” x 10”).
   2. Cabinet hardware (1 of each type).
   3. Lumber with transparent finish for each species and cut. (12")
   4. Wood veneer faced panel products with transparent finish (12” x 24").
   5. Solid or quartz surface material.

E. Manufacturer's product data describing type and quality of the following:
   1. Plastic laminate (face grade and liner grade).
   2. Cabinet hardware (each type).

F. Submit certification that fire-retardant treatment materials comply with governing ordinances and meet or exceed ASTM E84 tests. Include certification by treating plant that treatment will not bleed through finish surfaces. Materials shall bear UL label showing Flame Spread 25 or less and smoke developed 40 or less. Mill certification is not acceptable.

G. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material.
   2. Building Product Disclosures and Optimization.

1.05 DEFINITIONS

A. Exposed Portions of Casework: Include surfaces visible when doors and drawers are closed. Bottoms of casework more than 4 feet above floor and tops less than 6 feet 6 inches above floor shall be considered as exposed. Visible members in open cases or behind glass doors also shall be considered as exposed portions.

B. Semi-Exposed Portions of Casework: Includes those members behind opaque doors, such as shelves, divisions, interior faces of ends, case back, drawer sides, backs and bottoms, and back face of doors. Tops of casework 6 feet 6 inches or more above floor shall be considered semi-exposed.

C. Concealed Portions of Casework: Include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

1.06 QUALITY ASSURANCE

A. Fabricator qualifications: A firm specializing in the fabrication of millwork with a minimum of 5 years experience and a satisfactory record of performance on projects of comparable size and quality. Shop is in compliance with all AWI's Quality Certification Program requirements.

B. Installation: Performed only by skilled finish carpenters with a minimum of 3 years experience in installing custom millwork similar to that required for this project.

C. All solid surface material type work shall be performed by a Manufacturer Certified fabricator.

D. Provide lumber factory marked with type, grade, mill and grading agency identification on concealed surfaces. Omit marking and submit mill certificates for materials to receive transparent finishes that cannot be marked on a concealed surface.

E. Quality Grade: Materials and fabrication shall be "custom grade" unless otherwise indicated on the drawings or specified herein as "premium grade", both in accordance with "Quality Standard Illustrated," of the AWI conforming to the following sections:
   1. Section 100: Solid wood members.
   2. Section 200: Plywood and particleboard.
   3. Section 400: Casework and tops.
   4. Section 500: Paneling.
   5. Section 1500: Factory finishing.
   6. Section 1700: Installation of architectural woodwork.

F. Mock-up: Before beginning "matched panel" work construct full scale corner condition extending 8'-0" (minimum) each direction, demonstrating veneer grain matching, joint construction, range of color and general workmanship, including trim work.
   1. Approved mock-up will establish minimum standards of quality and workmanship for Architectural Woodwork.
   2. Mock-up shall remain on site until completion and acceptance of paneling work. When coordinated with Architect, mock-up may be incorporated into the final work.

1.07 DELIVERY, STORAGE AND HANDLING

A. Protect woodwork materials and items during delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver woodwork materials and items until concrete, masonry, painting, grinding and other similar wet work has been completed and is thoroughly dry, outside door openings are permanently watertight, exterior windows are glazed and, in case of temperature dropping below 60o F., until temporary heating and ventilating systems are in operation.

C. Store materials in dry, well-ventilated spaces with constant minimum temperature of 60o F., and maximum relative humidity of 55%.
   1. Do not store adhesives with materials that have a high capacity to absorb VOC emissions (i.e., materials which are woven, fibrous or porous in nature, such as acoustical ceilings, carpets, textiles, etc.).
   2. Do not store adhesives in occupied spaces.

1.08 PROJECT CONDITIONS

A. Provide and maintain a constant temperature and humidity before, during and after installation as required to maintain optimum moisture content of installed materials.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.09 COORDINATION

1. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Provide materials that comply with Project Sustainable Design Requirements and Low Emitting Material goals.

B. Lumber
   1. Provide lumber surfaced four sides (S4S) and worked to profiles and patterns shown. Nominal sizes are as shown, except where detailed dimensions are indicated.
   2. Moisture Content: Provide materials kiln-dried to maximum moisture content of 6% complying with AWI Standards, Section 100-G-3.
   3. Softwood Lumber: Comply with PS-20, "American Softwood Lumber Standard," and with applicable rules of grading and inspection agency for species indicated.
      a. Western Red Cedar, Ponderosa Pine, White Pine: Western Lumber Grading Rules, published by Western Wood Products Association (WWPA), or Standard Grading

Rules for West Coast Lumber, No. 16, published by West Coast Lumber Inspection Bureau (WCLIB).

4. Species: Fabricator's option.

C. Hardwood Lumber: In accordance with AWI 300, "Custom" Grade, and AWI 100, Grade I, except no checks will be allowable on visible surfaces. Well seasoned and kiln dried. Moisture content at time of fabrication shall not exceed 6%.
   1. Species and Cut: As indicated on casework details.
   2. Species and Cut
      a. [Rift sawn] [Quarter sawn] [Plain sliced] [white oak] [red].
      b. Plain sawn hard maple [natural] [select white].

D. Softwood Plywood: Thickness as indicated. Formaldehyde free.
   1. Concealed Use: APA-BB-EXPOSURE I, with exterior glue (Plyform).
   2. Comply with PS-1, "Construction and Industrial Plywood".

E. Hardwood Plywood: "Custom" Grade, in accordance with AWI 200, Grade I (one-side or two side as required). MDF fiberboard core typical except veneer core permitted for thickness less than 1/2". Thickness as indicated. Formaldehyde free.
   1. Conform to PS-51.
   2. Species and cut to match hardwood finish lumber.
   3. Species and Cut: As indicated on casework details.

F. Particle Board (Substrate for Laminate Surfaces): High density industrial grade with a minimum density of 45 pounds per cubic foot and a moisture content between 12% maximum and 8% minimum, meeting or exceeding ANSI A208.1 grade M-2 minimum or ASTM D1037; formaldehyde-free. ASTM E84, Class A.
   1. ARAUCO Vesta FR Particleboard
   2. SIERRAPINE Encore FR
   3. PANEL SOURCE INTERNATIONAL Pyroblock Platinum Particleboard

G. Medium Density Fiberboard (MDF): Thickness as specified unless otherwise indicated on Drawings. Moisture content between 12% maximum and 7% minimum . Formaldehyde free. Meets ANSI A208.2 and the following minimum standards:
   1. Internal Bond: 90 psi.
   2. Modulus of Rupture: 2,500 psi.
   3. Screw Holding Power: 325 pounds.
   4. Density: Minimum 40 pounds per cubic foot.
   5. Fire Rating: ASTM E84 Class A
      a. Smoke Developed: 95
      b. Flame Spread: 15
   6. Manufacturers
      a. ARAUCO Vesta FR MDF
      b. ROSEBURG FOREST PRODUCTS Medite FR
      c. PANEL SOURCE INTERNATIONAL Pyroblock Platinum MDF

H. Thermoset Decorative Overlay: Particle board or MDF with surface of thermally fused, melamine impregnated decorative paper complying with Laminating Materials Association (LMA) SAT-1 and NEMA LD 3, Grade VGL. Formaldehyde free.

I. Plastic Laminate: Conform to the requirements of the National Electrical Manufacturer's Association (NEMA) Publication Number LD-3. Colors, patterns and finishes as indicated.
   1. General Purpose Grade: 0.05 inches thick.
   2. Backing Sheet Grade: 0.02 inches thick.
   3. Post-Forming Grade: 0.042 inches thick.
   4. Cabinet Liner: 0.02 inches thick.
   5. Provide solid color type where indicated on drawings.

6. Fill and seal plastic laminate joints with Seamfil by KAMPEL ENTERPRISES, INC. or equal. Colors to match plastic laminate.
7. Manufacturer and Color: As indicated
8. Other Acceptable Manufacturers: Solid surface manufactured by the following companies are acceptable providing they meet the requirements specified herein and the colors and pattern are an acceptable match as determined by the Architect.
    a. FORMICA
    b. PIONITE
    c. NEVAMAR
    d. WILSONART.
    e. LAMINART

J. Hardware Items: All exposed hardware to be satin stainless steel [satin brass] [satin chrome] [polished chrome] [brushed nickel] finish.

K. Drawer Slides: Self-closing, side mounting type with nylon tire, steel ball-bearing rollers. Manufactured by BLUM, GRASS, AMEROCK, KNAPE & VOGT; ACCURIDE. Load capacity as follows:
    a. 75 pounds: Drawers up to 3-1/2 inches deep: Similar to ACCURIDE Series 2132.
    b. 100 pounds: Drawers up to 8 inches deep: Similar to ACCURIDE Series 2832.
    c. 150 pounds: Drawers over 8 inches deep, all file drawers: Similar to ACCURIDE Series 4034.
2. Drawer and Door locks: 5-pin tumbler, dead bolt. KENSTAN; BEST; COMPX NATIONAL; CORBIN. Provide 2 keys per cylinder.
3. Concealed Hinges: European style, self-closing, type as required for construction. HAFELE; GRASS; PRAMETE; BLUM.
4. Continuous Hinge: 780 HD Roton Hinge by HAGER. Aluminum with finish as selected by Architect.]
5. Continuous Hinge: Piano type.]
6. Drawer and Door Pulls: Wire pull, 5/16" diameter x 3-1/3" long x 1-5/16" extension. STANLEY, GRASS, BLUM, HAFELE.
7. Drawer and Door Pulls: As indicated.]
8. Adjustable Cabinet Shelf Supports – Spoon Type: 5mm; nickel plated.
9. Adjustable Cabinet Shelf Supports – Clip Type: KNAPE & VOGT steel nickel plated.
    a. Standards: KV #255 NP for dado installation.
    b. Clips: KV #256 NP.]
10. Surface Mount Shelf Supports: KNAPE & VOGT (KV); NEWTECH HARDWARE; SUGATSUNE AMERICA, steel cadmium plated heavy duty double slotted supports.
    a. Standards: Equivalent to KV #85; unless otherwise indicated 48 inches high, maximum 30 inch spacing.
    b. Brackets: Equivalent to KV #185; unless otherwise indicated, 3 per standard, for 12 inch shelf.
11. Glass Shelf Supports: KNAPE & VOGT (KV); NEWTECH HARDWARE; SUGATSUNE AMERICA, black painted finish standard duty single slot supports.
    a. Standards: KV #80; space as indicated.
    b. Brackets: KV #180; space as indicated.
12. Catches: Magnetic, STANLEY #45 or equal by NATIONAL LOCK or EPCO.
13. Sliding Glass Door Track Assembly: KNAPE & VOGT #992 ZC. Consists of Upper Channel (993), Shoe (995), Ball Bearing Carrier (997), and Lower Track (999).
14. Sliding Glass Cabinet Door Locks: KNAPE & VOGT #963 CHR.
15. Coat Rods: 1-1/16" o.d. chrome plated steel with escutcheons; provide for clear span as follows:
    a. 4 feet: 20 gage.
    b. Over 4 feet to 7 feet: KNAPE & VOGT #770, wall thickness 0.12".
    c. Over 7 feet: Provide suitable intermediate support.

16. Grommets: High impact ABS cable hole cover, with spring closure or slide closure in top. Color as selected by Architect. Refer to Drawings for locations and sizes. Manufactured by DOUG MOCKETT, BAINBRIDGE MANUFACTURING or US FUTABA.
17. Miscellaneous Items
    a. CPU holder by COMPUTER COMFORTS, INC. #SEC-RACK, locking CPU Holder or equal
    b. Flat screen garage by KI or equal
    c. Pencil drawer by HAWORTH #PPD-18 or equal by KNOLL or ALLSTEEL.
    d. Adjustable keyboard tray by HAWORTH #AKPM-21-SI or equal by KNOLL or ALLSTEEL.
    e. Security lock for computers to be BELKIN Notebook, #918583/F8E550-CMK.
18. Stand-Off Brackets: 1” diameter stainless steel, brushed finish. Similar to 3FORM Point Support or equal by DOUG MOCKETT. ½” deep cap; barrel length as indicated.
19. Additional Items: As indicated on the casework details.

L. Nails
1. Provide steel nails with diamond point for soft woods and blunt point for hardwoods.
2. Interior Work - Finishing Nails: 6d for 3/4" material; 9d or 10d for 5/4" material; and 12d for 1-1/2" material.

M. Adhesive: Low-VOC, FS MMM-A-125C, Type II, water- and mold-resistant; complying with required VOC regulations.

N. Solid Surface Material: 1/2” or 3/4" inch thick sheets. Changed mfr 2/16/2015
1. Provide thicknesses as indicated on the drawings.
2. Surface burning characteristics in accordance with ASTM E 84: Class I or A, and as follows:
    a. Flame spread: <25.
    b. Smoke developed: <25.
3. Joints: Provide watertight, fused joints as recommended by manufacturer.
4. Edge Treatment: As detailed on drawings. Ease all exposed edges not otherwise detailed.
5. Make field cut-outs as required to install plumbing items and toilet accessories. See Division 22 and Section 10 28 13.
6. Manufacturer and Color: As indicated
7. Other Acceptable Manufacturers: Solid surface manufactured by the following companies are acceptable providing they meet the requirements specified herein and the patterns and colors are an acceptable match as determined by the Architect.
    a. DU PONT Corian
    b. FORMICA
    c. WILSONART

O. Quartz Composition Material: Non porous, scratch and high temperature resistant crushed quartz composition.
1. Thicknesses: As indicated.
2. Flexural properties: ASTM D 790, ASTM C 880
3. Compression strength: ASTM C 170
4. Certified food contact: NSF/ANSI 51 Certified.
5. Surface burning characteristics - ASTM E 84: Class I or A, and as follows:
    a. Flame spread: <25.
    b. Smoke developed: <25.
6. Joints: Provide watertight color matched, fused joints as recommended by manufacturer.
7. Edge Treatment: As detailed on drawings. Ease all exposed edges not otherwise detailed.
8. Manufacturer and Color: As indicated
9. Other Acceptable Manufacturers: Solid surface manufactured by the following companies are acceptable providing they meet the requirements specified herein and the patterns and colors are an acceptable match as determined by the Architect.

a. DU PONT Corian
b. CAMBRIA
c. CAESERSTONE
d. LG VIATERA

P. Glass
1. For Doors: Clear float glass, ASTM C1036, Type I, Class 1, quality 93, 1/4" thick unless noted otherwise.
2. For Doors: Clear tempered float glass, ASTM C1048, Condition A, Type I, Class 1, quality 93. Kind FT, exposed edges seamed, 1/4 inch thick unless noted otherwise.]
3. For Shelves: Clear tempered float glass, ASTM C1048, Condition A, Style I, Type I, quality 93, Class 1, seamed at edges before tempering, 1/4" thick unless noted otherwise.
4. For Countertops: Decorative laminate safety glass: ASTM C1172, standard application for laminated architectural flat glass. 1” Cracked Glass with holographic Jewels as supplied by SPECIALTY ARCHITECTURAL PRODUCTS Mr. Igor Beaufils, (419) 450-5051.
a. Edges: Monolithically polished.
b. Reference: ASTM C1036, Type 1-transparent, quality Q3-glazing select quality.

Q. Plastic Laminate - Chemical Resistant Type: Conform to the requirements of the National Electrical Manufacturer's Association (NEMA) Publication Number LD-3, Type GP-HGL. Colors, patterns and finishes shall be as indicated.
1. Resistance to reagents: Test with five 0.25 mil drops remaining on surface for 16 hours followed by washing off with tap water, then cleaned with liquid soap and water, dried with soft cotton cloth and then cleaned with naphtha.
a. No change in color, surface texture, and original protectability remaining from test results of following reagents: 98% Acetic Acid, Butyl Alcohol, Acetone, 90% Formic Acid, Benzine, Chloroform, 28% Ammonium Hydroxide, Xylene, Carbon Tetrachloride, Zinc Chloride (Sat.), Toluene, Cresol, Sodium Carbonate (Sat.), Gasoline, Ether, Calcium Hypochlorite (Sat.), Kerosene, Cottonseed Oil, Sodium Chloride (Sat.), Mineral Oil, 40% Formaldehyde, Methyl Alcohol, Ethyl Acetate, Trichlorethylene, Ethyl Alcohol, Amyl Acetate, Monochlorobenzine
b. Superficial effects only: Slight color change, spot, or residue only with original protectability remaining from test results of following reagents: 77% Sulfuric Acid, 37% Hydrochloric Acid, 85% Phenol, 33% Sulfuric Acid, 20% Nitric Acid, Furfural, 85% Phosphoric Acid, 30% Nitric Acid, Dioxane

R. Acrylic Panels: Laminated unfilled acrylic [with embedding material].
1. Manufacturers: LUMICOR, 3 FORM INC., VERITAS.
2. Color and Patterns: As indicated on the drawings.
3. Adhesives and Sealants: As recommended by manufacturer. Conform to adhesive requirements specified herein.
4. Performance Properties
a. Tensile Strength – ASTM D638: 10,000 psi.
b. Flexural Strength – ASTM D790: 14,600 psi.
c. Abrasion Resistance – ASTM D1044
d. 10 Cycles: Haze 15%
e. 200 Cycles: Haze 50%
f. Hardness (Rockwell) – ASTM D785: M-93.
g. Tensile Impact Strength – ASTM D1822: 20 ft. lbs./in2.
5. Thickness: As detailed on the drawings.
6. Acrylic Panel Framing and Support Shapes: Extruded aluminum; powder coat finish; colors indicated. “Versa” and “Frame” by 3 FORM INC. or similar systems by other listed acrylic panel manufacturers. Provide all fittings, closures and hardware for complete assemblies as indicated on drawings.

S. Tackable Wallboard
1. Description: ½” thick 7 pcf fiberboard with fabric facing.

2. Fabric: Fabric is based on various manufacturers as indicated on the drawings. Fabric manufactured by other manufacturers will be considered if materials meet the requirements of the Basis of Design and the color and style are acceptable matches as approved by the Architect.
3. Locations: Where indicated on casework drawings.
4. Mounting: Adhesive mount to substrate.

T. Slatwall Panels: T-Grooved wood composite 3/4” (19mm) thick panels, pre-engineered and machined for use with groove inserts and retail display hardware. Provide aluminum trim and groove treatment.
1. High Pressure Laminate adhered to ANSI A208.2, industrial-grade MDF substrate and having a balancing backer sheet. Color as selected by Architect.
2. Attachment System: Direct attachment with concealed clips, for installation direct to studs or solid substrate.

U. Wire Supported Glass Shelves: Provide complete system consisting of support wire, fittings and glass shelves.
1. Wire: Stainless steel stranded wire; 3mm diameter.
2. Fittings: Stainless steel.
   a. Wire termination fittings; profile as indicated on drawings. Sized to fit 3mm diameter wire.
   b. Shelf Supports: JAKOB Wire Rope Swivel Cone with Disk, Swaged; sized to fit wire.
3. Glass Shelves: As specified herein, except ¼” thick
4. Manufacturers: JAKOB Inox Line or equal by LOOS AND COMPANY, or DÉCOR CABLE.

V. Sculptured Panels
1. Panel Description: 32 by 32 by 1 inch maximum profile relief, smooth surface solid mineral composite panel containing no retardants, accelerators, release agents, or plastics.
2. Manufacturer and Pattern: MODULAR ARTS, INC. (206-788-4210) “Swim” horizontal application.

2.02 FABRICATION

A. General: Except as specified hereinafter, fabricate all work in accordance with AWI quality standards as specified. Work not specified with a level of quality shall be not less than "Custom" quality per AWI. All particle board panels to be balanced construction.

B. Custom Casework
1. Quality Standard: Custom Grade per AWI Section 400 and Division 400B.
2. Design and Materials: As detailed.]

C. Custom Casework
1. Quality Standard: Custom Grade per AWI Section 400.
2. "Flush Overlay" design as shown in AWI Architectural Casework Details.
3. Core Materials
   a. Partical Board: Typical for plastic laminated finish materials.
   b. Plywood Core: Typical for wood veneered surfaces.
   c. Solid Hardwood: Typical for all drawer construction, except drawer faces.
   d. Hardboard or Luan Plywood: Drawer bottoms.
4. Plastic Laminate Facing
   a. All exposed surfaces: Plastic laminate, general purpose grade. Include on exposed face and edges of all cabinets except where detailed otherwise on the drawings. Apply to all edges of doors and drawer fronts. Doors shall have laminate on both faces. Cabinet elements (tops, counters, face panels, end panels, rails, etc.) that are finished with laminate on the exposed surfaces shall have laminate balancing sheets on the concealed or semi-concealed faces.
      1) Back Panels: Standard 1/4" prefinished hardboard. Install in housed joints in surrounding panels.

D. A vinyl catalyzed factory finish (AWI Finish System No. 4) shall be applied to all semi-concealed surfaces that do not have a pressure laminate finish or a balancing sheet finish. This includes drawer interior and drawer sides, ends, edges and adjustable semi-concealed shelving.
    a. At Contractor's option, the use of .025" thick cabinet Liner Grade laminate and .030" thick Backing sheet grade laminate may be used in lieu of AWI Finish System No. 4.
    2. All casework material in 3/4" thick, excluding facing material thickness, unless otherwise detailed, required for stability, or doors in excess of 48" in any dimension. Drawer sides to be 1/2" thick; front and back 3/4"; bottom 1/4" thick.
    3. Adjustable Shelves: Install supports at each end of all shelves and intermediate supports at all shelves over 30".
    4. Design
        a. Configuration of casework is indicated on drawings.
        b. Detailing and design required to provide rigid, solid and structurally adequate casework is the responsibility of the fabricator; all within parameters of AWI specifications and as approved by the Architect.
        c. The following conditions require special attention:
            1) Casework exceeding 42" in width between supports.
            2) Sink and/or equipment cutouts and supports.
            3) Countertops exceeding 24" unsupported.
            4) Wall and Ceiling Mounted Casework: Provide integral framing in casework of size, strength, and in locations which allow unit to be screw attached to proper substrate and remain rigidly in place.

E. Plastic Laminate Countertops and Window Stools
    1. Quality Standard: Custom Grade per AWI Section 400.
    2. Top Core: Construct tops of 3/4" thick particle board core typical; provide exterior grade plywood (Plyform) at counters with sinks (and associated splashes) and other locations where indicated on drawings.
        a. Where double layers indicated, glue together to form monolithic 1-1/2" thick panel.
    3. Splashes: Provide with minimum 1/4" scribe typical.
        a. Integral coved back splash with permanently attached straight side splash coped into backsplash.
        b. Provide straight splashes where shown; permanently attached to top.
        c. Seal: Prior to permanent attachment of straight splashes to top, seal all joints by setting in continuous bead of clear silicone sealant.
    4. Exposed Edges: Build exposed edges to 1-1/2" thick at overhang by attaching continuous strip of core material to bottom side of top.
    5. Joints in core, if required, to be fitted with mechanical panel fasteners; spacing not to exceed 12" apart nor more than 3" from outside corners.
    6. Finishes: Finish tops, splashes and edges with plastic laminate as follows:
        a. General purpose grade [Solid color type] [Post forming grade]
        b. Balance underside of tops with backing sheets, 0.020".
        c. Finish bottom of all overhangs with laminate.
    7. Custom Edges: Finish as indicated on drawings.
    8. Edges: Except where cabinet design requires matching laminate edge, provide 3mm PVC on Front & Back Edges, 1mm PVC on Side Edges.
    9. Provide counter supports at 36” maximum.

F. Solid Surface and Quartz Surface Material Countertops and Components: Fabricate to profiles, sizes and edge conditions indicated on drawings and as directed by manufacturers requirements.
    1. Solid Surface: Back and side splashes, where indicated, to be fused to top to ensure watertight joint.
    2. Fabricate with openings and mortises precut, where possible to receive fixtures, accessories and other similar items of work.

3. Ease edges as indicated on the drawings.
4. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and solid surface manufacturer requirements.
5. Where countertops do not have a continuous substrate, locate and provide closure strips to prevent openings from countertop underside to top of support casework.
6. Where joint design intent indicated is to be seamless, provide manufacturers recommended adhesive to create inconspicuous, nonporous joints, with chemical bond.
7. Provide counter supports at 42” maximum or as recommended by manufacturer.

G. Adjustable Shelving – Plastic Laminate Finish: Fabricate to details indicated; conform to requirements for countertops specified herein.

H. Fixed Shelving and Coat Rod – Plastic Laminate Finish: Fabricate to details indicated; conform to requirements for countertops specified herein.

2.03 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: Comply with requirements indicated below for grade, finish system, staining, and sheen, with sheen measured on 60-degree gloss meter per ASTM D 523:
1. Grade: Premium.
2. AWI Finish System: TR-4, conversion varnish.
3. Stain Colors: As indicated on drawings; Final stain colors as selected by Archnitect to match approved samples.
4. Wash Coat for Stained Finish: Apply a vinyl wash coat to woodwork made from closed-grain wood before staining and finishing.
5. Sheen: Semigloss, 55-75 gloss units.

PART 3 EXECUTION

3.01 PREPARATION

A. Condition architectural woodwork materials, items and products to average prevailing humidity conditions in installation areas before installing.

B. Install blocking and anchoring devices built into substrates for anchorage of architectural woodwork.

C. Deliver inserts and anchoring devices to be built into substrates well in advance of time substrates are to be built.

D. Before installing woodwork, examine shop-fabricated work for completion and back priming.

E. Ventilation for Adhesives: Comply, at a minimum, with the adhesive manufacturers’ recommendations for space ventilation during and after installation. Maintain the following ventilation conditions during the adhesive curing period or for 72 hours after installation (whichever is longer): 1) supply 100% outside air 24 hours a day; 2) supply airflow at a rate of 6 air changes per hour, when outside air temperatures are between 55o F and 85o F and humidity is between 30% and 60%; and 3) supply airflow at a rate of 1.5 air changes per hour, when outside air conditions are not within the range stipulated in the previous item 2.

3.02 INSTALLATION

A. Quality: Comply with AWI Section 1700.

B. Install woodwork materials and products plumb, level, true and straight with no distortion. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level (including countertops, window stools and shelves), and with 1/16" maximum offset in flush adjoining surfaces, 1/8" maximum offsets in revealed adjoining surfaces.

C. Scribe and cut work to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

D. Install countertops level, true to alignment, accurately fit to wall conditions and securely fastened to base units and other support systems as indicated.
   1. Solid Surface Type Countertops: Form joints using tinted adhesive as recommended by top manufacturer.

E. Casework: Install without distortion so that doors and drawers will fit openings properly and be accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.

F. Anchor woodwork to anchors or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk concealed fasteners and blind nailing as required for a complete installation. Use fine finishing nail for exposed nailings, countersunk and filled flush with woodwork.

G. Plastic Laminate Wall Covering: Install with adhesive as recommended by plastic laminate manufacturer.

3.03 CLEANING AND PROTECTION

A. Repair damaged and defective millwork to eliminate functional and visual defects. Where not possible to repair properly, replace millwork as directed by the Architect.
   1. Chipped, scratched or patched plastic laminate will not be accepted and must be replaced.

B. Clean hardware, lubricate and make final adjustments for proper operation.

C. Protect installed work during remaining construction operations.

D. Clean woodwork on exposed and semi-exposed surfaces. Touch-up shop applied finishes to restore damaged or soiled areas.

E. Cover completed casework with 4-mil polyethylene film protective enclosure, applied in a manner that will allow easy removal and without damage to woodwork or adjoining work. Remove cover immediately before the time of final acceptance.

END OF SECTION 06 40 00

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SECTION 06 61 00
CAST POLYMER FABRICATIONS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work includes cast polymer tub surrounds.

1.02 WORK SPECIFIED IN OTHER SECTIONS

A. Wood Blocking: Section 06 10 50.

B. Toilet Accessories: Section 10 28 13.

1.03 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2023, with Editorial Revision.

B. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2022.

C. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2022.

D. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2017.

E. ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser; 2019.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

G. IAPMO Z124 - Plastic Plumbing Fixtures; 2022, with Editorial Revision.

H. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 QUALITY ASSURANCE

A. Fabricator qualifications: A firm specializing in the fabrication of cast polymer items with a minimum of 5 years experience and a satisfactory record of performance on projects of comparable size and quality. Fabricator shall be acceptable to the Architect.

B. Installation: Performed only by skilled finish carpenters with a minimum of 3 years experience in installing custom solid surface items similar to that required for this project.

1.05 SUBMITTALS

A. Submit shop drawings for all items. Include
   1. large scale details.
   2. methods of fabrication, edging, location and construction of joints.

B. Submit samples of cast polymer.

C. Product Data: Submit for all items.

1.06 DELIVERY, STORAGE AND HANDLING

A. Protect materials and items during delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver materials and items until concrete, masonry, painting, grinding and other similar wet work has been completed and is thoroughly dry.

C. Store materials in dry, well-ventilated spaces with constant minimum temperature of 60 degrees F., and maximum relative humidity of 55%.

1.07 PROJECT CONDITIONS

A. Provide and maintain a constant temperature and humidity before, during and after installation as required to maintain optimum moisture content of installed materials.

B. Obtain measurements and verify dimensions and details before proceeding with architectural woodwork.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cast Polymer: Cast Polymer: Homogenous compression molded material composed of acrylic resins or polyester/acrylic resin blend, fire-retardant filler materials, fiber reinforcement, and coloring agents with surface gel coat meeting the following requirements.
   1. Material: Homogeneous filled acrylic meeting ANSI Z124.3 and .6, Type Six, and Fed. Spec. WW-P-541E/GEN.
   2. Basic Minimum Material Properties
      a. Surface burning ASTM E84: Flame spread meets Class A, Smoke Developed Index 85.
      b. Liquid Absorption, ASTM D570, for 1/4 inchmaterial thickness: 0.321 percent.
      c. Izod Impact, ASTM D256, Method A: 3.0 ft.-lb./in. Method E: 4.0 ft.-lb./in.
      d. Tensile Modulus, ASTM D638 Nominal: 7.48 X 105 PSI.
      e. Hardness, ASTM D 2583, Barcol Hardness: 51.Rockwell RB Hardness: 60.5, IST Hardness: 34.7.
      f. Flexural Modulus, ASTM D790 : 7.49 X 105 PSI.
      g. Gloss Level 40% at 60o, NEMA LD 3.; +/- 5%.
      h. Stain Resistance, CSA B45.5/IAPMO Z124-2011, Passes.
      i. Boiling Water Resistance, NEMA LD 3, Method 3.5: No effect.
      j. Ball Impact Resistance, NEMA LD 3, Method 3.8, 1-1/2" diameter steel ball: Over 72", no damage.
      k. Abrasion Resistance, ASTM D4060, Passes.
   3. Colors: As selected by Architect.
   4. Panels: Homogeneous minimum 1/4" thick molded panels. Surrounds to be cast polymer wall panels; installed as indicated on Drawings. No horizontal seams or trim strips permitted. Provide one piece for each wall. Joints will be permitted at corners only. Sizes as shown on Drawings.

B. Manufacturer
   1. Basis of Design: Drawings and specifications are based on products fabricated from SWANSTONE COMPANY.
   2. Other Manufacturers: Products by AMI, CREATIVE DESIGN MARBLE, MINCEY MARBLE MANUFACTURING, MPL CORPORATION or other manufacturers will be considered during bidding. Products must meet the performance requirements specified, match colors selected as determined by the Architect, conform to details indicated on the drawings and be approved by Architect.

2.02 ACCESSORIES

A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

B. Adhesive and Sealant: As recommended by manufacturer.

2.03 SOURCE QUALITY CONTROL

A. Allowable Tolerances
   1. Variation in Component Size: Plus or minus 1/8 inch.
   2. Location of Openings: Plus or minus 1/8 inch from indicated location.

2.04 FABRICATION

A. Shop assemble cast polymer materials for delivery to site in units easily handled and to permit passage through building openings.

B. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings.

C. Rout and finish component edges with clean, sharp returns. Rout cutouts, radii and contours to template. Smooth edges. Repair or reject defective and inaccurate work.

PART 3 EXECUTION

3.01 PREPARATION

A. Condition materials, items and products to average prevailing humidity conditions in installation areas before installing.

B. Install blocking and anchoring devices built into substrates for anchorage of solid surface fabrications.

C. Deliver inserts and anchoring devices to be built into substrates well in advance of time substrates are to be built.

3.02 INSTALLATION

A. General
   1. Install components plumb and level, in accordance with approved shop drawings and product installation details.
      a. Install to a tolerance of 1/8" in 8'-0" for plumb and level, and with no offset in flushness of adjoining surfaces.
   2. Keep components and hands clean during installation. Remove adhesives, sealants, and other stains.

B. Scribe and cut work to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

3.03 CLEANING AND PROTECTION

A. Protect surfaces from damage until Date of Substantial Completion.

B. Repair damaged and defective items to eliminate functional and visual defects. Where not possible to repair properly, replace items as directed by the Architect.

C. Protect installed work during remaining construction operations.

END OF SECTION 06 61 00

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SECTION 06 65 00
SIMULATED WOOD TRIM

PART 1 GENERAL

1.01 WORK INCLUDED

A. Section includes plastic simulated exterior wood trim, including all installation accessories.

1.02 SECTIONS

A. Painting: Section 09 90 00.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM): ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

A. Product Data: Submit for all items.

B. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, accessories, finish colors and textures.

C. Samples: Submit selection and verification samples for finishes, colors and textures.

D. Quality Assurance Submittals: Submit the following:
   1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
   2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria, and physical requirements.
   3. Manufacturer's Instructions: Manufacturer's installation instructions.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

B. System Description
   1. Performance Requirements: Provide simulated wood trim units which have been manufactured, fabricated and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.
   2. Fire-Test Characteristics: Test molded units per ASTM E84 for Class A requirement by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE & HANDLING

A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

PART 2 PRODUCTS

2.01 MATERIAL

A. Contractor Option: Contractor can provide one of the two plastic simulated wood trim option materials. Either material selected by contractor must be complete for entire building project and comply with specification.
   1. High density polyurethane: Homogenous and free of voids, cracks and foreign inclusions and other defects.

a. Compressive strength: 800-950 psi.
b. Tensile strength: 550-650 psi.
c. Moisture Resistance: Non-water absorbing.
d. Fire: ASTM E84 Class A rating.
e. Manufacturers: MELTON CLASSICS INC. FYPON MOLDED MILLWORK, or STYLE SOLUTIONS INC

2. Free foam cellular PVC: Small-cell microstructure and density of .55 grams/cm3. Homogenous and free of voids, cracks and foreign inclusions and other defects.
a. Water Absorption%: <0.50 ASTM D570
b. Tensile Strength psi: 3500 ASTM D638
c. Tensile Modulus psi: 100,000 ASTM D638
d. Flexural Strength psi: 5100 ASTM D790
e. Flexural Modulus psi: 215,000 ASTM D790
f. Nail Hold Lbf/in of penetration: 300+ ASTM D1761
g. Screw Hold Lbf/in of penetration: 240+ ASTM D1037
h. Staple Hold Lbf/in of penetration:69+ ASTM D1037
i. Manufacturers: AZEK EXTERIORS TRIM; PLYGEM.

B. Sizes and Profiles: As indicated.

2.02 ACCESSORIES

A. Fasteners: As recommended by molded unit manufacturer, provide trim screws, drywall screws or finishing nails. Pneumatic nail gun permissible for use; staple gun not permissible for use.

B. Joint Compound: As recommended by molded unit manufacturer, provide spackle joint compound, ready-mixed, vinyl type as recommended for exterior application.

C. Adhesive: Use manufacturer recommended adhesive for product installation.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine conditions under which work is to be performed and notify Contractor in writing of unsatisfactory conditions. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.02 PRE-INSTALLATION RESPONSIBILITY

A. Prior to manufacturing, dimensions and field conditions not shown on the drawings will be checked by the installer so that appropriate adjustments can be made by the manufacturer.

B. Prior to installation, the installer shall check jobsite dimensions. Any discrepancies between design and field dimensions shall be brought to the attention of the General Contractor and the Architect. Work shall not proceed until discrepancies are corrected.

3.03 INSTALLATION

A. Comply with manufacturer's written installation instructions and comply with governing regulations and industry standards applicable to the work.

B. Install trim materials and products plumb, level, true and straight with no distortion. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level, and with 1/16" maximum offset in flush adjoining surfaces, 1/8" maximum offsets in revealed adjoining surfaces.

C. Scribe and cut work to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

D. Standing and Running Trim: Install with minimum number of joints possible; using full-length pieces (from maximum length available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners.

E. Anchor woodwork to anchors or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk concealed fasteners and blind nailing as

required for a complete installation. Use fine fasteners for exposed nailings, countersunk and filled flush.

F. Leave installed trim ready for field painting. See Section 09 21 16 for joint finishing procedures.

3.04 ADJUSTING AND TESTING

A. Inspect system components for proper operation and fit. Adjust, repair or replace components not conforming to requirements. Repair or replacement of an individual unit shall be as approved by the Architect.

3.05 PROTECTION

A. Advise Contractor of procedures required to protect finished work from damage during remainder of construction period.

B. Provide finished units undamage. Damage shall be repaired by the installer at the expense of the party damaging the work and in accordance with the contract requirements.

END OF SECTION 06 65 00

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SECTION 06 73 00
COMPOSITE DECKING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Section includes composite decking and trim, including all installation accessories.

1.02 SECTIONS

A. Wood Framing: Section 06 10 00

1.03 REFERENCE STANDARDS

A. ASTM D143 - Standard Test Methods for Small Clear Specimens of Timber; 2023.

B. ASTM D198 - Standard Test Methods of Static Tests of Lumber in Structural Sizes; 2022a.

C. ASTM D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C with a Vitreous Silica Dilatometer; 2016.

D. ASTM D1037 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials; 2012 (Reapproved 2020).

E. ASTM D1761 - Standard Test Methods for Mechanical Fasteners in Wood and Wood-Based Materials; 2020.

F. ASTM D4761 - Standard Test Methods for Mechanical Properties of Lumber and Wood-Based Structural Materials; 2019.

G. ASTM D7032 - Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite and Plastic Lumber Deck Boards, Stair Treads, Guards, and Handrails; 2021.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

1.04 SUBMITTALS

A. Product Data: Submit for all items.

B. Samples: Submit selection and verification samples for finishes, colors and textures.

C. Quality Assurance Submittals: Submit the following:
   1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
   2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria, and physical requirements.
   3. Manufacturer's Instructions: Manufacturer's installation instructions.

D. Evaluation Reports: For the following, from ICC-ES:
   1. Plastic decking.
   2. Decking fasteners.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

B. System Description
   1. Performance Requirements: Provide simulated wood trim units which have been manufactured, fabricated and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.
   2. Fire-Test Characteristics: Test molded units per ASTM E84 for Class A requirement by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
   3. Structural Performance:
      a. Deck: Uniform Load – 100lbf/sq.ft.
      b. Tread of Stairs: Concentrated Load: 750 lbf/sq.ft., and 1/8” max. deflection with a concentrated load of 300 lbf on area of 4 sq. in.

1.06 DELIVERY, STORAGE & HANDLING

A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.08 WARRANTY

A. Provide manufacturer’s warranty against rot, decay, splitting, checking, splintering, fungal damage, and termite damage for a period of 25 years beginning from date of purchase under normal conditions of use and exposure. In addition, provide Fade and Stain Warranty against food staining and fading beyond 5 Delta E (CIE units) for a period of 25 years.

PART 2 PRODUCTS

2.01 MATERIAL

A. Plastic Lumber, General: Products acceptable to authorities having jurisdiction with current model code evaluation reports that show compliance with building code in effect for Project for indicated type of construction.
   1. Allowable loads and spans, as documented in evaluation reports or in information referenced in evaluation reports, shall not be less than design loads and spans indicated.
   2. Decking Standard: Complying with ASTM D7032, ASTM D1037.

B. Most plastic decking is a composite product consisting of solid shapes made from recycled polyethylene and cellulose fiber (wood or agricultural waste fiber) with antifungal additives.

C. Contractor Option: Contractor can provide one of the two composite decking option materials. Either material selected by contractor must be complete for entire building project and comply with specification.
   1. Manufacturer: TREX [Transend]
      a. Material Description: Extruded composite decking consisting of recycled Linear Low Density Polyethylene (LLDPE) and recycled wood.
         1) Size: 1 x 5.5”.
         2) Lengths – 12, 16, and 20 feet
         3) Color: To be selected by Architect from Manufacturer’s full list of product colors.
      b. Properties:
         1) Flame Spread: ASTM E84: 70
         2) Nail Withdrawal: ASTM D1761 163 lbs/in
         3) Screw Withdrawal: ASTM D1761 558 lbs/in
         4) Fungus Resistance: ASTM D1413 Rating = No Decay
         5) Termite Resistance: AWPAE1-72 Rating = 9.6
         6) Compression Parallel: ASTM D198 1,588 psi
         7) Compression Perpendicular: ASTM D143 1,437 psi
         8) Bending Strength: ASTM D1983 280 psi
         9) Shear Strength: ASTM D1431 761 psi
         10) Modulus of Elasticity: ASTM D4761 412,000 psi
         11) Modulus of Rupture: ASTM D4761 3.280 12)
         12) Thermal Conductivity: ASTM C1771.57 BTU-in/hr-ft @85°F
   2. Manufacturer: AZEK Timbertech
      a. Description: Composite plank consisting of high-density polyethylene (HDPE) and wood flour, extruded into sizes and shapes indicated with the following physical properties:

1) Size: 1 x 5.5”.
2) Lengths – 12, 16, and 20 feet
3) Color: To be selected by Architect from Manufacturer’s full list of product colors.

b. Properties:
1) Modulus of Elasticity ASTM D-6109: 542,200 psi.
2) Modulus of Rupture D-6109: 3157 psi.
3) Water Absorption ASTM ASTM D1037, %vol.<1.29%.
4) Flame Spread Index ASTM E84: 75
5) Smoke Development ASTM E84, 200.
6) Direct Screw Withdrawal Force ASTM D1761: 787 lbs/in
7) Coefficient of Linear Thermal Expansion ASTM D696: length 2.0x10-5 in/in/°F, width 3.4x10-5 in/in/°F. n.
8) Fungus Resistance: ASTM D1413 Rating = No Decay

D. Deck Framing - Structure Flashing Tape: 20 mil self-adhering, self-healing butyl-based deck flashing tape to protect wood framing and posts from premature rot and corrosion. Installation includes horizontal and vertical surfaces including all joists, rim joist, beams, steps, stair stringers, blocking, ledger board, under joists hangers and other surface. Apply at temperatures above 50° F. Provide in widths for complete top coverage.
1. Basis of Design Product: TREX Protect as manufactured by IBP, LLC.

2.02 ACCESSORIES

A. Fasteners: Provide fasteners of size and type acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate.
1. Concealed Fasteners: Manufacturers hidden fasteners and clips as recommended
2. Screws: No. 8, 2-1/2 inch stainless steel or high quality coated composite deck screws.
3. Deck Splines: Corrosion-resistant metal or plastic splines that fit in grooves routed into the sides of decking material and are fastened to deck framing with screws. Splines provide uniform spacing of decking material

PART 3 EXECUTION

3.01 INSPECTION

A. Examine conditions under which work is to be performed and notify Contractor in writing of unsatisfactory conditions. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.02 PRE-INSTALLATION RESPONSIBILITY

A. Prior to manufacturing, dimensions and field conditions not shown on the drawings will be checked by the installer so that appropriate adjustments can be made by the manufacturer.

B. Prior to installation, the installer shall check jobsite dimensions. Any discrepancies between design and field dimensions shall be brought to the attention of the General Contractor and the Architect. Work shall not proceed until discrepancies are corrected.

3.03 INSTALLATION

A. Comply with manufacturer's written installation instructions and comply with governing regulations and industry standards applicable to the work.
1. Cut, drill, and rout using carbide tipped blades
2. Do not use composite material for structural applications
3. Pre-drill holes located closer than 1 ½ inches from ends of plank
4. Cut Ends square -or- support ends with shims and spacers as required to provide continuous support

B. Install materials and products plumb, level, true and straight with no distortion.

C. Standing and Running Trim: Install with minimum number of joints possible; using full-length pieces (from maximum length available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners.

END OF SECTION 06 73 00

SECTION 07 10 00.13
WATERPROOFING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Section includes
   1. Hot applied rubberized waterproof system - (HARW).
   2. Self-adhered sheet waterproofing system - (SASW).

B. Provide waterproofing in the following applications and areas:
   1. Basement walls below grade: HARW or SASW, Contractor's option.
   2. Wall areas where floor slab is below grade: HARW or SASW, Contractor's option.
   3. Tunnel walls and top: HARW or SASW, Contractor's option.
   4. Structural slab at balcony conditions, elevated plaza decks, double slabs, etc.: HARW or SASW, Contractor's option.
   5. Planter walls; on plant side of wall where face of wall on opposite side is exposed to view/weather: HARW or SASW, Contractor's option.
   6. Elevator pit walls: HARW or SASW, Contractor's option.
   7. Elevator pit underslab: SASW.
   8. Other areas where indicated.

C. Surface preparation, primers, and protective covering.

D. Plaza deck pavers and pedestals.

1.02 RELATED SECTIONS

A. Ceramic tile waterproofing membrane: Section 09 30 00.

B. Building Insulation: Section 07 21 00.

C. Sealants: Section 07 92 00.

D. Traffic Coatings: Section 07 18 00.

E. Fluid-Applied Membrane Air Barriers: Section 07 27 26: for above grade envelope protection and coordination.

F. Sustainable Design Requirements: Section 01 81 13.

G. VOC Limits: Section 01 81 16.

1.03 REFERENCE STANDARDS

A. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2023.

B. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2023a.

C. ASTM C836/C836M - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course; 2018 (Reapproved 2022).

D. ASTM D41/D41M - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; 2011 (Reapproved 2023).

E. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

F. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2022.

G. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2018.

H. ASTM D1056 - Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber; 2020.

I. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

J. ASTM D4263 - Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method; 1983 (Reapproved 2018).

K. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2015a (Reapproved 2023).

L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

M. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a (Reapproved 2019).

1.04 SUBMITTALS

A. Shop Drawings: Submit details of special joint or termination conditions and conditions of interface with other materials. Edge terminations, flashing details, treatment of joint penetrations or projections at large scale. Details shall reference each material, sequence of placement and application procedure.
   1. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported concrete pavers.

B. Product Data: Submit for all items. Include construction details, material descriptions, and tested physical and performance properties of waterproofing and manufacturer's written instructions for evaluating, preparing, and treating substrate..

C. Samples: For each exposed product and for each color and texture specified, including the following products:
   1. 8-by-8-inch square of waterproofing and flashing sheet.
   2. 8-by-8-inch square of insulation.
   3. 4-by-4-inch square of drainage panel.
   4. Plaza-deck paver, 4-by-4-inch square, in each color and texture required.
   5. Paver pedestal assembly.

D. Statement of Application: Submit statement signed by Contractor and installer, stating that work complies with these specifications and that the installation methods complied with the manufacturer's printed specifications and instructions for the conditions of installation and use on this project.

E. Applicator's License Certificate: Copy of "Certificate of License" issued to system applicator by manufacturer.

F. Sample warranty.

G. Contamination Profile: Manufacturer shall provide the Installer, Contractor and Owner with a tabular profile of chemicals, solutions, oils, compounds or materials which are injurious to the fluid-applied membrane system. This profile shall be established by generic (or trade name) basis, including those materials normally found to exist in the work environment or likely to occur on this work. The system should not be exposed to materials (directly or indirectly) as established by the Contamination Schedule during application or after completion of the work.

H. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company specializing in the manufacture of specific type of waterproofing membrane systems specified with ten years minimum experience.

B. Installer/Applicator: Company specializing in application of specified waterproofing with five years minimum experience and trained and approved by waterproofing manufacturer.

C. Obtain primary materials for each waterproofing type required from single manufacturer. Provide secondary materials only as recommended and approved by manufacturer of primary materials.

D. Pre-Waterproofing Conference
   1. Contractor: Prior to installation of waterproofing and associated work, schedule and administer a pre-installation meeting at the project site to review the material selections, installation procedure, special details, flashings, coordination, inspection procedures, and protection and repairs.
      a. Attendance: Architect, Contractor, Installer, manufacturers' representatives and trades requiring coordination with the work.
      b. Contractor: Take minutes and provide copies to all attendees.

E. Manufacturer's Representative (primary material manufacturer): Furnish services of manufacturer's technical representative at the job site at the start of installation, periodically as work progresses and after completion as necessary to advise on every phase of the waterproofing work.
   1. Install entire system in accordance with the manufacturer's instructions except where more stringent requirements are indicated or specified, then the more stringent requirements shall govern.

F. Contractor: Notify Architect 72 hours in advance of scheduled waterproofing work.

G. Installer to advise General Contractor of finish and curing requirements of concrete surfaces, as relates to application of the waterproofing materials, prior to installation of those substrates.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened packaging fully identified with brands, type, grade, class and other qualifying information including instruction for use and identifying numbers.

B. Storage waterproofing materials in a dry area away from high heat, flames or sparks. Provide weatherproof covering on top and all sides, allowing for adequate ventilation.

C. Store protection board flat and off the ground, preferably on a wood platform. Provide weatherproof covering on top and all sides.

D. Store only as much material at point of use as required for each day's work.

E. Handling: Handle all materials in a manner to prevent damage of any kind. Remove damaged material from the site and replace with new specified material.

1.07 JOB CONDITIONS

A. Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
   1. Surfaces to receive membrane shall be free of water, dew, frost, snow and ice.

B. Ventilation: Provide positive ventilation for enclosed areas continuously throughout the application and for a minimum of 8 hours afterward or until coatings have completely cured.

C. Do not allow waste products (petroleum, grease, oil, solvents, vegetable or mineral oil, etc.) to come in contact with the membrane. Exposures to foreign materials or chemical discharges must be presented to membrane manufacturer for evaluation to determine impact on membrane. See "Contamination Profile" specified under paragraph 1.03G herein.

D. Special Precautions: Allow no open fires or spark-producing equipment in the application area until vapors and fumes have dissipated. Post "No Smoking" signs in area during application and maintain for at least 8 hours following application.

1.08 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

B. Installer's Special Warranty: Provide warranty for two (2) years against leaks, failures and defects. Upon notification of such defects, within the warranty period, make necessary repairs and replacements at the convenience of the Owner without additional cost to the Owner.
   1. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pavers on plaza decks.

PART 2 PRODUCTS

2.01 MATERIALS

A. Hot Applied Rubberized System (HARW)
   1. Membrane: Elasticized rubberized asphaltic compound, self-bonding to normal substrates, hot poured, quick setting.
   2. Physical Properties
      a. Water Vapor Permeability - ASTM E96/E96M, Procedure E: 0.027 perms.
      b. Water Resistance - CGSB 37-GP-50M: No delamination, blistering, emulsification or deterioration.
      c. Water Absorption - CGSB 37-GP-50M: Gain in weight 0.35 g maximum. Loss in weight 0.18 g maximum.
      d. Penetration - ASTM D5329: At 77 degrees F, maximum 110; at 122 degrees F, maximum 200.
   3. Elongation - ASTM D5329: 1000% minimum.
      a. Low Temperature Crack Bridging Capability - CGSB 37-GP-50M: No cracking, adhesion loss, or splitting.
   4. Miscellaneous Materials: Primer, detail coatings, flashing, bonding adhesive, splicing cement, lap sealant, water cut-off mastic, pipe seals, pourable sealer, and other related items as recommended by membrane manufacturer.
      a. Primer: Solvent type conforming to ASTM D41/D41M.
      b. Reinforcing Flashing and Protection Course: 60 mil, uncured neoprene sheet in uncut rolls.
      c. Modified Asphalt Flashing and Protection Course: Alternative to uncured neoprene, 80-90-mil polyester or polyester and glass-reinforced modified asphalt sheet.
      d. Termination Sealant or Mastic: Moisture-curing or bituminous type.
      e. Termination Bar: Stainless steel or high-strength plastic.
   5. Miscellaneous: As required to complete installation.
   6. Manufacturers
      a. Liquid Membrane 6125 by AMERICAN HYDROTECH
      b. TremProof 6100 by TREMCO
      c. CCW-500R by CARLISLE
      d. 790-11 by HENRY
      e. STRATASEAL HR by CETCO
      f. HRM 714 by W.R. MEADOWS

B. Self - Adhered Sheet Membrane System (SASW)
   1. Membrane: Self-adhering laminated sheet comprised of rubberized asphalt and polyethylene film; minimum 60 mil thickness. Furnish in 36" wide x 60' long rolls with release paper.
   2. Physical Properties
      a. Tensile Strength, Film - ASTM D882: 5000 psi.
      b. Tensile Strength, Membrane - ASTM D412: 325 psi.
      c. Pliability, 180 degree bend over 1" mandrel - ASTM D1970/D1970M: -25 degrees F.
      d. Cycling over 1/4" crack, 100 cycles - ASTM C836/C836M: At -25 degrees, no effect.
      e. Permeance - ASTM E96/E96M, Method B: 0.05 perm.
      f. Water Absorption: ASTM D570: 0.1% (weight/72 hours).

3. Miscellaneous Materials: Primer, detail coatings, flashing, bonding adhesive, splicing cement, lap sealant, water cut-off mastic, pipe seals, pourable sealer, and other related items as recommended by membrane manufacturer.
4. Cants: At all inside corners; minimum face 3/4".
5. Miscellaneous: As required for complete installation.
6. Manufacturers
    a. Bituthene 4000 by GPC APPLIED TECHNOLOGIES
    b. Mel-Rol System by W.R. MEADOWS
    c. CCW MiraDri 860/861 by CARLISLE
    d. WP-200 by HENRY
    e. ENVIROSHEET by CETCO

C. Underslab Sheet Membrane: Reinforced, composite waterproofing sheet specifically designed for pre-applied underslab waterproofing conditions.
1. Performance Properties
    a. Resistance to Puncture (1” Rod) – ASTM E154/E154M: 220 pounds.
    b. Tensile Strength – ASTM D4632/D4632M: 80 pounds.
    c. Resistance to Permeance by Moisture – ASTM E96/E96M: .01 perms.
    d. Water Absorption – ASTM D570: 0.5% maximum.
2. Miscellaneous Materials: Primer, detail coatings, flashing, bonding adhesive, splicing cement, lap sealant, water cut-off mastic, pipe seals, pourable sealer, and other related items as recommended by membrane manufacturer.
3. Manufacturer: The following products are acceptable provided they meet the specified performance properties:
    a. Polyguard Underseal Underslab by POLYGUARD PRODUCTS
    b. Preprufe 300 Membrane by GCP APPLIED TECHNOLOGIES.
    c. Precon Membrane by W. R. MEADOWS.
    d. Miraply H by CARLISLE CCW
    e. ULTRASEAL by CETCO

D. Accessories
1. Vertical Protection Board
    a. Vertical Protection Board - At Elevator Pit Walls: Asphaltic hardboards "Protection Course" PC-3 by W.R. MEADOWS or GCP APPLIED TECHNOLOGIES Protection 03; 1/8" thick; two layers required.
    b. Vertical Protection/Drainage – All Other Locations
        1) Description: 3/8" thick high impact polystyrene drainage core with filter fabric adhered to core.
        2) Adhesive and Tape: Types as recommended by drainage board manufacturer.
        3) Manufacturer: Hydroduct HSF by GCP APPLIED TECHNOLOGIES; Amerdrain 650 by AMERICAN WICK DRAIN CORPORATION; CCW Miradrain 6200XL by CARLISLE; Hydrodrain by HYDROTECH; PolyFlow 15 by POLYGUARD PRODUCTS, Mel-Drain 7955 and Mel-Drain Total Drain by W. R. MEADOWS.
    c. Insulation Protection Board: Rigid insulation. See Section 07 21 00. Provide in addition to drainage board at all location except elevator pit walls.
2. Horizontal Protection/Drainage Board
    a. Description: 3/8" thick high impact polystyrene drainage core with filter fabric adhered to core.
    b. Adhesive and Tape: Types as recommended by drainage board manufacturer.
    c. Manufacturer: Hydroduct HSF by GCP APPLIED TECHNOLOGIES; Amerdrain 650 by AMERICAN WICK DRAIN CORPORATION; CCW Miradrain 6200XL by CARLISLE; Hydrodrain by HYDROTECH; PolyFlow 18 by POLYGUARD PRODUCTS, AQUADRAIN 30H by CETCO Mel-Drain by W. R. MEADOWS.
3. Expansion Joint Fillers: Provide membrane support and additional membrane length at joints.

a. Above Grade: Closed cell foam tubing, size and properties as recommended by waterproofing membrane manufacturer.
b. Below Grade: Closed cell neoprene gaskets; ASTM D1056 Class SC (oil resistant and medium swell), 2 to 5 psi compression deflection.

E. Plaza Deck Pavers: Solid, hydraulically pressed, standard-weight concrete units, square edged, manufactured for use as plaza-deck pavers; 7500-psi minimum compressive strength, ASTM C140/C140M; absorption not greater than 5 percent, ASTM C140/C140M; no breakage and maximum 1 percent mass loss when tested for freeze-thaw resistance according to ASTM C67/C67M.
1. Manufacturers: Subject to compliance with requirements, products manufactured by the following manufacturers are acceptable:
a. HANOVER ARCHITECTURAL PRODUCTS
b. SUNNY BROOK PRESSED CONCRETE COMPANY
c. WAUSAU TILE COMPANY
d. WESTILE ROOFING PRODUCTS
2. Thickness: 1-3/4 inches
3. Face Size: 18 inches square.
4. Color: As selected by Architect from manufacturer's full range.

F. Paver Pedestals: Paver manufacturer's standard paver support assembly, including adjustable or stackable pedestals, shims, and spacer tabs for joint spacing of 1/8 to 3/16 inch.

G. Plaza Deck Insulation: Section 07 20 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the waterproofing.
1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D4263.
3. Verify that compacted subgrade is dry, smooth, sound, and ready to receive waterproofing sheet.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION OF SUBSTRATES

A. Prepare, fill, prime, and treat substrates to receive waterproofing membrane, including joints, cracks, corners and penetrations according to manufacturer's written instructions and recommendations. Remove dust and dirt from joints and cracks according to ASTM D4263.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction. Mask termination elevations to prevent application of waterproofing materials on surfaces exposed to view.

C. Remove grease, oil, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

E. Semi-Liquid Membrane: Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.

F. Outside Corners: Bevel or round outside corners of substrate by grinding to produce a minimum 3/4" face or radius if not provided under Division 03 or use other means to treat outside corners approved by waterproofing manufacturer.

G. Inside Corners: Prepare and treat using methods recommended by manufacturer.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to manufacturer's written instructions and recommendations and ASTM D 6135 (for sheet membrane).

3.03 INSTALLATION – HOT APPLIED RUBBERIZED SYSTEM (HARW)

A. General
   1. Comply with manufacturer's instructions and details, except where more stringent requirements are indicated or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.
   2. Terminate membranes above wearing surface as indicated and where concealed by subsequent finish materials. Where concealment is not possible, terminate slightly below wearing surface (approximately ½").

B. Flashing
   1. Install elastomeric flashing sheets at terminations of waterproofing membrane according to manufacturer's written instructions.
   2. Prime substrate with surface conditioner.
   3. Install elastomeric flashing sheet and adhere to deck and wall substrates in a 125 mil layer of hot – applied rubberized asphalt.
   4. Extend elastomeric flashing sheet up walls or parapets a minimum of 8 inches above and 6 inches onto deck to be waterproofed.
   5. Install termination bars and mechanically fasten to top of elastomeric flashing sheet at terminations and perimeter of waterproofing.

C. Hot Applied Membrane
   1. Apply surface conditioner, at manufacturer's recommended rate, over prepared substrate and allow to dry.
   2. Heat and apply rubberized asphalt according to manufacturer's written instructions.
      a. Heat rubberized asphalt in an oil- or air-jacketed melter with mechanical agitator specifically designed for heating rubberized asphalt.
   3. Start application with manufacturer's authorized representative present.
   4. Reinforced Membrane: Apply hot rubberized asphalt to substrates and adjoining surfaces indicated. Spread to a thickness of 90 mils; embed reinforcing fabric, overlapping all side and end laps 2"; broom or brush fabric to embed fabric into membrane and remove all wrinkles.
   5. Apply waterproofing over prepared joints and up wall terminations and vertical surfaces to heights indicated or required by manufacturer.
   6. Cover waterproofing with protection course with overlapped joints while membrane is still hot to ensure good bond.

3.04 INSTALLATION – SELF ADHERED SHEET SYSTEM (SASW)

A. General
   1. Comply with manufacturer's instructions and details, except where more stringent requirements are indicated or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.
   2. Terminate membranes above wearing surface as indicated and where concealed by subsequent finish materials. Where concealment is not possible, terminate slightly below wearing surface (approximately ½").

B. Comply with ASTM D6135.

C. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

D. 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.

E. Horizontal Application: Apply sheets from low to high points of decks to ensure that laps shed water.

F. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

G. Seal edges of sheet-waterproofing terminations with mastic or termination sealant.

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. Seal all sides of patched areas with termination sealant or mastic

J. Immediately install protection course with butted joints over waterproofing membrane.

3.05 INSTALLATION – UNDER SLAB SHEET MEMBRANE

A. Preparation: As recommended by membrane manufacturer. Compact substrate as specified in Division 31, Earthwork. Remove loose aggregate or sharp protrusions. Fill gaps or voids greater than ½". Remove standing water prior to membrane applications.

B. Installation: In accordance with manufacturer's instructions.

3.06 INSTALLATION OF DRAINAGE AND PROTECTION ASSEMBLY

A. Exposed Waterproofing System: Provide protection assemblies as follows:
   1. Horizontal Surfaces: After all curing, testing and repair work is complete, install protection/drainage board assembly as follows:
      a. Install drainage panels over membrane, with tight butt joints and completely covering membrane. Adhere with adhesive as recommended by panel manufacturer.
      b. Overlap fabric onto previous panel. Adhere overlapped filter fabric with tape or mastic as recommended by manufacturer.
      c. Place pavers and pedestals over insulation and protection/drainage board.
   2. Vertical Surfaces
      a. Elevator Pit Walls: After all curing and repair work is complete and prior to backfilling, install one layer of 1/4" thick protection board over membrane, placing boards with tight butt joints and completely covering membrane.
      b. All Other Walls
         1) After all curing and repair work is complete and prior to backfilling, install one layer of drainage/protection board over membrane, placing boards as recommended by manufacturer with tight butt joints and completely covering membrane.
         2) Rigid Insulation: Provide rigid insulation in addition to drainage/protection board. See Section 07 21 00.
      c. Do not nail or otherwise penetrate membrane to attach protection boards. Use suitable adhesive compatible with membrane.

3.07 PLAZA DECK INSULATION INSTALLATION

A. See Section 07 20 00.

B. Install minimum of two layers of board insulation to achieve required thickness over waterproofed surfaces. Stagger joints of adjacent board thicknesses a minimum of 4". Cut and fit to within 3/4 inch of projections and penetrations.

C. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.08 PLAZA-DECK PAVER INSTALLATION

A. Install concrete pavers in locations indicated according to manufacturer's written instructions.

B. Install paver pedestals and accessories in locations and to elevations required. Adjust for final level and slope.

C. Loosely lay pavers on pedestals, maintaining a uniform open joint width. Tightly seat pavers against spacers to eliminate lateral movement or drift of paving assembly. Align joint patterns parallel in each direction.
   1. Lay out pavers to avoid less-than-half-width pavers at perimeter or other terminations.

D. Install pavers to not vary more than 1/16 inch in elevation between adjacent pavers or more than 1/16 inch from surface plane elevation of individual paver.

E. Maintain tolerances of paving installation within 1/4 inch in 10 feet of surface plane in any direction.

3.09 FIELD QUALITY CONTROL

A. Owner will engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish daily reports to Architect.

B. 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.

C. Owner will engage an independent testing agency to observe flood testing and examine underside of decks and terminations for evidence of leaks during flood testing.

D. Prepare test and inspection reports.

3.10 CLEANING, PEOTECTION AND REPAIR

A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

B. Protect installed board insulation and insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

C. Horizontal Applications
   1. Do not permit foot or vehicular traffic on unprotected membrane.
   2. After installation of protection board, no traffic is permitted on deck except as required to install subsequent materials and then only after additional protection is provided.
   3. Provide additional (temporary) protection as follows:
      a. Pedestrian Traffic: 3/4" plywood sheets.
      b. Light Equipment: Minimum 2x planking over plywood.

D. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

END OF SECTION 07 10 00.13

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SECTION 07 13 26
SELF-ADHERED WATERPROOFING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide waterproofing and accessories for complete watertight installation.
   1. Modified bituminous sheet waterproofing.

B. Surface preparation, primers, and protective covering.

1.02 RELATED SECTIONS

A. Sealants: Section 07 92 00.

1.03 REFERENCED STANDARDS

A. ASTM C836/C836M - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course; 2018 (Reapproved 2022).

B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

C. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2022.

D. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

E. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2023.

F. ASTM D4263 - Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method; 1983 (Reapproved 2018).

G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

H. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a (Reapproved 2019).

1.04 SUBMITTALS

A. Shop Drawings: Submit details of special joint or termination conditions and conditions of interface with other materials. Edge terminations, flashing details, treatment of joint penetrations or projections at large scale. Details shall reference each material, sequence of placement and application procedure.
   1. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported concrete pavers.

B. Product Data: Submit for all items. Include construction details, material descriptions, and tested physical and performance properties of waterproofing and manufacturer's written instructions for evaluating, preparing, and treating substrate..

C. Samples: For each exposed product and for each color and texture specified, including the following products:
   1. 8-by-8-inch square of waterproofing and flashing sheet.

D. Statement of Application: Submit statement signed by Contractor and installer, stating that work complies with these specifications and that the installation methods complied with the manufacturer's printed specifications and instructions for the conditions of installation and use on this project.

E. Applicator's License Certificate: Copy of "Certificate of License" issued to system applicator by manufacturer.

F. Sample warranty.

1.05 CONTAMINATION PROFILE: MANUFACTURER SHALL PROVIDE THE INSTALLER, CONTRACTOR AND OWNER WITH A TABULAR PROFILE OF CHEMICALS, SOLUTIONS, OILS, COMPOUNDS OR MATERIALS WHICH ARE INJURIOUS TO THE FLUID-APPLIED MEMBRANE SYSTEM. THIS PROFILE SHALL BE ESTABLISHED BY GENERIC (OR TRADE NAME) BASIS, INCLUDING THOSE MATERIALS NORMALLY FOUND TO EXIST IN THE WORK ENVIRONMENT OR LIKELY TO OCCUR ON THIS WORK. THE SYSTEM SHOULD NOT BE EXPOSED TO MATERIALS (DIRECTLY OR INDIRECTLY) AS ESTABLISHED BY THE CONTAMINATION SCHEDULE DURING APPLICATION OR AFTER COMPLETION OF THE WORK.

1.06 QUALITY ASSURANCE

A. Manufacturer: Company specializing in the manufacture of specific type of waterproofing membrane systems specified with ten years minimum experience.

B. Installer/Applicator: Company specializing in application of specified waterproofing with five years minimum experience and trained and approved by waterproofing manufacturer.

C. Obtain primary materials for each waterproofing type required from single manufacturer. Provide secondary materials only as recommended and approved by manufacturer of primary materials.

D. Pre-Waterproofing Conference
   1. Contractor: Prior to installation of waterproofing and associated work, schedule and administer a pre-installation meeting at the project site to review the material selections, installation procedure, special details, flashings, coordination, inspection procedures, and protection and repairs.
      a. Attendance: Architect, Contractor, Installer, manufacturers' representatives and trades requiring coordination with the work.
      b. Contractor: Take minutes and provide copies to all attendees.

E. Manufacturer's Representative (primary material manufacturer): Furnish services of manufacturer's technical representative at the job site at the start of installation, periodically as work progresses and after completion as necessary to advise on every phase of the waterproofing work.

F. Install entire system in accordance with the manufacturer's instructions except where more stringent requirements are indicated or specified, then the more stringent requirements shall govern.

G. Contractor: Notify Architect 72 hours in advance of scheduled waterproofing work.

H. Installer to advise General Contractor of finish and curing requirements of concrete surfaces, as relates to application of the waterproofing materials, prior to installation of those substrates.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened packaging fully identified with brands, type, grade, class and other qualifying information including instruction for use and identifying numbers.

B. Storage waterproofing materials in a dry area away from high heat, flames or sparks. Provide weatherproof covering on top and all sides, allowing for adequate ventilation.

C. Store protection board flat and off the ground, preferably on a wood platform. Provide weatherproof covering on top and all sides.

D. Store only as much material at point of use as required for each day's work.

E. Handling: Handle all materials in a manner to prevent damage of any kind. Remove damaged material from the site and replace with new specified material.

1.08 JOB CONDITIONS

A. Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Surfaces to receive membrane shall be free of water, dew, frost, snow and ice.

B. Ventilation: Provide positive ventilation for enclosed areas continuously throughout the application and for a minimum of 8 hours afterward or until coatings have completely cured.

C. Do not allow waste products (petroleum, grease, oil, solvents, vegetable or mineral oil, etc.) to come in contact with the membrane. Exposures to foreign materials or chemical discharges must be presented to membrane manufacturer for evaluation to determine impact on membrane. See "Contamination Profile" specified under paragraph 1.03G herein.

D. Special Precautions: Allow no open fires or spark-producing equipment in the application area until vapors and fumes have dissipated. Post "No Smoking" signs in area during application and maintain for at least 8 hours following application.

1.09 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.
   1. Warranty Period: Five (5) years from date of Substantial Completion.

B. Installer's Special Warranty: Provide warranty for two (2) years against leaks, failures and defects. Upon notification of such defects, within the warranty period, make necessary repairs and replacements at the convenience of the Owner without additional cost to the Owner.
   1. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pavers on plaza decks.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manufacturers: Subject to compliance with requirements, provide products from one of the following:
   1. CARLISLE COATINGS
   2. CETCO
   3. HENRY COMPANY
   4. W.R. MEADOWS INC

B. Modified Bituminous Sheet: Minimum 60-mil (1.5-mm) nominal thickness, self-adhering sheet consisting of 56 mils (1.4224 mm) of rubberized asphalt laminated on one side to a 4-mil- (0.10-mm-) thick, polyethylene-film reinforcement, and with release liner on adhesive side[; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.

C. Physical Properties:
   1. Tensile Strength, Membrane: 250 psi (1723.69 kPa) minimum; ASTM D412, Die C, modified.
   2. Ultimate Elongation: 300 percent minimum; ASTM D412, Die C, modified.
   3. Low-Temperature Flexibility: Pass at minus 20 deg F (minus 29 deg C); ASTM D1970/D1970M.
   4. Crack Cycling: Unaffected after 100 cycles of 1/8-inch (3-mm) movement; ASTM C836/C836M.
   5. Puncture Resistance: 40 lbf (180 N) minimum; ASTM E154/E154M.
      a. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F (21 deg C); ASTM D570.
   6. Water Vapor Permeance: 0.05 perm (2.9 ng/Pa x s x sq. m) maximum; ASTM E96/E96M, Water Method.

D. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the waterproofing.
   1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
   2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D4263.
   3. Verify that compacted subgrade is dry, smooth, sound, and ready to receive waterproofing sheet.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION OF SUBSTRATES

A. Prepare, fill, prime, and treat substrates to receive waterproofing membrane, including joints, cracks, corners and penetrations according to manufacturer's written instructions and recommendations. Remove dust and dirt from joints and cracks according to ASTM D4258.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction. Mask termination elevations to prevent application of waterproofing materials on surfaces exposed to view.

C. Remove grease, oil, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

E. Outside Corners: Bevel or round outside corners of substrate by grinding to produce a minimum 3/4" face or radius if not provided under Division 03 or use other means to treat outside corners approved by waterproofing manufacturer.

F. Inside Corners: Prepare and treat using methods recommended by manufacturer.

G. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to manufacturer's written instructions and recommendations and ASTM D 6135 (for sheet membrane).

3.03 INSTALLATION - SHEET MEMBRANE SYSTEM

A. General
   1. Comply with manufacturer's instructions and details, except where more stringent requirements are indicated or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.
   2. Terminate membranes above wearing surface as indicated and where concealed by subsequent finish materials. Where concealment is not possible, terminate slightly below wearing surface (approximately ½”).

B. Comply with ASTM D6135.

C. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

D. 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.

E. Horizontal Application: Apply sheets from low to high points of decks to ensure that laps shed water.

F. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

G. Seal edges of sheet-waterproofing terminations 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 (152.4 mm) beyond repaired areas in all directions.

J. Immediately install protection course with butted joints over waterproofing membrane.

3.04 CLEANING, PEOTECTION AND REPAIR

A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

B. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

END OF SECTION 07 13 26

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SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Rigid board insulation in masonry cavity walls.
B. Insulated sheathing at masonry veneer walls.
C. Perimeter and under slab insulation.
D. Semi-rigid glass-fiber wall insulation.
E. Spray polyurethane foam insulation.
F. Spray-applied cellulose insulation.
G. Rigid board insulation at furred masonry wall.
H. Plaza deck rigid insulation.
I. Double slab rigid insulation.
J. Waterproofing protection board, when used as combination protection board/perimeter insulation.
K. Glass fiber blanket wall and ceiling insulation.
L. Glass fiber batt insulation for ceiling tile/grid application.
M. Sound attenuation blankets in stud/gypsum board walls.
N. Spandrel glass/curtainwall insulation.
O. Concrete masonry unit (CMU) insulation – foamed in place.
P. Plenum liner and tunnel liner insulation.
Q. Semi rigid mineral wool insulation in masonry cavity walls.
R. Structural thermal breaks

1.02 RELATED SECTIONS

A. Exterior Insulation and Finish System: Section 07 24 13.
B. Wood Nailers: Section 06 10 00.
C. Pour-in Masonry Insulation: Section 04 00 00.
D. Masonry Insulation – Foam Inserts: Section 04 00 00.
E. Roof Insulation: Section _____. Coordinate with specified roof system
F. Firestopping (Safing): Section 07 84 00.
G. Sustainable Design Requirements: Section 01 81 13.
H. VOC Limits: Section 01 81 16.

1.03 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).
B. ASTM C203 - Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation; 2022.
C. ASTM C206 - Standard Specification for Finishing Hydrated Lime; 2014 (Reapproved 2022).
D. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.
E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

F. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

G. ASTM C1029 - Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation; 2020.

H. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2019.

I. ASTM C1104/C1104M - Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation; 2019.

J. ASTM C1149 - Standard Specification for Self-Supported Spray Applied Cellulosic Thermal Insulation; 2017.

K. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023a.

L. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2022.

M. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2015.

N. ASTM D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C with a Vitreous Silica Dilatometer; 2016.

O. ASTM D732 - Standard Test Method for Shear Strength Plastics by Punch Tool; 2017.

P. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2017.

Q. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics; 2016 (Reapproved 2023).

R. ASTM D1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics; 2020.

S. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2019.

T. ASTM D2863 - Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index); 2023.

U. ASTM D6226 - Standard Test Method for Open Cell Content of Rigid Cellular Plastics; 2021.

V. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

W. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

X. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

Y. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2024.

Z. ASTM E605/E605M - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 2019 (Reapproved 2023).

AA. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members; 2019 (Reapproved 2023).

BB. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

CC. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

DD. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

EE. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

FF. UL 1040 - Standard for Safety Fire Test of Insulated Wall Construction; Current Edition, Including All Revisions.

GG. UL 1715 - Standard for Safety Fire Test of Interior Finish Material; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Submit for all items.

B. Spray Foam Insulation Qualification Data: For qualified installer.

1.05 QUALITY ASSURANCE

A. Insulation Thermal Properties: Thermal conductivity k-factors and thermal resistance R-values indicated are values at 75 degrees F., mean temperature.
   1. Where insulation is identified by R-value, provide thickness required to achieve indicated R-value. Foam insulation R-values are "aged" thermal values in accordance with LTTR – Long Term Thermal Resistance predicted by ASTM C1289.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

C. Spray Foam Insulation Installers: Trained and approved by manufacturer and with experienced in performing application of SPF materials on not less than five projects with similar quantities of sprayed insulation materials in similar applications.
   1. Sample: A representative surface of not less than 100 sq. ft. shall be sprayed and approved before proceeding with spray insulation work.

D. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver insulation materials in manufacturer's original, unopened, and labeled packages.

B. Store insulation materials at the site inside storage trailers or the building in a dry, ventilated place. Exterior storage not permitted. Comply with manufacturer's recommendations for handling and protection during installation.

C. Remove fibrous batt insulation that has become wet before or after installation. Replace with new, dry insulation.

D. Protect plastic insulation from excessive exposure to sunlight. Protect at all times against ignition. Complete installation and covering of plastic insulation materials as rapidly as possible in each area of work.

PART 2 PRODUCTS

2.01 RIGID BOARD INSULATION - POLYSTYRENE

A. Extruded-Polystyrene Board Insulation: ASTM C578, Type IV, 25 psi, 1.6 p/cf.; maximum flame-spread and smoke-developed indexes of 25 and 165, respectively, per ASTM E84.
   1. Plaza deck and double slab areas: ASTM C578 Type III, 60 psi, 2.2 p/cf.

B. Thicknesses: Provide the following unless otherwise indicated on the drawings.
   1. Masonry Cavity Wall Application: 2 inch.
   2. Perimeter/Under Slab Application: 2 inch.
   3. Furred Wall Application: 1-1/2 inch.
   4. Waterproofing Protection Board Application: 1-1/2 inch.
   5. Plaza Deck: As indicated.
   6. Double slabs at Garage: 4”.

C. Adhesive: Types as recommended by insulation manufacturer for substrates and substrate coating materials where applicable.

D. Manufacturer: Subject to compliance with requirements, provide products by DUPONT - DOW CHEMICAL Styrofoam; OWENS CORNING Foamular; KINGSPAN GreenGuard; DIVERSIFOAM PRODUCTS Certifoam

2.02 GLASS-FIBER BLANKET INSULATION

A. Type: Glass fiber blanket designed to friction fit with metal. Manufacturers standard lengths; widths as required to fit framing conditions. Provide facings as follows:
   1. Unfaced: Conform to ASTM C665 Type I, with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics.
   2. Kraft Facing: Areas where insulation is not exposed (concealed behind gypsum board). Conform to ASTM C665 Type II, Class C, Category 1.
   3. Flame Resistant Foil Facing: Areas where insulation is exposed (not covered by gypsum board or concealed interstitial space between faced insulation and gypsum wall board face). Conform to ASTM C665 Type III, Class A, Category 1; flame-spread index of 25 or less.

B. Thickness (Nominal)
   1. Wall: 6", unless otherwise indicated.
   2. Ceiling: 10”, unless otherwise indicated.

C. Thickness: As indicated.

D. Manufacturer: Subject to compliance with requirements, provide products by JOHNS MANVILLE, OWENS-CORNING FIBERGLASS, CERTAINTEED, GUARDIAN BUILDING PRODUCTS or KNAUF INSULATION.

E. Tape: Type as approved by insulation manufacturer.

2.03 SOUND ATTENUATION BLANKETS

A. Type: Unfaced semi-rigid mineral fiber or glass fiber blankets. Conform to ASTM C665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics.

B. Thickness: 3 inch, unless otherwise indicated.

C. Manufacturer: Subject to compliance with requirements, provide products by JOHNS MANVILLE; THERMAFIBER, OWENS-CORNING FIBERGLAS, CERTAINTEED, ROXUL or FIBREX.

2.04 SPANDREL GLASS/CURTAINWALL INSULATION

A. Manufacturer: Subject to compliance with requirements, provide products by JOHNS MANVILLE, OWENS-CORNING FIBERGLAS, CERTAINTEED, GUARDIAN BUILDING PRODUCTS or KNAUF INSULATION; fiberglass insulation with factory-applied facing.

B. Unfaced, Glass-Fiber Board Insulation: ASTM C 612, Type IA; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84, passing ASTM E136 for combustion characteristics.
   1. Nominal density of 2.25 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F.
   2. Thickness: As indicated on drawings.

C. Foil-Faced, Glass-Fiber Board Insulation: ASTM C612, Type IA; faced on one side with foil-scrim-kraft or foil-scrim-polyethylene vapor retarder, with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84 ASTM E84.
   1. Nominal density of 2.25 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F.
   2. Thickness: As indicated on drawings.

D. Dark-Surfaced, Glass-Fiber Board Insulation: ASTM C612, Type IA; faced on one side with black glass-fiber mat or black polymer finish; maximum flame-spread and smoke-developed

indexes of 25 and 50, respectively, per ASTM E84.

1. Nominal density of 2.25 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F.
2. Thickness: As indicated on drawings.

2.05 SPRAY-APPLIED CELLULOSE INSULATION

A. Self-Supported, ASTM C1149,Type I (materials applied with liquid adhesive; suitable for either exposed or enclosed applications), chemically treated for flame-resistance, processing, and handling characteristics.

B. Manufacturer: K-13 Spray-On-Systems insulation manufactured by INTERNATIONAL CELLULOSE CORPORATION; materials manufactured by THERMACOUSTIC or PRO CELL are acceptable provided they meet the specified requirements.

C. Description
   1. Color: White.
   2. Performance Requirements
      a. Thermal Resistance: R-16
      b. Apply at minimum thickness to provide an R value as specified.
      c. Bond Strength (ASTM E736/E736M)
         1) Not less than 400 psf
         2) Not less than 600 times its weight @ 1”
   3. Labeling: The sprayed insulation must have been tested in sprayed form by U. L. and have each bag labeled with the reference to U.L. test results according to ASTM E84/U.L. 723:
      a. Class 1
   4. Fire Resistance
      a. Flame spread: 5.
      b. Smoke Development: 5.

2.06 SPRAY POLYURETHANE FOAM INSULATION

A. Closed-Cell Type
   1. Material: ASTM C1029, Type II minimum, closed cell polyurethane foam insulation containing no CFC’c, HCFC’s and VOC’s.

B. Physical Properties
      a. Density (ASTM D1622): Minimum 2.0 pcf
      b. Closed cell content (ASTM D6226): >90%
      c. Thermal Conductivity: R-Value = 6.4/inch. R-values are "aged" thermal values in accordance with PIMA Bulletin #101 and RIC/TIMA Bulletin #281-1 conditioning procedures
      d. Water Absorption (ASTM D2842): Maximum 1.0% volume.
      e. Water Vapor Transmission Permeability (perm-inch) (ASTM E96/E96M): 2.2.
      f. Fire performance in accordance with ASTM E84 and UL 723 flame spread 25 or less and smoke development 450.
      g. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
   2. Thickness: As indicated or as required to fill voids where applicable.
      a. Stud Cavity: As indicated
   3. Primer: Type as recommended by insulation manufacturer for adjacent and substrate surfaces. Ensure adjacent wall framing members are not deflected after installation and cure.
   4. Thermal Barrier: Where foam insulation is left exposed to building interior, provide approved 15 minute thermal or ignition barrier meeting the requirements of ASTM E119, UL 1715, UL 1040 or NFPA 286 and ICC (IBC) Section 2603.4 (minimum ½” gypsum board, intumescent coating or similar code complying material).

a. Bonding Agent: Provide suitable agent to ensure adequate bond between spray foam insulation and thermal barrier.

5. Transition Membrane between Air Barrier Membrane and Roofing and Other Adjacent Materials: As recommended by manufacturer and comply with both air barrier manufacturer's recommendations and roofing material manufacturer's recommendations (as applicable).
6. Manufacturers: Subject to compliance with specified requirements, provide products by SWD, HENRY, HUNTSMAN BUILDING SOLUTIONS, JOHNS MANVILLE, BASF, CARLISLE, GACO-WESTERN, PREFERRED SOLUTIONS, INC.

C. Open Cell Type
1. Material: Spray-applied polyurethane foam using water as a blowing agent, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.
a. Minimum density of 0.4 lb/cu. ft., thermal resistivity of 3.4 deg F x h x sq. ft./Btu x in. at 75 deg F.
2. Primer: Type as recommended by insulation manufacturer for adjacent and substrate surfaces.
3. Manufacturers: Subject to compliance with specified requirements, provide products by DEMILEC, GACO-WESTERN JOHNS MANVILLE or ICYNENE.

2.07 SEMI-RIGID GLASS–FIBER INSULATION

A. Type: Semi-rigid, unfaced glass fiber boards. Conforming to ASTM C612, Type 1A and 1B.

B. Thickness: 1", unless otherwise indicated.

C. Thermal Conductivity - R-Value: 4.3 for 1".

D. Density: 3.0 pcf.

E. Surface Burning Characteristics:

F. Flame Spread 15
1. Smoke Developed 0

G. Manufacturer: Microlite by JOHNS MANVILLE; Type 703 by OWENS-CORNING; subject to compliance with requirements, products by one of the following is acceptable CERTAINTEED, GUARDIAN BUILDING PRODUCTS or KNAUF INSULATION.

2.08 INSULATED SHEATHING

A. Material: Polyisocyaurate, foil faced, conforming to ASTM C1289, Type I, Class 1 or 2, minimum density 1.9 pcf.; foam-plastic core and facings shall have a flame-spread index of 25 or less when tested individually.
1. Compressive Strength – ASTM D1621: 25 psi.
2. Flexural Strength – ASTM C203: 40 psi.
3. Water Absorption – ASTM C206: Maximum 0.05% by volume.
4. Water Vapor Permeance – ASTM E96/E96M: <0.03 perms.

B. Thickness: 2".

C. "R" Value: Minimum 5.6 per inch.

D. Fasteners and Adhesive: Types as recommended by insulation manufacturer.

E. Manufacturer: Thermax by DUPONT - DOW CHEMICAL; Energy Shield by ATLAS ROOFING; Isoshield Silver by APACHE PRODUCTS; AP Foil by JOHNS MANVILLE; R-MAX Ecomax: Xci by HUNTER.

2.09 FOAM-IN PLACE CONCRETE MASONRY INSULATION

A. Contractor's Option - Exterior concrete masonry walls and concrete masonry party walls: Contractor may use one of the insulation types as specified below. The same type must be used throughout the entire project. Provide one of the following types of insulation:
1. Rigid Foam Inserts: See Section 04 00 00.
2. Foam-In-Place: As specified herein.

B. Foam-In-Place
   1. Physical Propoerties
      a. Thermal Conductivity – ASTM C177: .066 (3-1/2" thickness @ 75o F)
      b. "R"-Value (Block and Insulation)
         1) 8" CMU (60 lb. Density block): 14.0 minimum.
         2) 12" CMU (60 lb. Density block): 20.0 minimum.
      c. Density – ASTM D1622: 0.7 pcf.
      d. Fire Safety ASTM E84
         1) Flame Spread: 25 or less.
         2) Smoke Developed: 450 or less.
   2. Manufacturer: Provide one of the following:
      a. TAILORED CHEMICAL PRODUCTS Core-Fil 500
      b. C.P. CHEMICAL COMPANY Tripolymer
      c. THERMAL CORPORATION OF AMERICA Thermco
      d. JESCO, INC. Rapco Foam

2.10 PLENUM LINER AND TUNNEL LINER INSULATION

A. Description: Rigid fiberglass core with black fiberglass top layer and black spray applied polymer coating. Treat airstream surface mat facing with an EPA-registered anti-microbial agent.
   1. Thickness: 2".
   2. Density: 3.0 pcf.
   3. R-Value: 8.7.

B. Compliance: Conform to ASTM C1071, Type II; ASTM D5116; ASTM G21 and G22 and 90A and 90B.

C. Surface Burning: Does not exceed 25 flame spread and 50 smoke developed when tested in accordance with ASTM E84, NFPA 255 and UL 723.

D. Air Velocity – ASTM C1071: Maximum 5000 fpm; tested to 12,500 fpm.

E. Water Absorption – ASTM C1104/C1104M: Less than 3% by weight.

F. Manufacturer: Rigid Plenum Liner by KNAUF or equal by JOHNS MANVILLE, OWENS-CORNING FIBERGLASS, CERTAINTEED, GUARDIAN BUILDING PRODUCTS or KNAUF INSULATION.

2.11 SEMI RIGID MINERAL WOOL INSULATION

A. Manufacturer: Subject to compliance with requirements, provide products by THERMAFIBER, ROXUL or FIBREX INSULATIONS INC.

B. Unfaced: ASTM C612; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics.
   1. Thickness: As indicated.
   2. R-value: 4.2 per inch.
   3. Facing: Unfaced.

C. Density: 4 pcf.
   1. Fiber Color: Darkened color [at rainscreen applications] [where indicated].

D. Foil-Faced: ASTM C612; faced on one side with foil-scrim or foil-scrim-polyethylene vapor retarder; with maximum flame-spread and smoke-developed indexes of 25 and 5, respectively, per ASTM E84.
   1. Thickness: As indicated.
   2. R-value: 4.2 per inch.
   3. Facing: Unfaced.
   4. Density: 4 pcf.
   5. Fiber Color: Darkened color at rainscreen applications.

E. Hardware: Clip as recommended by manufacturer compatible with types of wall systems.

2.12 STRUCTURAL THERMAL BREAKS

A. Structural Thermal Break Material: Structural thermal break material to prevent thermal bridging between building elements, minimizing energy loss while maintaining structural integrity.
   1. Material: Reinforced laminate thermoset.
   2. Thickness: As indicated
   3. Ultimate Mechanical Properties, Nominal:
      a. Compressive Strength, ASTM D695: 38,900 psi (268.2 MPa).
      b. Tensile Strength, ASTM D638: 9,400 psi (64.8 MPa).
      c. Tensile Modulus, ASTM D638: 1.7 x 106 psi (11,721.0 MPa).
      d. Flexural Strength, ASTM D790: 22,300 psi (153.7 MPa).
      e. Shear Strength, ASTM D732: 13,400 psi. (92.3 MPa).
   4. Flame Resistance, Nominal:
      a. Oxygen Index, ASTM D2863: 21.8 percent.
   5. Thermal Properties:
      a. Thermal Conductivity, ASTM C177: 1.8 BTU/hr/ft2/in/degree F (0.259 W/m* degree K).
      b. Coefficient of Thermal Expansion, ASTM D696: 2.2 in/in/degree C x10−5.
   6. Manufacturer: CLIMASPEC TB

2.13 ACCESSORY MATERIALS

A. Supplementary Support: Provide galvanized wire mesh, woven wire ties or flexible metal rods where required for supplementary support of insulation in permanent proper location.

B. Insulation Clips
   1. Description: Perforated metal plates (2" x 2") with metal spindle welded and extending through center. Speed washer (1" x 1") snaps over spindle to secure insulation.
   2. Adhesive: Type as recommended by clip manufacturer for adhesion to the various substrates.
   3. Spacing: As recommended by manufacturer.
   4. Spindle Length: As selected to ensure tight fit without compressing insulation so as to decrease insulation value.
   5. Manufacturer: AGM INDUSTRIES, INC. Series T TACTOO Insul-Hangers; ECKEL INDUSTRIES OF CANADA; Stic-Klip Type N Fasteners; GEMCO; Spindle Type.

C. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

PART 3 EXECUTION

3.01 PREPARATION

A. Examine substrates and installation conditions. Do not proceed with insulation work until unsatisfactory conditions have been corrected.

B. Verify substrate surfaces are dry and free of irregularities or substances harmful to insulation. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

C. Verify mechanical and electrical services within walls have been installed and tested.

D. Fill miscellaneous voids and spaces in wall framing and at window and door framing with batt insulation loosely stuffed in place.

E. Spray-On and Spray Foam Insulations: Provide masking, drop cloths or other satisfactory coverings for all materials/ surfaces which are not to receive insulation to prevent damage from overspray.

3.02 INSTALLATION OF RIGID BOARD [SEMI-RIGID] INSULATION - CAVITY WALL

A. Place insulation horizontally within cavity where indicated. Fit boards tightly together and around penetrations.

B. Place to ensure tight joints between all insulation panels installed.

C. Use manufacturer's suggested adhesive and or mechanical fasteners to bond the insulation panel to substrate. Keep perimeter fasteners 3/8" from edges and ends of boards

D. CMU Backup Cavity: Place insulation panels to clear wall ties, yet maintain a tight joint between the panels.

3.03 INSTALLATION OF RIGID BOARD INSULATION - PERIMETER INSULATION

A. Place at all slab-on-grade conditions at building perimeter.

B. Adhere to substrate as required to maintain insulation in final location prior to backfilling.

C. Coordinate placement of insulation with placement of vapor barrier. See Section 07 26 00.

3.04 INSTALLATION OF RIGID BOARD - WATERPROOFING PROTECTION BOARD

A. Coordinate installation of insulation (waterproofing protection board) with application of waterproofing. See Section 07 10 00.

B. Place insulation boards with long edge horizontally on exterior waterproofed walls below grade.

3.05 INSTALLATION OF RIGID BOARD INSULATION - FURRED MASONRY AND CONCRETE WALLS

A. Place insulation between furring members; maintain tight joints between insulation panels and between insulation panels and furring members.

B. If required, use insulation manufacturer's suggested adhesive to bond the insulation panel to the wall.

C. See Section 09 21 16 for furring members.

3.06 INSTALLATION OF BLANKET/BATT INSULATION

A. Install blanket type insulation with tight fitting butt joints. Provide supplementary support at vertical and horizontal installations when required to maintain insulation in permanent proper location.
   1. Spot adhere insulation to inside face of exterior sheathing or similar back-up material as required to maintain insulation in it’s proper location.

B. Fit insulation between members. Do not over-compress.

C. Locate facing to room side, where applicable.

D. Install interior wall sound attenuation at interior partitions where indicated on floor plans or wall types.

3.07 INSTALLATION SPANDREL GLASS/CURTAINWALL INSULATION

A. In Curtainwall Frames at Spandrel Glass
   1. Install insulation board behind spandrel glass with [foil-face away from glass] [black facing toward glass]. Leave 2" space between glass and insulation, unless otherwise detailed.
   2. Screw-attach aluminum clip angles to storefront frames at 16" on centers.
   3. Friction-fit the insulation between curtainwall frames against the clip-angles.
   4. After insulation is properly fitted, apply a continuous piece of foil-scrim tape against insulation board and storefront frame.
   5. Apply continuous tape over spliced joints in insulation (if any).

B. Coordinate with placement of perimeter fire safing. See Section 07 84 00.

3.08 INSTALLATION OF SEMI-RIGID GLASS-FIBER INSULATION

A. Install to underside of slab

B. Use insulation clips and supplementary supports as required.
   1. Locate and space clips as recommended by insulation manufacturer.
   2. Adhere clips to substrate using adhesive of type recommended by adhesive manufacturer for substrates encountered.
   3. Impale insulation over clip spindle and secure with washers.

3.09 INSTALLATION OF INSULATED SHEATHING

A. Place insulation horizontally within cavity where indicated. Fit boards tightly together and around penetrations.

B. Place to ensure tight joints between all insulation panels installed.

C. Use manufacturer's suggested adhesive and or mechanical fasteners to bond the insulation panel to substrate. Keep perimeter fasteners 3/8" from edges and ends of boards

D. CMU Backup Cavity: Place insulation panels to clear wall ties, yet maintain a tight joint between the panels.

3.10 SPRAY-ON CELLULOSE

A. Inspect surfaces to receive spray insulation prior to application to determine if priming/sealing is required to insure bonding and/or to prevent discoloration caused by migratory stains. Prime accordingly.

B. Installed thickness will be determined as the minimum thickness measured as per ASTM E605/E605M field test procedure.

C. Installation, clean-up and curing: Coordinate with other trades whose work may be affected or have an effect on the insulation installation.

D. Installation, clean-up and curing: According to manufacturer’s recommendations.

E. Provide natural or mechanical ventilation continuously to properly cure the insulation.

3.11 PLENUM AND TUNNEL INSULATION

A. Install on face of concrete or CMU surfaces.

B. Conform to manufacturer’s installation instructions.

C. Use insulation clips and adhesive as required.
   1. Locate and space clips as recommended by insulation manufacturer.
   2. Adhere clips to substrate using adhesive of type recommended by adhesive manufacturer for substrates encountered.
   3. Impale insulation over clip spindle and secure with washers.
   4. Paint all mechanical fasteners black to match insulation board.

3.12 SPRAY FOAM INSULATION

A. Prepare surfaces as recommended by insulation manufacturer. Remove substances from metal deck or other metal surfaces that will prohibit insulation/metal bond. Apply primer where required by manufacturer.

B. Spray-Applied Insulation: Install Spray-application of polyurethane foam in accordance with ULC S705.2 and the manufacturer’s instructions. Install in areas where indicated on the drawings. Fill all voids for a complete solid installation.

C. Trim, as needed, any excess thickness that would interfere with the application of cladding/covering system by other trades.

D. Clean-up all overspray from adjacent surfaces and floor.

END OF SECTION 07 21 00

SECTION 07 26 13
ABOVE-GRADE VAPOR RETARDERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide membrane vapor retarders in the following areas:
   1. Building perimeter walls at natatorium and where indicated.
   2. Walls at sauna.
   3. Roof over natatorium and where indicated.
   4. Other areas where indicated.

1.02 RELATED SECTIONS

A. Below-Grade Vapor retarders: Section 07 26 16.

B. Dampproofing (Natatorium CMU Cavity Wall): Section 07 11 13.

C. Sustainable Design Requirements: Section 01 81 13.

D. VOC Limits: Section 01 81 16.

1.03 REFERENCE STANDARDS

A. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 1998 (Reapproved 2017).

B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

1.04 SUBMITTALS

A. Product Data: Submit on all items.

B. Shop Drawings: Provide drawings of special joint conditions.

C. Manufacturer's Installation Instructions: Indicate preparation and installation recommendations, including transition to adjacent materials.

D. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.05 PROJECT CONDITIONS

A. Do not install membrane vapor retarders until substrate construction and all penetrating items and features are completed.

B. Obtain Architect's acceptance of installed membrane vapor retarders before installing covering materials.

1.06 QUALITY ASSURANCE

A. Note: It is the intent of the drawings and this section to provide a complete continuous vapor retarder envelope at all [Natatorium] perimeter walls and roof. At all junction points between the two planes, lap membrane approximately 6” and seal with tape or other methods recommended by membrane manufacturers. Notify Architect of areas or situations where a continuous vapor retarder cannot be achieved. Do not cover vapor retarder with other materials until vapor retarder has been inspected by the Architect.

PART 2 PRODUCTS

2.01 VAPOR RETARDER MATERIALS - WALLS

A. Perimeter Stud Framed Walls – Areas where vapor retarder is not exposed (concealed behind gypsum board or similar type fire resistant materials): Multi-ply rubber modified plastic laminate reinforced with nylon cord. Provide in maximum practical widths.
   1. Perm Rating: Maximum 0.05 gr./ft2/hr. when tested in accordance with ASTM E96, Procedure A.
   2. Manufacturer: T-65 by GRIFFOLYN CO., DIVISION OF REEF INDUSTRIES; Dura-Skrim 8 by RAVEN INDUSTRIES; FIBERWEB 200 or equal by STEGO.

B. Perimeter Stud Framed Walls – Fire Rated - Areas where vapor retarder is exposed (not covered by gypsum board or similar materials): Multi-ply low density polyethylene reinforced with non-woven nylon cord.
   1. Perm Rating: Maximum 0.05 gr./ft2/hr. when tested in accordance with ASTM E96/E96M, Procedure A.
   2. Fire Rating: Class I, Class A flame spread rating in accordance with UBC-42 and ASTM E84.
      a. Smoke Developed: Maximum 75.
      b. Flame Spread: Maximum 5.
   3. Manufacturer: 55 FR by GRIFFOLYN CO., DIVISION OF REEF INDUSTRIES or equal by RAVEN INDUSTRIES, STEGO or FIBERWEB.

C. Tape: Pressure sensitive, high density polyethylene tape produced by vapor retarder manufacturer; specifically designed for sealing vapor retarder sheet joints. Single faced and double faced as required by installation conditions. Minimum 4” width.

D. Sheet Seal Materials
   1. Sheet Seal for Wall Opening Applications: Rubberized asphalt bonded to sheet polyethylene, self-adhesive.
      a. Thickness: 25 mil, nominal.
      b. Maximum Vapor Permeability (Perm): 1 ng/S/m/pa.

2.02 VAPOR RETARDER MATERIALS - ROOF

A. Natatorium Roof
   1. Material: Polyethylene sheet backed rubberized asphalt membrane, 40 mils thick.
   2. Properties
      a. Tensile Strength – ASTM D1970/D1970M: 40 lbf/in. minimum.
      b. Permeance – ASTM E96/E96M: 0.1 perms maximum.
      c. Peel Adhesion – ASTM D903: Minimum 5 lbs/in. width
      d. Elongation – ASTM D1970/D1970M: 10% min.
   3. Manufacturers: 725TR by CARLISLE; products manufactured by W. R. GRACE, POLYGUARD PRODUCTS, GAF or CERTAINTEED are acceptable provided they meet the specified requirements and are approved as a vapor retarder membrane within the natatorium roofing assembly.

PART 3 EXECUTION

3.01 PRE-INSTALLATION CONFERENCE

A. Not less than two weeks before starting installation of materials in the section, the contractor will convene a meeting at project site with Architect, Owner’s representative, Contractor installer foreman/superintendent, material manufacturer’s representative, [Commissioning Agent] and mechanical and electrical trades.
   1. Review project requirements, required submittals, status of substrate work, areas of potential conflict and interference, availability of materials, installer’s personnel, equipment and facilities, construction schedule, weather and forecasted weather conditions, and coordinate methods, procedures and sequencing requirements for proper installation,

integration and protection of the work.

3.02 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.03 PREPARATION

A. Remove loose or foreign matter which might impair adhesion of materials.

B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.04 INSTALLATION

A. General: Install materials in accordance with manufacturer's instructions.

B. Perimeter Walls
   1. Install a single layer of membrane vapor retarder over framing members.
   2. Lap joints minimum 6" and tape.
   3. Coordinate installation with insulation and gypsum board installation.

3.05 NATATORIUM ROOF

   1. Install a single layer of membrane vapor retarder over entire metal deck area.
   2. Overlap ends 6”; overlap side edges 3-1/2”.
   3. At roof perimeter, continue membrane vertically down exterior face, horizontally across bottom face and vertically up interior face of perimeter structural steel (tube) as indicated on drawings.

B. Penetrations: Seal and flash all penetrations using sheet seal materials and methods as recommended by vapor retarder manufacturer.

3.06 PROTECTION

A. Protect installed membrane vapor retarder from damage until installation of covering materials. Seal all cuts, punctures, and penetrations of membrane vapor retarders with tape.

3.07 FIELD QUALITY CONTROL

A. Do not cover installed weather barriers until substrates are installed and inspected by Architect.

B. Take digital photographs of each portion of the weather barrier installation prior to covering up. Submit to Architect.

END OF SECTION 07 26 13

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SECTION 07 26 16
BELOW-GRADE VAPOR RETARDERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide membrane vapor retarders below interior concrete floor slabs on grade.

1.02 RELATED SECTIONS

A. Above-Grade Vapor Retarders: Section 07 26 13.

B. Dampproofing (Natatorium CMU Cavity Wall): Section 07 11 13.

1.03 REFERENCE STANDARDS

A. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2019.

B. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

C. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs; 2017.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

SUBMITTALS

A. Product Data: Submit on all items.

2.02 PROJECT CONDITIONS

A. Do not install membrane vapor retarders until substrate construction and all penetrating items and features are completed.

B. Obtain Architect's acceptance of installed membrane vapor retarders before installing covering materials.

2.03 QUALITY ASSURANCE

A. Note: It is the intent of the drawings and this section to provide a complete continuous vapor retarder envelope at all Natatorium perimeter walls and roof. At all junction points between the two planes, lap membrane approximately 6” and seal with tape or other methods recommended by membrane manufacturers. Notify Architect of areas or situations where a continuous vapor retarder cannot be achieved. Do not cover vapor retarder with other materials until vapor retarder has been inspected by the Architect.

B. Prior to concrete placement, receive letter from vapor barrier manufacturer verifying installation is per ASTM E164.

PART 2 PRODUCTS

3.01 VAPOR RETARDER MATERIALS

A. Slab-On-Grade – Zero Perm Application
   1. Water Vapor Retarder: ASTM E1745; Class A or B.
   2. Water Vapor Transmission Rate: Maximum 0.006 gr./ft2/hr. when tested in accordance with ASTM E96.
   3. Perm Rating: Maximum 0.01 gr./ft2/hr. when tested in accordance with ASTM E96, Procedure A.
   4. Puncture Resistance: ASTM E1745, minimum 1970 grams.
   5. Tensile Strength: ASTM E1745, minimum 45.0 lbf/in.
   6. Manufacturers/Products
      a. Premoulded Membrane Vapor Seal with Plasmatic Core by W. R. MEADOWS.
      b. Stego Wrap (15 mil (0.381 mm)) Vapor Retarder; STEGO INDUSTRIES.
      c. Vapor Guard; REEF INDUSTRIES.

7. Applications: Provide under slabs indicated to receive finish materials that are critically sensitive, low permeance floor coverings requiring a moisture-emission level at 3 lbs. of water/1000 sq. ft. of slab per ASTM F1869, Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride. Includes floor coverings of rubber, sheet vinyl, carpet with vinyl backing, urethane, epoxy, methyl methacrylate, linoleum and wood.

B. Tape: Pressure sensitive, high density polyethylene tape produced by vapor retarder manufacturer; specifically designed for sealing vapor retarder sheet joints. Single faced and double faced as required by installation conditions. Minimum 4” width.
   1. Provide type recommended for below grade applications.

PART 3 EXECUTION

4.01 PRE-INSTALLATION CONFERENCE

4.02 NOT LESS THAN TWO WEEKS BEFORE STARTING INSTALLATION OF MATERIALS IN THE SECTION, THE CONTRACTOR WILL CONVENE A MEETING AT PROJECT SITE WITH ARCHITECT, OWNER’S REPRESENTATIVE, CONTRACTOR INSTALLER FOREMAN/SUPERINTENDENT, MATERIAL MANUFACTURER’S REPRESENTATIVE, COMMISSIONING AGENT AND MECHANICAL AND ELECTRICAL TRADES.
   1. Review project requirements, required submittals, status of substrate work, areas of potential conflict and interference, availability of materials, installer’s personnel, equipment and facilities, construction schedule, weather and forecasted weather conditions, and coordinate methods, procedures and sequencing requirements for proper installation, integration and protection of the work.

4.03 INSTALLATION

A. Interior concrete floor slabs-on-grade. Place, protect, and repair sheet vapor retarder according to ASTM E1643 and manufacturer's written instructions; place sheets in position with longest dimension parallel with direction of pour.
   1. Install a single layer of membrane vapor retarder material over level compacted base.
   2. Secure vertical surfaces to walls and column bases; fold corners. Provide sealed contact with piping, conduit, and all other penetrating items. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments (such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier). At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab.
   3. Lap joints minimum of 6" with manufacturers recommended tape. Provide sealed contact with piping, conduit, and all other penetrating items.
   4. Premolded expansion joint material specified in section 03 30 00 is applied after vapor retarder is in place.
   5. Seal punctures and cuts before placing concrete. Repair as recommended by manufacturer. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.
   6. Trim exposed vapor retarder at floor line after concrete has been cured and hardened.

4.04 PROTECTION

A. Protect installed membrane vapor retarder from damage until installation of covering materials. Seal all cuts, punctures, and penetrations of membrane vapor retarders with tape.

B. When vapor retarder is used in conjunction with perimeter insulation, the vapor retarder shall be placed in a manner to isolate the insulation from the prepared subgrade and foundation wall surfaces.

END OF SECTION 07 26 16

SECTION 07 27 19
PLASTIC SHEET AIR BARRIERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide creped surface plastic film air barrier at exterior stud walls. Materials to bridge and seal the following air leakage pathways and gaps:
   1. Connections of the walls to the roof air barrier or membrane.
   2. Connections of the walls to the foundation or structure.
   3. Expansion joints.
   4. Openings and penetrations of all window frames, storefront, curtain wall.
   5. Door frames.
   6. Piping, conduit, duct and similar penetrations.
   7. Masonry ties, screws, bolts and similar penetrations.
   8. All other air leakage pathways in the building envelope.

1.02 REFERENCE STANDARDS

A. AATCC Test Method 127 - Test Method for Water Resistance: Hydrostatic Pressure; 2018, with Editorial Revision (2019).

B. ASTM D822/D822M - Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings; 2013 (Reapproved 2018).

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

E. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

F. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

G. ASTM E1677 - Standard Specification for Air Barrier (AB) Material or Assemblies for Low-Rise Framed Building Walls; 2023.

H. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.03 SUBMITTALS

A. Product Data: Submit material Manufacturer’s Product Data, material manufacturer's instructions for evaluating, preparing, and treating substrate, temperature and other limitations of installation conditions, Technical Data, and tested physical and performance properties.

B. Submit manufacturer’s instructions and details for installation over sheathing and related methods approved and recommended by air barrier manufacturer for Architects approval and comments. Details to include but not limited to:
   1. Opening for windows, doors, storefronts, louvers and related openings.
   2. Penetrations
   3. Transitions
   4. Terminations
   5. Fastening methods and patterns
   6. Tapes and seaming.

C. Compatibility: Submit letter from primary material manufacturer stating that materials proposed for use are permanently chemically compatible and adhesively compatible with adjacent materials proposed for use.

1.04 QUALITY CONTROL

A. Pre-installation Conference: Conduct to review conditions and review installation requirements and all detailing.
   1. Attendance is required by representatives of related trades including covering materials, substrate materials and adjacent materials.

B. All tapes, fasteners and accessories to be approved by air barrier manufacturer for complete continuous assembly.

C. Representative: Provide air barrier manufacturer representative to attend job site to inspect installation to verify compliance with manufacturer's standard installation requirements.

1.05 PROJECT CONDITIONS

A. Do not install membrane air barriers until substrate construction and all penetrating items and features are completed.

B. Sequencing. Do not install air barrier material before the roof assembly has been sufficiently installed to prevent a buildup of water in the interior of the building

C. Field Conditions: Do not install air barrier in snow, rain, fog, or mist. Do not install air barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the primary material manufacturer.

PART 2 PRODUCTS

2.01 MATERIALS

A. Flexible Plastic Sheet Air Barrier: Tyvek Commercial Wrap "D" by DuPONT or equal by GLOBAL WRAP, STEGO, RAVEN INDUSTRIES or HENRY COMPANY meeting the following performance requirements:
   1. Air Penetration – ASTM E1677: Type I
   2. Wall Assembly Air Penetration Resistance ASTM E283/E283M cfm/ft2 @ 1.57 psf <0.04
   3. Water Vapor Transmission – ASTM E96/E96M Method B: 200.
   4. Water Penetration Resistance – AATCC Test Method 127: >235.
   5. Tear Resistance – ASTM D822/D822M Method A: 38/35.
   6. Surface Burning Characteristics – ASTM E84: Class A for flame spread and smoke developed.
   7. Water Vapor Transmission: ASTM E96/E96M-05 Method B (perms) 30
   8. Wall Assembly Water Penetration Resistance ("high-performance" assembly): ASTM E331 Tested to 15 psf No leakage
   9. Flame Propagation/Multiple Assemblies: NFPA 285-Pass
   10. Surface Burning Characteristics:
       a. ASTM E84 Smoke Developed Index Class 25 Class A
       b. ASTM E84 Flame Spread Index Class15 Class A

B. Mechanical Fasteners, Flashings and Tape: Types as recommended by film manufacturer.
   1. Steel Frame Fasteners: Corrosion resistant, gasketed with washer in sufficient length(s).
   2. Wood Frame Fasteners: Corrosion resistant nail with plastic cap or plastic cap staple in sufficient length(s).
   3. Flashings and Tapes: Self adhering for substrates encountered.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are suitable prior to commencing work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Verify substrate is visibly dry.

C. Ensure that the following conditions are met:
   1. Surfaces are sound, dry, even, and free of contaminants.

2. Inspect surfaces to be smooth without large voids or sharp protrusions.

D. Verify sealants are compatible with flexible sheet air barrier proposed for use.

3.02 INSTALLATION

1. Install air barrier in a way that provides continuity throughout the building envelope. Install materials in accordance with manufacturer's instructions and the following (unless manufacturer requires other procedures in writing based on project conditions or particular requirements of their recommended materials):
2. Install head flashing material over all doors, windows and similar openings which to be later covered by air barrier material for proper drainage of water away from the window.
3. Install building wrap over sheathing board, rigid insulation or other fully-supported continuous substrates as per manufacturer's instructions.
4. Ensure air barrier material is plum and level on foundation, and unroll extending over window and door openings.
5. Ensure air barrier material is applied over back edge of weep screed for proper water drainage.
6. Unroll the air barrier material with the printed side facing out, wrapping the entire building, including door and window openings.
7. Attach into wood stud framing, through insulated sheathing board or into metal stud framing with plastic cap nails or fasteners specified by air barrier material manufacturer. The fasteners must penetrate the framing member a minimum of 1/2 inch (12.7 mm) on every vertical stud line.
8. Fasteners need to be installed along every stud vertically and 12" or closer together as specified by the material manufacturer apart horizontally to maintain integrity of air barrier assembly to ensure the material is fastened to building when negative and positive pressures are exerted.
9. Install with drainage plane surface pattern in horizontal position. Install lower level air barrier material ensuring the upper layers of air barrier material lap the bottom layer to ensure proper shingling and water drainage.
10. Overlap at all corners of building by a minimum of 12 inches (304.8 mm).
11. Overlap vertical seams by a minimum of 6 inches (152.4 mm).
12. Prepare each window and door rough opening as recommended by the air barrier manufacturer or prepare by cutting a modified "I" pattern and wrap excess material to the inside of the rough opening and fasten securely to a framing member. At the window header, make a 6 to 8 inch (203.2 mm) diagonal cut at the corners of the air barrier and fold the material up above the rough opening, exposing the underlying sheathing. If windows are already in place when installing air barriers, trim as close to them as possible and tape all edges with manufacturer approved sealant tape.
13. Detail remaining terminations and penetrations with accessory materials as per manufacturer's instructions for air leakage and ensuring lapping of the material for proper shingling and drainage of bulk water.
14. When the end of a roll is reached, fold the edge of the building wrap under itself and attach to the structural sheathing or through non-structural sheathing to the nearest framing member.
15. Tape all horizontal and vertical seams with manufacturer approved construction tape.
16. Seal top and bottom edges of rolled out material to substrate with manufacturer approved construction tape.
17. Seal all tears and cuts with manufacturer approved construction tape.

3.03 PROTECTION

A. Protect installed air barrier from damage until installation of covering materials. Seal all cuts, punctures, and penetrations with tape.

3.04 INSPECTION

A. Arrange for and facilitate special inspection in accordance with OBC OBC Section 1704.5.1.2.

END OF SECTION 07 27 19

SECTION 07 27 26
FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Type 1 - Fluid-applied vapor retarding air barrier.
   2. Type 2 - Fluid applied vapor permeable air barrier.

1.02 RELATED SECTIONS

A. Sustainable Design Requirements: Section 01 81 13.

B. Construction Waste Management and Recycling: Section 01 74 19.

C. Gypsum Board Assemblies joint-and-penetration treatments: Section 09 21 16.

D. Building Insulation for foam-plastic board insulation: Section 07 21 00.

E. Joint Sealants for joint-sealant materials and installation: Section 07 92 00.

F. Through-Wall – Flashing Membrane: Section 04 00 00.

1.03 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

B. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

C. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

D. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2018.

E. ASTM D1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting; 2021.

F. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers; 2022.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

I. ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source; 2022.

J. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

K. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

L. ASTM E1186 - Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems; 2017.

M. ASTM E1677 - Standard Specification for Air Barrier (AB) Material or Assemblies for Low-Rise Framed Building Walls; 2023.

N. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

O. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

P. CGSB 37-GP-56M: Membrane, Modified, Bituminous, Prefabricated, and Reinforced.

1.04 DEFINITIONS

A. ABAA: Air Barrier Association of America.

B. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.05 PRECONSTRUCTION TESTING

A. Mockup Testing: Air barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.
   1. Contractor will engage a qualified testing agency.
   2. Qualitative Testing: Mockups will be tested for evidence of air leakage according to ASTM E1186, smoke pencil with pressurization or depressurization.
   3. Quantitative Air Leakage Testing: Testing of the mockup for air leakage will be conducted not to exceed the test pressure differential, positive and negative, indicated in "Performance Requirements" Article for air barrier assembly air leakage when tested according to ASTM E2178
   4. Notify Architect seven days in advance of the dates and times when mockup testing will take place.

1.06 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.

B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction. Include details of interfaces with other materials that form part of air barrier. Include details of mockups.

C. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with the barrier; signed by product manufacturer.

D. Qualification Data: For Applicator.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers.

F. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.07 QUALITY ASSURANCE

A. Applicator Qualifications: A firm experienced in applying air barrier materials 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. Mockups: Before beginning installation of air barrier, apply air barrier to masonry mock-up constructed under section 04 00 00 to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.
   1. Coordinate construction of mockup to permit inspection by testing agency of air barrier before external insulation and cladding is installed.
   2. Include junction with foundation wall intersection.
   3. If Architect determines air barrier applications to mockups do not comply with requirements, reapply air barrier until approved.

C. Preinstallation Conference: Conduct conference at Project site.
   1. Include installers of other construction connecting to air barrier, including roofing, waterproofing, architectural precast concrete, masonry, sealants, windows, glazed curtain walls, and door frames.

2. Review air barrier requirements including surface preparation, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mockups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

D. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations and where applicable, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

E. Statement of Application: Submit statement signed by Contractor and installer, stating that work complies with these specifications and that the installation methods complied with the manufacturer's printed specifications and instructions for the conditions of installation and use on this project.
   1. Contamination Profile: Manufacturer shall provide the Installer, Contractor and Owner with a tabular profile of chemicals, solutions, oils, compounds or materials which are injurious to the system. This profile shall be established by generic (or trade name) basis, including those materials normally found to exist in the work environment or likely to occur on this work. The system should not be exposed to materials (directly or indirectly) as established by the Contamination Schedule during application or after completion of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer.

B. Remove and replace liquid materials that cannot be applied within their stated shelf life.

C. Store rolls according to manufacturer's written instructions.

D. Protect stored materials from direct sunlight.

1.09 PROJECT CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

1.10 WARRANTY

A. Submit manufacturer’s 10 year material warranty.

PART 2 PRODUCTS

2.01 FLUID-APPLIED MEMBRANE AIR BARRIER – TYPE 1

A. Class 1 Fluid-Applied, Vapor-Retarding Membrane Air Barrier: Cold-applied, elastomeric membrane.
   1. Products: Subject to compliance with requirements, provide either synthetic polymer or modified bituminous from one of the following:
      a. HENRY COMPANY
      b. CARLISLE COATINGS & WATERPROOFING
      c. MEADOWS, W. R., INC.
      d. STO CORPORATION
      e. RUBBER POLYMER CORP.
      f. MASTER BUILDERS SOLUTIONS
      g. TREMCO
      h. Subject to compliance with the specified performance requirements, products manufactured by others are acceptable upon Architects approval.
   2. Physical and Performance Properties

a. Air Permeability ASTM E2178: 0.004 cfm / ft2 @ 1.57 lbs / ft2 and have no increased air leakage when subjected to a sustained wind load of 10.5 lbs/ft2 for 1 hour and gust wind load pressure of 62.8 lbs/ft2 for 10 seconds when tested at 1.6 lbs/ft2 to ASTM E331
b. Water vapor permeance: 0.09 perms to ASTM E96/E96M
c. Wet Film Thickness: Per manufacturer as required to achieve performance and code compliance.
d. Surface Burning: ASTM E84 Class A flame spread and smoke developed.
e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
f. Adhesion to Substrate: Minimum 20 lbf/sq. in. when tested according toASTM D4541

B. Self-adhering transition membrane: SBS modified bitumen, self-adhering sheet membrane complete with a cross-laminated polyethylene film. Membrane shall have the following physical properties:
1. Air leakage: <0.0001 CFM/ft² @1.6 lbs/ft2 to ASTM E283/E283M
2. Vapor permeance: 0.05 perms to ASTM E96/E96M

C. Membrane Thickness: 0.0394” (40 mils (1.016 mm))
1. Low temperature flexibility: -22 degrees Fahrenheit (-5.56 degrees Celsius) to CGSB 37-GP-56M
2. Elongation: 200% to ASTM D412-modifed

2.02 FLUID-APPLIED MEMBRANE VAPOR/AIR BARRIER – TYPE 2

A. Fluid-Applied, Vapor Permeable Membrane Air Barrier: Cold-applied, elastomeric membrane.
1. Products: Subject to compliance with requirements, provide either synthetic polymer or modified bituminous from one of the following:
a. HENRY COMPANY
b. CARLISLE COATINGS & WATERPROOFING
c. MEADOWS, W. R., INC.
d. STO CORPORATION
e. MOMENTIVE – GE
f. RUBBER POLYMER CORP.
g. MASTER BUILDERS SOLUTIONS
h. DOW - DUPONT
i. Subject to compliance with the specified performance requirements, products manufactured by others are acceptable upon Architects approval.
2. Physical and Performance Properties
a. Air Permeability ASTM E2178: 0.004 cfm / ft2 @ 1.57 lbs / ft2 and have no increased air leakage when subjected to a sustained wind load of 10.5 lbs/ft2 for 1 hour and gust wind load pressure of 62.8 lbs/ft2 for 10 seconds when tested at 1.6 lbs/ft2 to
b. Water vapor permeance: 10 - 14 perms to ASTM E96/E96M Method B
c. Wet Film Thickness: Per manufacturer as required to achieve performance and code compliance.
d. Surface Burning: ASTM E84 Class A flame spread and smoke developed.
e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
f. Adhesion to Substrate: Minimum 20 lbf/sq. in. when tested according to ASTM D4541.

B. Self-adhering transition membrane: Vapor permeable air barrier membrane consisting of a microporous film laminate, backed with adhesive, which allows water vapor to permeate through while acting as a barrier to air and rain water. Membrane shall have the following physical properties:
1. Air leakage: <0.002 CFM/ft2 @ 1.6 lbs/ft2 to ASTM E283/E283M.
2. Membrane Thickness: 17 mils (0.4318 mm)

3. Low temperature flexibility -40 degrees Fahrenheit (4.44 degrees Celsius): Pass to ASTM D3111

2.03 AUXILIARY MATERIALS

A. Primer and block filler: Liquid waterborne or solvent-borne primer recommended for substrate by manufacturer of air barrier material.

B. Through-Wall Flashing and Transition Membrane (Self-Adhering): SBS modified bitumen, self-adhering sheet membrane complete with a cross-laminated polyethylene film. Membrane shall have the following physical properties:
   1. Membrane Thickness: 0.0394 inches (1 mm)
   2. Film Thickness: 4.0 mils (0.1016 mm)
   3. Flow (ASTM D5147): Pass @ 212 degrees Fahrenheit (100 degrees Celsius)
   4. Puncture Resistance: 134 lbf to ASTM E154
   5. Tensile Strength (film): 5723 psi (39458.71 kPa) ASTM D882
   6. Tear Resistance: 13lbs. MD to ASTM D1004
   7. Low temperature flexibility: -22 degrees Fahrenheit (-5.56 degrees Celsius) to CGSB 37-GP-56M

C. Joint Reinforcing Strip: Air barrier manufacturer's glass-fiber-mesh tape.

D. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

E. Adhesive and Tape: Air barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

F. Stainless-Steel Sheet: ASTM A240, Type 304, 0.0187 inch (0.47 mm) thick, and Series 300 stainless-steel fasteners.

G. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft density; flame spread index of 25 or less according to ASTM E162; with primer and non-corrosive substrate cleaner recommended by foam sealant manufacturer.

H. Preformed Silicone-Sealant Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.

I. Joint Sealant: ASTM C920, single-component, neutral-curing silicone; Class 100/50 (low-modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 07 92 00.

J. Other materials as recommended by barrier manufacturer for a complete air and water tight barrier.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
   1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
   2. Verify that concrete has cured and aged for minimum time period recommended by air barrier manufacturer.
   3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
   4. Verify that masonry joints are flush and completely filled with mortar.
   5. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

B. Mask off adjoining surfaces not covered by air barrier 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 in concrete with substrate patching membrane.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.03 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C1193 and air barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D4258 before coating surfaces.
   1. Prime substrate and apply a single thickness of preparation coat strip extending a minimum of 3 inches (76.2 mm) along each side of joints and cracks. Apply a double thickness of air barrier membrane and embed a joint reinforcing strip in preparation coat.

B. Gypsum Sheathing: Fill joints greater than 1/4 inch (6.35 mm) with sealant according to ASTM C1193 and with air barrier manufacturer's written instructions. Apply first layer of fluid air barrier membrane at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air barrier membrane over joint reinforcing strip.

3.04 TRANSITION STRIP INSTALLATION

A. Install strips, transition strips, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.
   1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
   2. Install transition strip so that a minimum of 3 inches (76.2 mm) of coverage is achieved over both substrates.

B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.
   1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

C. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

E. Apply joint sealants forming part of air barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply manufacturer’s recommended transition strip so that a minimum of 3 inches (76.2 mm) of coverage is achieved over both substrates. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch (25.4 mm) of full contact.
   1. Transition Strip: Roll firmly to enhance adhesion.

2. Elastomeric Flashing Sheet: Apply adhesive to wall, frame, and flashing sheet. Install flashing sheet and termination bars, fastened at 6 inches (152.4 mm) o.c. Apply lap sealant over exposed edges and on cavity side of flashing sheet.
3. Preformed Silicone-Sealant Extrusion: Set in full bed of silicone sealant applied to walls, frame, and membrane.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

I. Seal top of through-wall flashings, specified in Section 04 00 00, to air barrier with an additional 6-inch- wide, strip.

J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (152.4 mm) beyond repaired areas in strip direction.

3.05 AIR BARRIER MEMBRANE INSTALLATION

A. Apply air barrier membrane to form a seal with strips and transition strips and to achieve a continuous air barrier according to air barrier manufacturer's written instructions.

B. Apply air barrier membrane within manufacturer's recommended application temperature ranges.

C. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.
1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

D. Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions such as masonry ties.
1. Membrane Air Barrier: Dry film thickness as required by manufacturers written instructions or greater thickness as required to meet specified performance properties.

E. Apply strip and transition strip a minimum of 1 inch (25.4 mm) onto cured air membrane according to air barrier manufacturer's written instructions.

F. Do not cover air barrier until it has been tested and inspected by testing agency

G. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.06 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:
1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed, if applicable.

7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Strips and transition strips have been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

C. Tests: Testing to be performed will be determined Owner's testing agency from among the following tests:
   1. Qualitative Testing: Air barrier assemblies will be tested for evidence of air leakage according to ASTM E1186, smoke pencil with pressurization or depressurization.
   2. Quantitative Air Leakage Testing: Testing not to exceed the test pressure differential, positive and negative, indicated in "Performance Requirements" Article for air barrier assembly air leakage according to ASTM E283/E283M.

D. Remove and replace deficient air barrier components and retest as specified above.

3.07 CLEANING AND PROTECTION

A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
   1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed for more than 60 days or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions..
   2. Protect air barrier from contact with incompatible materials and sealants not approved by air barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 07 27 26

SECTION 07 27 27
SELF ADHERED SHEET AIR BARRIERS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Materials and installation methods for self-adhered vapor permeable air barrier membrane system located in the non-accessible part of the wall.
   2. Materials and installation methods to bridge and seal air leakage pathways in roof and foundation junctions, window and door openings, control and expansion joints, masonry ties, piping and other penetrations through the wall assembly.

1.02 REFERENCE STANDARDS

A. AATCC Test Method 127 - Test Method for Water Resistance: Hydrostatic Pressure; 2018, with Editorial Revision (2019).

B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

C. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2022.

D. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 1998 (Reapproved 2017).

E. ASTM D1876 - Standard Test Method for Peel Resistance of Adhesives (T-Peel Test); 2008 (Reapproved 2023).

F. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

G. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers; 2022.

H. ASTM D5034 - Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test); 2021.

I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

J. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a (Reapproved 2019).

K. ASTM E1186 - Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems; 2017.

L. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

M. ASTM E2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies; 2024.

N. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.03 DEFINITIONS

A. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.04 PERFORMANCE REQUIREMENTS

A. Provide an air and vapor barrier constructed to perform as a continuous air barrier and as liquid water drainage plane flashed to discharge any incidental condensation or water penetration.

B. Provide a continuous air barrier to control air leakage into, or out of the conditioned space. The air barrier shall have the following characteristics:

1. Continuous, with all joints made airtight.
2. Air Permeability: Not to exceed 0.004 cfm/ft2 under a pressure differential of 1.57 psf. when tested in accordance with ASTM E2178.
3. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
4. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:
    a. Walls and windows or doors.
    b. Different wall systems.
    c. Wall and roof.
    d. Wall and roof over unconditioned space.
    e. Walls and roof across construction, control and expansion joints.
5. All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's product data, installation instructions, and substrate preparation recommendations.

B. Shop drawings: Show the locations and extent of air and vapor barrier system including details of typical conditions, intersections with other envelope systems and materials, membrane counter-flashings and details showing how gaps in the construction will be bridged and how miscellaneous penetrations such as conduits, pipes, etc. are sealed.

C. Samples: Submit representative samples of all sheet membranes.

D. Warranty: Submit a sample warranty identifying the terms and conditions stated in Article 1.10.

1.06 QUALITY ASSURANCE

A. Manufacturer: Air and vapor barrier materials shall be manufactured and marketed by a firm with a minimum of 10 years' experience in the production and sales of air barrier membrane products.

B. Installer: The installer shall demonstrate qualifications to perform the work of this Section by submitting the following: Written confirmation or certification from the air barrier manufacturer that the installer has been trained and is recognized by the manufacturer as suitable for the execution of the work.

C. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include but not be limited to the following:
    1. Review of submittals
    2. Review of surface preparation, minimum curing period and installation procedures
    3. Review of special details and flashings
    4. Sequence of construction, responsibilities and schedule for subsequent operations
    5. Review of mock-up requirements
    6. Review of inspection, testing, protection and repair procedures

D. Manufacturer's Representative: Make arrangements necessary to have a trained representative of the manufacturer to review installation procedures. Notify manufacturer's representative not less than 72 hours before meeting is to be held.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in labeled packages, storing self-adhered membranes packages in upright position. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from sunlight, weather, excessive temperatures and

construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a wet substrate or during snow, rain, fog, or mist.

1.09 WARRANTY

A. Submit manufacturer's warranty that air barrier and accessories are free of defects at time of delivery and are manufactured to meet manufacturer's published physical properties and material specifications.

B. Warranty Period: Five years from date of substantial completion.

PART 2 PRODUCTS

2.01 GENERAL

A. For each type of material required for the work of this section, provide primary materials and materials compatible with the air barrier membrane.

2.02 MANUFACTURERS

A. Basis of Design: Specifications are based on Perm-A-Barrier VPS manufactured by W.R. GRACE.

B. Other Manufacturers: Subject to compliance, products manufactured by HENRY, TREMCO, POLYGUARD PRODUCTS, APPLIED TECHNOLOGIES or CARLISLE are acceptable.

2.03 SELF-ADHERED AIR BARRIER MEMBRANE

A. Description: 40 mil (1.016 mm) thick, self-adhering sheet consisting of 36 mils (0.9144 mm) of rubberized asphalt laminated to a 4 mil (0.1016 mm) cross-laminated polyethylene film with release liner on adhesive side.

B. Physical and Performance Requirements:
   1. Air Permeance, ASTM E2178: Not to exceed 0.004 cfm/sq. ft. under a pressure differential of 1.57 psf pressure difference
   2. Assembly Air Permeance, ASTM E2357: Not to exceed 0.04 cfm/sq.ft. under a pressure differential of 1.57 psf
   3. Water Vapor Permeance, ASTM E96/E96M: Not less than 15 perms
   4. Water Resistance, AATCC Test Method 127: No less than 5 hrs at 1.8 feet (55 cm)/21 inch
   5. Breaking Force, ASTM D5034: 55 lbf MD, and 44 lbf CD
   6. Pull Adhesion, ASTM D4541: min. 15 psi (103.42 kPa) to primed glass faced gypsum sheathing, min. 12 psi (82.74 kPa) to primed CMU
   7. Peel Adhesion, ASTM D903: min. 5 pli to primed glass faced gypsum sheathing, min. 4 pli to Perm-A-Barrier® VPS, min. 2.5 pli to primed CMU
   8. UV Exposure Limit: Not more than 150 calendar days
   9. Water Penetration Resistance Around Nails, ASTM D1970/D1970M Modified: Pass
   10. Fire Resistant: Evaluated to NFPA 285 as part of the designed wall assemblies containing foam plastic insulation

2.04 AUXILIARY MATERIALS

A. Transition Membrane: 40 mil (1.016 mm) membrane consisting of a 36 mil (0.9144 mm) self-adhesive rubberized asphalt integrally bonded to 4 mil (0.1016 mm) of cross-laminated, polyethylene film. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming to the following:
   1. Water Vapor Transmission, ASTM E96/E96M, Method B: 0.05 perms max.

2. Air Permeance: Not to exceed 0.00012 cfm/sq. ft. under a pressure differential of 1.57 psf pressure difference
3. Puncture Resistance, ASTM E154/E154M: 40 lbs. min.
4. Lap Adhesion at -4ºC (25ºF), ASTM D1876: 5.0 lbs./in. of width
5. Tensile Strength, ASTM D412, Die C Modified: min. 400 psi (2757.90 kPa)
6. Elongation, Ultimate Failure of Rubberized Asphalt, ASTM D412, Die C: min. 200%.

B. Transition Aluminum Membrane: 35 mil (0.889 mm) self-adhesive rubberized asphalt integrally bonded to 5 mil (0.127 mm) of aluminum film to provide a min. 40 mil (1.016 mm) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming to the following:
1. Water Absorption, ASTM D570: Max 0.1% by weight
2. Puncture Resistance, ASTM E154/E154M: 80 lbs min.
3. Lap Adhesion at 25ºF, ASTM D1876 Modified: 5.0 lbs./in. of width
4. Tensile Strength, ASTM D412, Die C Modified: min. 600 psi (4136.86 kPa)
5. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C Modified: min. 200%

C. Through-Wall Flashing Membrane: Self-adhered through-wall flashing membrane, 32 mils (0.8128 mm) of self-adhering SBS rubberized asphalt laminated to a 8 mil (0.2032 mm) cross-laminated, high-density polyethylene film with a siliconized release liner.

D. Primary, Transition and Flashing Membrane Primer: Type as recommended by membrane manufacturer for various flashing membranes and substrate materials.

E. Butyl-based Self-Adhered Membrane: Transition between air and vapor barrier membrane and TPO or EPDM membranes.

F. Mastic: Liquid mastic for sealing around brick ties, penetrations and lap and T-joints. Types as recommended by membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrates and conditions are ready to accept the Work of this section. Notify Architect in writing of any discrepancies. Commencement of the Work or any parts thereof shall mean acceptance of the prepared substrates.

B. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the membranes. Fill voids, gaps and spalled areas in substrate to provide an even plane. Strike masonry joints full-flush.

C. Curing compounds or release agents used in concrete construction must be resin based without oil, wax or pigments.

3.02 SURFACE PREPARATION

A. Clean, prepare and treat substrates according to manufacturers' written instructions. Surfaces to be coated must be clean, smooth, firm, free of dust, mud, loose mortar, wires, fins or any other substance that might prevent placement and bonding of membrane

B. Mask off surrounding surfaces to prevent accidental coating by primers and mastics.

C. Remove contaminants such as grease, oil and wax from exposed surfaces. Use repair materials and methods that are acceptable to manufacturer of the self-adhered membrane.

D. Prime areas to be detailed and allow to cure. Ensure exterior sheathing panels and other substrates receiving membrane receive an adequate amount of primer to achieve required bond to substrate.

E. Exterior sheathing panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws in accordance with exterior sheathing manufacturers written instructions.

F. Masonry Substrates: Repair any cracks, voids, and unfilled mortar joints with non-shrinking grout.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.03 AIR BARRIER MEMBRANE INSTALLATION

A. Install membrane in accordance with manufacturer's instructions and recommendations to provide a continuous air barrier.

B. Application of Self-Adhered Air Barrier Membrane
   1. Prime substrate to receive air barrier membrane as required by membrane manufacturer.
   2. Begin installation at the base of the wall placing top edge of membrane immediately below any masonry reinforcement or ties protruding from substrate.
   3. Overlap adjacent pieces 2 inches (50.8 mm) and roll seams.
   4. Subsequent sheets of membrane applied above shall be positioned immediately below masonry reinforcement or ties. Bottom edge shall be slit to fit around reinforcing wires or ties, and membrane shall overlap the membrane sheet below 2 inches (50.8 mm). Roll firmly into place.
   5. Seal around masonry reinforcing or ties and all penetrations with penetration & termination sealant.
   6. Coordinate the installation of air barrier with roof installer to ensure continuity of membrane with roof air barrier.
   7. At end of each working day seal top edge of air barrier to substrate with termination sealant.
   8. Do not expose air barrier membrane to sunlight for more than 150 days prior to enclosure.
   9. Prior to enclosing, repair punctures, damaged areas and inadequately lapped seams with a patch of the membrane sized to extend 6 inches (152.4 mm) in all directions from the perimeter of the affected area.

3.04 TRANSITION MEMBRANE INSTALLATION

A. Install strips, transition membrane, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier. Install all transition membrane only after application of air barrier.

B. Apply primer to substrates to receive transition membrane at required rate and allow to dry. Limit priming to areas that will be covered by transition tape in same day. Re-prime areas exposed for more than 24 hours.
   1. Prime glass-fiber-surfaced gypsum sheathing not covered with air membrane material with number of prime coats needed to achieve required bond, with adequate drying time between coats.

C. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge transition membrane to substrate with termination sealant.

E. Apply joint sealants forming part of air barrier assembly within sealant manufacturer's recommended application temperature ranges. Consult sealant manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition membrane so that a minimum of 3 inches (76.2 mm) of coverage is achieved over both substrates.
   1. Transition Membrane: Roll firmly to enhance adhesion.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant. See Section 07 21 00.

H. Repair punctures, voids, and deficient lapped seams in transition membrane. Slit and flatten fish-mouths and blisters. Patch with transition membrane extending 6 inches (152.4 mm) beyond repaired areas in strip direction.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:
   1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
   2. Continuous structural support of air barrier system has been provided.
   3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
   4. Site conditions for application temperature and dryness of substrates have been maintained.
   5. Maximum exposure time of materials to UV deterioration has not been exceeded.
   6. Surfaces have been primed, if applicable.
   7. Laps in transition membrane have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fish-mouths.
   8. Termination sealant has been applied on cut edges.
   9. Transition membrane has been firmly adhered to substrate.
   10. Compatible materials have been used.
   11. Transitions at changes in direction and structural support at gaps have been provided.
   12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
   13. All penetrations have been sealed.

C. Tests: Testing to be performed will be determined by Owner's testing agency from among the following tests:
   1. Qualitative Testing: Air barrier assemblies will be tested for evidence of air leakage according to ASTM E1186, smoke pencil with pressurization or depressurization.

D. Remove and replace deficient air barrier components and retest as specified above.

3.06 CLEANING AND PROTECTION

A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

B. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed for more than 150 days.

C. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

D. Remove masking materials after installation.

END OF SECTION 07 27 27

SECTION 07 31 13
ROOFING SHINGLES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work of this Section includes roofing shingles, felt underlayment, eave protection underlayment, ridge vents and miscellaneous fasteners.

1.02 RELATED SECTIONS

A. Flashing and Sheet Metal: Section 07 62 00.

1.03 REFERENCE STANDARDS

A. ASTM B749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products; 2020.

B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

C. ASTM D3018/D3018M - Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules; 2022.

D. ASTM D3161/D3161M - Standard Test Method for Wind Resistance of Steep Slope Roofing Products (Fan-Induced Method); 2020.

E. ASTM D3462/D3462M - Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules; 2023.

F. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).

G. ASTM D4869/D4869M - Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing; 2016a (Reapproved 2021).

H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

I. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2020a.

J. ASTM F1667/F1667M - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples; 2021a.

K. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. UL 790 - Standard for Standard Test Methods for Fire Tests of Roof Coverings; Current Edition, Including All Revisions.

M. UL 2218 - Standard for Impact Resistance of Prepared Roof Covering Materials; Current Edition, Including All Revisions.

N. ICC (IBC) AC 48 - Acceptance Criteria For Roof Underlayment For Use In Severe Climate Areas.

O. ICC (IBC) AC 207 - Acceptance Criteria for Polypropylene Roof Underlayments.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's printed product information indicating material characteristics, performance criteria, and product limitations.

B. Manufacturer's Installation Instructions: Provide published instructions that indicate preparation required and installation procedures.

C. Certificate of Compliance: Provide Certificate of Compliance from an independent laboratory indicating that the asphalt fiberglass shingles made in normal production meet or exceed the requirements of the following:
   1. ASTM E108 / UL 790 Class A Fire Resistance.
   2. ASTM D3161/D3161M / UL 997 Type I Wind Resistance.
   3. ASTM D3462/D3462M.

D. Shop Drawings: Indicate specially configured metal flashing, jointing methods and locations, fastening methods and locations, and installation details, as required by project conditions indicated.

E. Samples: For each exposed product and for each color and texture specified.
   1. Asphalt Shingles: Full size.
   2. Ridge and Hip Cap Shingles: Full size.
   3. Ridge Vent: 12-inch long Sample.
   4. Exposed Valley Lining: 12 inches (304.8 mm) square.

1.06 STORAGE AND HANDLING

A. Store all materials off ground on wooden pallets.

B. Stand felt rolls on end for storage.

C. Use care not to damage products in handling.

1.07 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace roofing shingles that fail within specified warranty period. Failures include, but are not limited to, the following:
   1. Manufacturing defects.
   2. Material Warranty Period: 40 years from date of Substantial Completion, prorated, with first five years nonprorated.
   3. Wind-Speed Warranty Period: Roofing shingles will resist blow-off or damage caused by wind speeds of up to 90 mph for five years from date of Substantial Completion.
   4. Algae-Resistance Warranty Period: Roofing shingles will not discolor for 10 years from date of Substantial Completion.
   5. Workmanship Warranty Period: Two years from date of Substantial Completion.

B. Roofing Installer's Warranty: On warranty form at end of this Section, signed by Installer, in which Installer agrees to repair or replace components of shingle roofing that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 ASPHALT GLASS FIBER ROOFING SHINGLES

A. Type: Laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.
   1. Weight per Square: 425

B. Conformance: ASTM D3018/D3018M Type I - self-sealing; UL Certification of ASTM D3462/D3462M; UL 997 Wind Resistance, Impact Resistance: UL 2218, Class 4.
   1. Fire Resistance: Class A according to ASTM E108 or UL 790.

C. Color: As selected by Architect.
   1. Algae Resistance: Granules resist algae discoloration.

D. Warranty: 40 year minimum.

E. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

F. Style and Manufacturer: Slateline by GAF/ELK with TIMBERTEX hip and ridge. Products by CERTAINTEED, TAMKO, OWENS CORNING are acceptable providing they meet the requirements specified.

G. Style and Manufacturer: Timberline 40 by GAF with Timbertex hip and ridge. Products by CERTAINTEED, TAMKO, OWENS CORNING are acceptable providing they meet the requirements specified.

2.02 ROOFING FELT - UNDERLAYMENT

A. Type: Asphalt-saturated felt. ASTM D4869/D4869M, Type I.

B. Weight: 15 lbs per 100 sq feet (0.10764 sq cm).

C. Size: 36 inch (914.4 mm) minimum roll width.

2.03 SELF-ADHERED UNDERLAYMENT – VAPOR PERMEABLE

A. Membrane Material: Fully adhered vapor permeable water-resistive sheet membrane consisting of multiple layers of UV stabilized spun-bonded polypropylene having the following properties:
   1. Thickness: Minimum 0.020 inches (0.51 mm).
   2. Water Vapor Permeance - ASTM E96ASTM E96/E96M Method B: 59 perms.
   3. Water Resistance tested (Ponding): AC 48, Pass, no leakage
   4. Tensile Strength tested - ASTM D1682: Pass
   5. Liquid Water Transmission - ASTM D4869/D4869M: Pass

B. Water-Resistive Flashing Membrane and Tape
   1. Self-adhered Underlayment Flashing: Self-adhered vapor permeable water-resistive sheet membrane consisting of multiple layers of UV stabilized spun-bonded polypropylene having properties equal to the primary self-adhered water resistive underlayment membrane.
   2. Tapes: UV stable, double/single sided, moisture-resistant flexible tape with adhesive backing; sizes and types as recommended by membrane manufacturer.

C. Manufacturer: Water-resistive vapor permeable roof underlayment membrane by VaproShield Slopeshield Self-Adhered (Basis of Design). Subject to compliance with the specified requirements products manufactured by GAF or SRP CANADA INC are acceptable.

2.04 SELF-ADHERED UNDERLAYMENT

A. Material: Polyethylene sheet backed rubberized asphalt membrane, 40 mils (1.016 mm) thick. Provide primer as recommended by membrane manufacturer.

B. Conformance: ASTM D1970/D1970M.

C. Warranty: Equal to shingle warranty.

D. Manufacturers: Bituthene Ice and Water Shield by W. R. GRACE; Polyken 640 Underlayment Membrane by POLYKEN TECHNOLOGIES; Polyguard Deck Guard by POLYGUARD PRODUCTS; Weather Watch by GAF; Winterguard by CERTAINTEED.

2.05 ACCESSORIES

A. Roofing Nails: ASTM F1667/F1667M; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch diameter, sharp-pointed, with a minimum 3/8-inch diameter flat head and of sufficient length to penetrate 3/4 inch (19.05 mm) into solid wood decking or extend at least 1/8 inch (3.18 mm) through OSB or plywood sheathing.
   1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
   2. Felt-Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch minimum diameter.

B. Roofing Cement: Asphalt roofing cement as recommended by roof product manufacturer; ASTM D4586/D4586M.

C. Vent Pipe Flashings: ASTM B749, Type L51121, at least 1/16 inch (1.59 mm) thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 4 inches (101.6 mm) from pipe onto roof.

2.06 SHINGLE RIDGE VENT

A. Vent Material: Preformed high density linear polyethylene; .08" thick with weather filter.

B. Length: Continuous along each ridge, unless otherwise indicated on drawings. Provide with connector and end plugs.

C. Color: As selected by Architect.

D. Provide end transitions as required.

E. Manufacturers: Shinglevent II by CERTAINTEED or equal by COR-A-VENT INC., GAF, LOMANCO INC., TAMKO and OWENS CORNING
   1. Net Free Area: 16 sq. inch/foot min.
   2. Roof to Wall Transition: COR-A-VENT Roof-2-Wall Vent or equal from listed manufacturers.

2.07 STATIC ROOF VENTS

A. Manufacturer: LOMANCO, AIR VENT, INC., GREENHECK, MASTER FLOW or equal.

B. Free Area: Minimum 50 square inches.

C. Description: Aluminum construction; enamel finish or mill finish. Provide with flashing flanges. Field paint, See Section 09 90 00.

D. Fasteners: Noncorrosive fasteners as recommended by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that roof penetrations and plumbing stacks are in place and flashed to deck surface.

B. Verify roof openings are correctly framed prior to installing work of this section.

C. Verify deck surfaces are dry and free of ridges, warps, or voids.

3.02 ROOF DECK PREPARATION

A. Follow shingle manufacturer's recommendations for acceptable roof deck materials.

B. Broom clean deck surfaces under eave protection and underlayment prior to their application.

3.03 INSTALLATION - UNDERLAYMENT

A. Place eave edge and gable edge metal flashing tight with fascia boards. Weather lap joints 2 inches (50.8 mm). Secure flange with nails spaced 8 inches (203.2 mm) on center.

B. Apply eave protection shingle underlayment in accordance with manufacturer's instructions.

C. Extend eave protection membrane minimum 24 inches (609.6 mm) up slope beyond interior face of exterior wall. (Eave width plus wall thickness and 24 inches.)
   1. In addition to eaves, apply at entire perimeter surfaces to receive asphalt shingles, including ridges, hips and rakes.

3.04 INSTALLATION - PROTECTIVE UNDERLAYMENT

A. Roof Slope Between 2:12 and 4:12: Apply one layer of self adhered underlayment over entire roof area, with ends and edges weather lapped minimum 12 inches (304.8 mm). Stagger end laps each consecutive layer.

B. Roof Slope 4:12 and Greater
   1. Roofing Felt Underlayment
      a. Apply one layer of felt underlayment horizontal over entire surface to receive asphalt shingles. Lap succeeding courses a minimum of 2 inches (50.8 mm); end laps a minimum of 4 inches (101.6 mm), and hips a minimum of 6 inches (152.4 mm).
      b. Secure felt underlayment to deck with roofing nails 1 inch (25.4 mm) in from edge and 12 inches (304.8 mm) o.c. Three rows per sheet width. Lap felt underlayment 12 inches at valleys and hips.

c. Omit felt underlayment at areas listed below to receive self-adhering underlayment. Lap felt underlayment over eave underlayment as recommended by manufacturer but not less than 2 inches (50.8 mm).

2. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free, on roof deck. Comply with environmental restrictions of underlayment manufacturer. Install membrane lapped in direction to shed water. Lap sides not less than 3-1/2 inches (89 mm). Lap ends not less than 6 inches (152.4 mm) staggered 24 inches (609.6 mm) between courses. Roll laps with roller. Cover underlayment within seven days. Provide at the following locations:
   a. Eaves: Extend from edges of eaves to a minimum of 24 inches (609.6 mm) beyond interior face of exterior wall.
   b. Rakes: Extend from edges of rake 24 inches (609.6 mm) beyond interior face of exterior wall.
   c. Valleys: Extend from lowest to highest point a minimum of 18 inches (457.2 mm) on each side.
   d. Hips: Extend 18 inches (457.2 mm) on each side.
   e. Ridges: Extend 36 inches (914.4 mm) on each side without obstructing continuous ridge vent slot.
   f. Sidewalls: Extend beyond sidewall 18 inches (457.2 mm), and return vertically against sidewall not less than 4 inches (101.6 mm).
   g. Dormers, Chimneys, Skylights, and Other Roof-Penetrating Elements: Extend beyond penetrating element 18 inches (457.2 mm), and return vertically against penetrating element a minimum of 4 inches (101.6 mm).
   h. Roof Slope Transitions: Extend 18 inches (457.2 mm) on each roof slope.

3.05 VALLEY FLASHING

A. Provide metal valley flashing installed to provide an open valley.

B. Provide flashing with the following:
   1. 1" V-crimp at flashing center running parallel with direction of valley.
   2. Edges formed with hook edge and cleated on 24" centers.
   3. Lap ends 8" in direction of water flow.
   4. Conform to SMACNA Figure 4-10.

C. See Section 07 62 00 for prefinished metal flashing material.

3.06 STATIC VENTS - INSTALLATION

A. Install where indicated on drawings in accordance with manufacturer's instructions and recommendations of roofing shingle manufacturer.

B. Coordinate with installation of substrates and roofing as required to ensure that each element of the work performs properly, and that combined elements are waterproof and weathertight.

3.07 SHINGLE - INSTALLATION

A. Use starter strip of shingle material cut on slotted end to 9" width and nail to eave with slot end up and edge overhanging eave 3/8".

B. Use shingles with 5" maximum exposure unless manufacturer recommends less.

C. Lay first course directly over starter strip with ends flush with starter strip at eaves.

D. Insure alignment by running vertical line down center of roof and laying shingles from center to rake.

E. Cutouts may break joints at either thirds or halves but system shall be consistent over entire roof.

F. Use number of nails and locations per shingle as recommended by shingle manufacturer.

G. Run a chalk line so valley will be 6" wide at top and diverge 1/8" per ft down to eaves. Neatly trim shingles to this line. Clip off shingle and glue upper inside corner of each shingle to valley

with asphalt cement.

H. Ridge shingles shall be 9" x 12" cut from strip shingles or factory supplied. Apply with 5" exposure, blind nailed, and tabbed. Run ridge shingles with wind.

I. Vent pipe sleeve flange minimum width 6". Fit shingles under lower edge and over sides and upper edge.

J. Run courses true to line with slots properly placed. Leave shingles flat without wave and properly placed.

K. Clean shingles and building of soiling caused by this installation.

END OF SECTION 07 31 13

SECTION 07 46 33
VINYL SIDING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide vinyl siding,corner board trim, window trim, and miscellaneous trim and miscellaneous trim as indicated on drawings or required for a complete installation. Types include:
   1. 5” exposed face clapboard – horizontal.
   2. Soffit - ventilated
   3. Board and batten

1.02 RELATED SECTIONS

A. Flashing: Section 076000.

1.03 REFERENCE STANDARD

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2023, with Editorial Revision.

B. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.

C. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2022.

D. ASTM D648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position; 2018.

E. ASTM D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C with a Vitreous Silica Dilatometer; 2016.

F. ASTM D1784 - Standard Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds; 2020.

G. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates; 2023.

H. ASTM D2843 - Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics; 2022.

I. ASTM D3679 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Siding; 2021.

J. ASTM D6638 - Standard Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks); 2018.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

L. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

1.04 SUBMITTALS

A. Samples: Submit minimum 9" long by full width sample of siding showing finish, pattern, color, gage and profile.

B. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

1.05 QUALITY ASSURANCE

A. Vinyl Siding Installer Qualifications: A qualified installer who employs a VSI-certified Installer on Project.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.

1.06 HANDLING AND STORAGE

A. Exercise care so as not to damage or deform material.

B. Stack on platforms or pallets and cover to protect from weather.

1.07 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.Failures include, but are not limited to, the following:
   1. Structural failures including cracking, fading, and deforming.
   2. Deterioration of materials beyond normal weathering.
   3. Fading is defined as loss of color, after cleaning with product recommended by manufacturer, of more than 5 Hunter color-difference units as measured according to ASTM D2244.
   4. Warranty Period: 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Specifications: Products by ALCOA BUILDING PRODUCTS; CERTAINTEED or ALSIDE are acceptable.

2.02 SIDING, SOFFIT AND TRIM

A. Siding and Soffit - General Requirements: Polyvinyl chloride products with the following characteristics:
   1. Siding: Comply with ASTM D3679, Class 2.
   2. PVC cell classification in accordance with ASTM D1784: 13334.
   3. Coefficient of linear expansion in accordance with ASTM D696: .000029 inch (0 mm) per inch per degree F.
   4. Tensile strength when tested in accordance with ASTM D638: Minimum 7,100 pounds per square inch.
   5. Modulus of elasticity when tested in accordance with ASTM D638: Minimum 360,000 pounds per square inch, average.
   6. Izod impact, standard 1/8 inch (3.18 mm) bar when tested in accordance with ASTM D256: 3.30 foot (100.58 cm)-pounds per inch, average.
   7. Shore D Hardness: Minimum 73.
   8. Specific Gravity: Minimum 1.39.
   9. Deflection temperature when tested in accordance with ASTM D648: 170 degrees Fahrenheit (76.67 degrees Celsius), 264 pounds per square inch.
   10. Smoke density rating when tested in accordance with ASTM D2843: 48 percent, average.
   11. Horizontal flammability, when tested in accordance with ASTM D635:
      a. Burn distance: 0.79 inch (20 mm).
      b. Burn time: Less than 5 seconds.
   12. Surface burning characteristics when tested in accordance with ASTM E84: Flame spread less than 20, fuel contribution 0, smoke density 400.
   13. Fire Resistance - Siding: 1 hour, when tested in accordance with ASTM E119, with siding applied over gypsum sheathing.
   14. Flammability - Siding: Comply with requirements of UBC Std 26-9.

B. Manufacturer: Verify and match existing.
   1. Wall Thickness: 044" nominal.
   2. Profile: As indicated
   3. Finish: Smooth.
   4. Color, Size Profile and Type:
      a. Board & Batten Vertical siding
      b. 4” Clapboard Horizontal siding

c. 8” Clapboard siding

C. Corner Board Trim and Window Trim: Provide nominal 4” wide corner trim and window surrounds; materials per manufacturer's requirements.

D. Soffit:
1. Color, Size and Type: Match existing adjacent.
2. Wall Thickness: 040" nominal.
3. Ventilation: 9” of net free area.
4. Finish: Smooth.

2.03 ACCESSORIES

A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside

B. corner caps, and other items as recommended by siding manufacturer for building configuration.

C. Provide accessories made from same material as and matching color and texture of adjacent siding unless otherwise indicated.

D. Vinyl Accessories: Integrally colored vinyl accessories complying with ASTM D3679 except for wind-load resistance.

E. Fasteners:
1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch (25.4 mm) into substrate.
2. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch (6.35 mm), or three screw-threads, into substrate.
3. For fastening vinyl, use non-ferrous or coated fasteners. Where fasteners are exposed to view, use prefinished aluminum fasteners in color to match item being fastened.

PART 3 EXECUTION

3.01 INSPECTION

A. Commencement of siding installation implies acceptance of the substrate as suitable to accept siding.

3.02 INSTALLATION

A. Install vinyl siding and soffit and related accessories according to ASTM D 4756.

B. Install in accordance with the latest edition of the "Rigid Vinyl Siding Application Manual", published by the Vinyl Siding Institute of the Society of the Plastics Industry, Inc.

C. Provide "J -Blocks" at all siding areas where light fixtures, hose bibs, outlets and similar type items occur.

3.03 CLEAN UP

A. Clean all siding surfaces of dirt, grime, and other surface blemishes.

B. Remove from the site all excess material, shipping packaging, debris and etc., related to the siding work.

END OF SECTION 07 46 33

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SECTION 07 46 46
MINERAL-FIBER CEMENT SIDING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide mineral-fiber cement, lap siding, panels, trim, fasteners, building paper, and other miscellaneous items as required for a complete installation.

1.02 RELATED SECTIONS

A. Sheathing: Section 06 10 00.

B. Sealant: Section 07 92 00.

C. Wood Blocking and Framing: Section 06 10 00.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

B. ASTM C1185 - Standard Test Methods for Sampling and Testing Fiber-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards; 2023.

C. ASTM C1186 - Standard Specification for Flat Fiber-Cement Sheets; 2022, with Editorial Revision (2023).

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

E. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product specifications, details, drawings and installation instructions for each component required.

B. Samples: Submit minimum 9" long by full width sample of siding and trim showing Each type of finish, pattern, color, profile, and thickness, as applicable.

C. Shop Drawings: Submit installation drawings for all components indicating relationship with each other and with adjacent materials and construction. Where installation details deviate from drawings or specification requirements, indicated such deviations on shop drawings.

1.05 DELIVERY, HANDLING AND STORAGE

A. Conform to manufacturer's requirements for delivery, handling and storage.

B. Exercise care so as not to damage or deform material.

C. Stack on platforms or pallets and cover to protect from weather.
   1. Install covering to allow adequate ventilation.
   2. Allow approximately 2 weeks acclimation to atmosphere at construction site.
   3. Protect edges and corners from chipping.

1.06 WARRANTY

A. Materials: Provide manufacturer's 15 year warranty (from date of installation) covering the following:
   1. Substrate: Warranted against splitting, cracking and delamination.
   2. Cracking (Definition): Refers to cracking to such a degree as to render the product unsuitable for ordinary use. Cracking does not include minute fractures of the applied finish.
   3. Workmanship: Application limited warranty 3 years.

PART 2 PRODUCTS

2.01 SIDING AND TRIM

A. Manufacturer: Subject to the specified requirements, products manufactured by the following are acceptable:
   1. JAMES HARDIE
   2. ALLURA/PLY CEM

B. Manufacturer and Material
   1. Basis of Design Panels: Specifications based on 5/16” thick HZ-5 HardiePanel Smooth manufactured by JAMES HARDIE or equal.
      a. Texture: Smooth
   2. Other Manufacturer: Subject to the specified requirements, products manufactured by the following are acceptable:
      a. ALLURA/PLY CEM

C. Material
   1. Non-asbestos fiber-cement siding to comply with ASTM C1186 Grade II, Type A.
   2. Flame-Spread index of 25 or less and smoke-developed index of 450 or less when tested in accordance of ASTM E84 or UL 723
   3. Factory Primer: Provide factory applied universal primer.
   4. Properties
      a. Flexural Strength: At least 1450 psi (9997.40 kPa) when in equilibrium condition, and at least 1015 psi (6998.18 kPa) when in wet condition, tested in accordance with ASTM C1185M C 1185.
      b. Freeze Thaw Resistance: At least eighty (80) percent flexural strength retained, when tested in accordance with ASTM C1185.
      c. Water tightness: No water droplets on underside when tested in accordance withASTM C1185.

D. Trim
   1. Texture: Smooth; material and finish to match siding.
   2. Sizes: As indicated
   3. Factory Primer: Provide factory applied universal primer.

2.02 MISCELLANEOUS ITEMS/FASTENERS

A. Fasteners
   1. Wood framing: 4d common corrosion resistant nails.
   2. Metal framing: 1 1/4" No. 8-18 x 0.375" head self-drilling, corrosion resistant S-12 ribbed buglehead screws.

B. Sealant: Urethane type. See Section 07 92 00.

C. Building Paper

2.03 TYPE: ASPHALT-SATURATED FELT. ASTM D4869, TYPE I.

   1. Weight: 15 lbs per 100 sq feet (0.10764 sq cm).
   2. Size: 36 inch (914.4 mm) minimum roll width.

B. Flashing: 24 ga stainless-steel.

C. Reveal Trims: Provide complete extruded aluminum ASTM B221, 6063-T5 reveal system of horizontal, vertical, vent strips, corners, J channel, trims and flashings.
   1. Finish: Factory primed for field paint.
   2. Fastening: Exposed fasteners as recommended by manufacturer.
   3. Manufacturers: FRY REGLET, TAMLYN.

D. .EPDM or Metal Flashings at Reveal Trims: type as recommended for complete watertight installation.

E. Patching Compound: 1 or 2 part fiber cement compound as recommended for smooth patching of fastener holes.

PART 3 EXECUTION

3.01 INSPECTION

A. Commencement of siding installation implies acceptance of the substrate as suitable to accept siding.

B. Discard materials that are chipped, unsound, improperly treated, not adequately seasoned or too small to fabricate work with a minimum number of joints, or which are of defective manufacture with respect to surfaces, sizes or patterns.

3.02 COORDINATION

A. Coordinate installation of siding and corner trim with installation of exterior sheathing/building paper and with installation of trim.

3.03 INSTALLATION

A. Building Paper: Install over entire wall area to receive siding. Install shingle style starting at bottom. Lap joints a minimum 2”; staple to sheathing as recommended by manufacturer.

B. Trim
   1. Install inside and outside corner trim as recommended by siding manufacturer.
   2. Coordinate installation of siding with installation of GFRC trim.
   3. Provide 1/8” clearance between siding and trim.
   4. Seal siding/trim gap with sealant as specified in Section 07 92 00.

C. C.Lap Siding
   1. Starting: Install a minimum 1/4 inch (6.35 mm) thick lath starter strip at the bottom course of the wall. Apply planks horizontally with minimum 1-1/4 inch (32 mm) wide laps at the top. The bottom edge of the first plank overlaps the starter strip.
   2. Allow minimum 1 inch (25.4 mm) vertical clearance between roofing and bottom edge of siding.
   3. Face nail to sheathing.
   4. Locate splices at least 12 inches (304.8 mm) away from window and door openings.

D. Panel Siding: Install per manufacturers recommendation and the following:
      a. Position panel fasteners 3/8” from panel edges and no closer than 2” away from corners.
      b. Vertical Joints, Install panels in moderate contact.

3.04 CLEAN UP

A. Clean all siding surfaces of dirt, grime, and other surface blemishes.

B. Remove from the site all excess material; shipping, packaging, debris, and etc., related to the siding work.

END OF SECTION 07 46 46

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SECTION 07 54 23
THERMOPLASTIC POLYOLEFIN ROOFING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide a thermoplastic membrane roofing system as shown and specified. Work includes:
   1. Mechanically fastened, single ply polyester reinforced thermoplastic polyolefin (TPO) membrane.
   2. Substrate board.
   3. Vapor retarder at Natatorium
   4. Insulation.
   5. Cover board.
   6. Flashing, pipe seals, and roofing accessories.
   7. Installing roof flashings and sheet metal furnished under Section 07 62 00.
   8. Membrane flashing under metal copings.

1.02 RELATED SECTIONS

A. Sustainable Design Requirements: Section 01 81 13.

B. Wood Blocking: Section 06 10 00 06 .

C. Flashing and Sheet Metal: Sections 07 62 00.

1.03 REFERENCE STANDARDS

A. ASCE 7-10 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; 2010.

B. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2023.

C. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2023a.

D. ASTM C473 - Standard Test Methods for Physical Testing of Gypsum Panel Products; 2019.

E. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.

F. ASTM C1278/C1278M - Standard Specification for Fiber-Reinforced Gypsum Panel; 2017.

G. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023a.

H. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 1998 (Reapproved 2017).

I. ASTM D1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting; 2021.

J. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

K. ASTM D2136 - Standard Test Method for Coated Fabrics—Low-Temperature Bend Test; 2019, with Editorial Revision (2021).

L. ASTM D2370 - Standard Test Method for Tensile Properties of Organic Coatings; 2016 (Reapproved 2021).

M. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing; 2021.

N. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

O. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

P. FM 4470 - Examination Standard for Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for Use in Class 1 and Noncombustible Roof Deck Construction; 2022.

Q. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: To participate as a qualified company in production of Elasto/Plastic materials, the company must have a minimum of five (5) years as the sole manufacturer of the brand name. Manufacturer shall also furnish notarized certification that he has been in business and had roofs installed for a minimum of five (5) years.

B. Installer Qualifications: An experienced roofing installer approved or licensed by roofing materials manufacturer and with not less than five (5) years of successful experience installing thermoplastic membrane roofing systems similar to those required for this project.

C. Manufacturer's representative shall conduct timely inspection of the roof installation to satisfy all warranty requirements.

D. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.

E. Insulation Thermal Properties: Thermal conductivity k-factors and thermal resistance R-values indicated are values at 75 degrees Fahrenheit (23.89 degrees Celsius)., mean temperature.
   1. Where insulation is identified by R-value, provide thickness required to achieve indicated R-value. Foam insulation R-values are "aged" thermal values in accordance with LTTR – Long Term Thermal Resistance predicted by ASTM C1289.

1.05 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience

C. FM Approvals Listing: Design and provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM 4470 Approvals as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.
   1. Fire/Windstorm Classification: Class 1A-90.

D. Wind Uplift: Conform to requirements of ICC (IBC) 1609 – 2017 and ASCE 7-10.

E. Fire Classification: U.L. Class A.

F. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E119 ASTM E119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

G. Insulation Thermal Properties: Thermal conductivity k-factors and thermal resistance R-values indicated are values at 75 degrees Fahrenheit (23.89 degrees Celsius)., mean temperature.

1. Where insulation is identified by R-value, provide thickness required to achieve indicated R-value. Foam insulation R-values are "aged" thermal values in accordance with LTTR – Long Term Thermal Resistance predicted by ASTM C1289-13.

H. Albedo - Solar Reflectance Index: Comply with Section 01 81 13.

1.06 SUBMITTALS

A. Product Data: Submit for all items.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Include as a minimum the following:
1. Layout of roof showing sheet sizes and field joint locations.
2. Location and type of penetrations.

C. Perimeter, penetration and special details.
1. Description of all materials.
2. Conformance to fire classifications requirements of ICC (IBC) 1505.
3. Layout of tapered insulation, including slopes.

D. Manufacturer's Approval: Obtain manufacturer's written approval of final shop drawings prior to beginning roofing operations.

E. Samples: Submit samples of all roofing and flashing materials.

F. Submit certification from roofing manufacturer that the roofing membrane and the selected roofing insulation are compatible.

G. Certifications: Roof manufacturer’s certification of compatibility with all adjacent materials that come in contact with roofing membrane.

H. Warranties: Sample of special warranties detailing terms as required herein.

I. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened, undamaged, labeled bundles or containers.

B. Store roofing materials, insulation and accessories at the site in storage trailers or the building in a dry, well-ventilated, weather tight place. Exterior storage not permitted. Comply with manufacturer's recommendations for handling and protection during installation.
1. Handle rolled goods to prevent damage to edge or ends.

C. Do not apply roofing materials to damp, frozen, dirty or dusty substrate surfaces.

D. Protection

E. Protect adjacent materials and surfaces from damage and soiling during roofing system installation.

F. Provide special protection or avoid heavy traffic on completed roofing work.

G. Protect paving and structure walls adjacent to hoists before starting work.

H. Do not overload the building structure with storage of materials or installation equipment on the substrate decking.
1. Handle and store materials and equipment to avoid damage to substrate decking.

1.08 PROJECT CONDITIONS

A. Environmental Conditions: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.09 WARRANTY

A. Contractor and roofing subcontractor shall warrant the total roofing system (membrane, insulation and flashing) with respect to workmanship and proper application for two (2) years from the date of acceptance by the Owner. Should any leaks covered under the warranty occur during this period, corrective action will be taken by the Contractor to repair the roof to the satisfaction of the owner and membrane manufacturer. ALL CORRECTIVE WORK WILL BE DONE AT NO COST TO THE OWNER. Work includes all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, substrate boards, vapor retarders, roof pavers, and walkway products.

B. The manufacturer(s) of the materials used shall provide a written, No Dollar Limit, fifteen (15) year guarantee on the complete roof installation. Upon warranty inspection and acceptance of the roof, the guaranty will be turned over to the Owner on behalf of the Contractor, by an authorized representative of the manufacturer. The guaranty shall begin when the project is completed and accepted by the Owner. Submit final guaranty in triplicate.

C. Warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories and other components of membrane roofing system.

D. System shall be warranted for all requirements specified herein, including for wind uplift as required.

E. Corrective measures on leaks shall be undertaken within seventy-two (72) hours after notification has been received by the Contractor or membrane manufacturer from the Owner.

PART 2 PRODUCTS

2.01 MEMBRANE ROOFING

A. Thermoplastic Polyolefin (TPO): ASTM D6878/D6878M, internally fabric- or scrim-reinforced, Standard Specification for Thermoplastic Polyolefin Based Sheet.
   1. Thermoplastic Sheet Membrane: Reinforced single ply membrane factory fabricated into flexible sheets.
   2. Property and Material Standard: Conform to ASTM D6878/D6878M.
   3. Thickness: Minimum 60 mils (1.524 mm).
   4. Physical Properties
      a. Tearing Strength - ASTM D1004: 156 lbg.
      b. Low Temperature Bend - ASTM D2136: Pass.
      c. Accelerated Weathering Test (Xenon Arc) - D2565: 10,000 hrs.
         1) Cracking (7x magnification): None.
         2) Discoloration (By Observation): Negligible.
         3) Crazing (7x magnification): None.
      d. Linear Dimensional Change - ASTM D1204: 0.1%.
   5. Color: White.

B. Flashing: 60 mils (1.524 mm) nominal thick reinforced sheet factory fabricated to the required shapes and sizes to suit project conditions; furnished by sheet roofing membrane manufacturer.

C. Inside and Outside Corners and Vent Flashing: Preformed.
   1. Provide asphalt compatible flashing membrane where asphalt contamination is anticipated.

D. Adhesive: Provide types as recommended by manufacturer for materials and conditions encountered.
   1. Provide asphalt compatible flashing membrane where asphalt contamination is anticipated.

E. Flashing Bars and Screws: Manufacturer's standard bars and fasteners. Spacings as required to meet design loads.

F. Mechanical Fasteners: As recommended by roofing manufacturer.

G. Splice Wash, Lap Sealant, Fastener Sealer, Etc.: Sheet material manufacturer's recommended materials for waterproof sealing of seams in membrane and waterproof sealing of joints between flashings and roofing membrane, adjoining surfaces, projections and penetrations through the roofing membrane. Compatible with materials with which used.

H. Membrane-covered Roof Expansion Joint Cover: Bellows type consisting of .06” thick membrane, support and attachment flanges.
   1. Joint Bellow Widths: As indicated.
   2. Membrane Cover: Material recommended by roofing manufacturer; compatible with roof membrane, integrally attached to bellow supports and attachment flange fabric.
   3. Bellow Supports: Closed cell foam, 3⁄8 inch (203.2 mm). minimum thickness.
   4. Concealed Attachment Flanges: Tin strip wrapped with neoprene-coated nylon fabric.
   5. Provide matching factory-fabricated corners, transitions, intersections and terminations.
   6. Termination Bar: Prepunched extruded aluminum bar.

I. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. GEN FLEX ROOFING SYSTEMS
   2. JOHNS MANVILLE
   3. GAF
   4. CARLISLE
   5. FIRESTONE - ELEVATE.
   6. VERSICO.
   7. MULE HIDE
   8. IKO COMMERCIAL

2.02 INSULATION

A. Polyisocyanurate Board Insulation: ASTM C1289 "Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board," Type II, glass-fiber mat facer on both major surfaces.
   1. Tapered Insulation: 1/4" per foot. No slope under ¼” per foot will be permitted.
   2. R-Value: Provide thickness for average R of 30 over entire roof area.
   3. Minimum Thickness at Drain: 4”.
   4. Compressive Strength: Minimum 20 (Grade 2).

B. Provide adhesives and mechanical fasteners as recommended by insulation manufacturer for substrates encountered.

C. Crickets (Tapered Insulation): Provide tapered insulation crickets sloped approximately ¼” per foot. Locate and arrange as indicated on drawings or as required to divert water at rooftop equipment or vertical obstructions.
   1. Material: Polyisocyanurate; conform to requirements and manufacturers specified herein.

D. Coverboard: Provide one of the following:
   1. ½” glass-mat, water-resistant gypsum substrate, primed surface; ASTM C1177/C1177M and ASTM D2370,. Dens-Deck by GEORGIA-PACIFIC, Secure Rock Roof Deck by USG, GlasRoc Roof Board by CERTAINTEED, DEXcell by GOLD BOND.
   2. ½” ASTM C1289 Type II, Class 4, Grade 2, polyisocyanurate with coated glass facer. Minimum compressive strength of 120 psi (827.37 kPa). FIRESTONE Isogard or equal.
   3. Adhered Roofing and Parapet Walls: ½” ASTM C1177/C1177M with face mat enhancement to allow adhesives to bond uniformly.
      a. Manufacturers GEORGIA-PACIFIC Dens-Deck Prime with EONIC Technology or equal by above coverboard manufacturers.
      b. Water Absorption (ASTM C473): Less than 5 percent of weight.
      c. Surface Water Absorption (ASTM C473): Nominal 1.0 grams.

2.03 VAPOR RETARDER

A. Material: Polyethylene sheet backed rubberized asphalt membrane, 40 mils (1.016 mm) thick.

B. Properties
   1. Tensile Strength – ASTM D1970/D1970M: 40 lbf/in. minimum.
   2. Permeance – ASTM E96/E96M: 0.01 perms maximum.
   3. Peel Adhesion – ASTM D903: 12 lbs/in. width
   4. Elongation – ASTM D1970/D1970M: 10% min.

C. Manufacturers
   1. Basis of Design: Deck Guard HT by POLYGUARD PRODUCTS
   2. Other manufacturers: Subject to compliance with the specified requirements, products manufactured by MIRADRI; W.R. GRACE; POLYKEN TECHNOLOGIES; GAF or CERTAINTEED are acceptable.

2.04 MISCELLANEOUS ITEMS

A. Wood Members: Comply with requirements of wood blocking, Section 06 10 50, for wood members indicated as roofing system work. Provide wood pressure treated as specified.

B. Mastic: Type as recommended by roofing manufacturer.

C. PVC Walkway Membrane: Roof manufacturer’s recommended reinforced PVC heat weldable walkway membrane; minimum 30" wide x lengths indicated. Minimum 2.4mm thick (0.096”).

D. Concrete Walkway Pads: 24” x 24” Concrete pads with slip sheet recommended by roofing manufacturer.

E. Substrate Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum substrate, Type X, 5/8 inch (15.88 mm) thick. GEORGIA-PACIFIC Dens Deck or ASTM C1278/C1278M USG Securock.
   1. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM 4470 Approvals, designed for fastening substrate board to roof deck.

F. Precast Splash Block: Heavyweight, hydraulically pressed concrete units, factory cast; absorption not greater than 5 percent, ASTM C140/C140M; no breakage and maximum 1 percent mass loss when tested for freeze-thaw resistance, ASTM C67/C67M. Provide at downspout locations indicated and with sacrificial roof layer for rooftop units.

2.05 FASTENERS

A. Provide roofing membrane manufacturer's recommended type mechanical fastener for deck. Type, size and spacing shall be as required to maintain manufacturer's system required warranty and wind uplift criteria.

PART 3 EXECUTION

3.01 INSPECTION

A. Pre-Installation Conference: Not less than two weeks before start of roofing installation, meet at project site with Architect, Owner's representative, Contractor, roofing installer, and roofing material manufacturer's representative.
   1. Review project requirements, required submittals, status of substrate work, areas of potential conflict and interference, availability of materials, installer's personnel, equipment and facilities, construction schedule, weather and forecasted weather conditions, and coordinate methods, procedures and sequencing requirements for proper installation, integration and protection of the work.

B. Examine substrates and installation conditions. Do not proceed with insulation and roofing work until unsatisfactory conditions have been corrected.

C. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Verify that work which penetrates roof deck, or requires men or equipment to traverse roof deck, has been completed.

B. Examine substrate surfaces for adequate anchorage, foreign materials, moisture and unevenness that would prevent the execution of roofing system specified.

C. Correct unsatisfactory conditions before starting roofing. Roof deck surface conditions shall comply with manufacturer's requirements and be acceptable to the roofing system installer.

D. Protect other work from spillage of roofing materials. Repair or replace other work damaged by installation of the thermoplastic membrane roofing system work.

3.03 SUBSTRATE BOARD

A. Install substrate board where indicated with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
   1. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers' written instructions.

3.04 VAPOR RETARDER

A. Install in accordance with membrane manufacturer’s instructions and recommendations.
   1. Install a single layer of membrane vapor barrier over entire substrate area.
   2. Overlap ends 6”; overlap side edges 3-1/2”.

3.05 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches (50.8 mm) or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 12 inches in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6.35 mm) with insulation.
   1. Cut and fit insulation within 1/4 inch (6.35 mm) of nailers, projections, and penetrations.

G. Adhered Insulation for Concrete Roof Deck: Install each layer of insulation and adhere to substrate as follows:
   1. Prime surface of concrete deck with asphalt primer at a rate of 3/4 gal/100 sq. ft. and allow primer to dry.
   2. Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 degrees Fahrenheit (-3.89 degrees Celsius) of equiviscous temperature.

H. Mechanically Fastened and Adhered Insulation for Metal Roof Deck: Install each layer of insulation and secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
   1. Fasten first layer of insulation according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.
   2. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
   3. Install subsequent layers of insulation in a cold fluid-applied adhesive.

I. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Stagger joints from joints in insulation below a minimum of 6 inches

(152.4 mm) in each direction. Loosely butt cover boards together and fasten to roof deck.

1. Fasten according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.
2. Fasten to resist uplift pressure at corners, perimeter, and field of roof.

3.06 ADHERED MEMBRANE INSTALLATION

A. Comply with roofing manufacturer's instructions and recommendations for handling and installing roofing system.

B. Flash and make watertight equipment curbs for mechanical equipment located on the roof.

C. General flashing details for roof penetrations, curbs, parapets and roof perimeters shall comply with roofing material manufacturer's standard details and recommendations for flashings.

1. Provide base flashing at perimeters and edges of membrane abutting walls, curbs or other construction. Provide prefabricated pipe seals for pipe and conduit penetrations, properly cemented to membrane and sealed to pipe or conduit with stainless steel clamp and top bead of sealant.
2. Mechanical fasteners below counterflashing, where required at perimeter flashings, to be fully enclosed with suitable membrane to form water tight seal.
3. Minimum height of membrane flashing terminations to be 8" above top of membrane, unless otherwise indicated.

D. Install roof flashing and sheet metal work provided herein and furnished under Section 07 62 00.

E. PVC Walkway Pads: Locate pads as indicated. Maintain approximately 4" between pads. Secure pads to membrane as recommended by membrane manufacturer.

F. Blocking Shim blocking solidly as required to make top surface of blocking level with top of insulation.

G. Perform test cuts at lap edges (seams) to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.

1. Perform test cuts after stoppages in the work and when recommended by roofing manufacturer after environmental changes.
2. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

H. Install membrane roofing and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty for existing membrane roofing system.

3.07 MECHANICALLY FASTENED MEMBRANE ROOFING INSTALLATION

A. Comply with roofing manufacturer's instructions and recommendations for handling and installing roofing system.

1. For in-splice attachment, install membranes roofing with long dimension perpendicular to steel roof deck flutes.

B. In-Seam Attachment: Secure one edge of sheet using fastening plates or metal battens centered within membrane seam and mechanically fasten sheet to roof deck.

C. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

D. Flash and make watertight equipment curbs for mechanical equipment located on the roof.

E. General flashing details for roof penetrations, curbs, parapets and roof perimeters shall comply with roofing material manufacturer's standard details and recommendations for flashings.

1. Provide base flashing at perimeters and edges of membrane abutting walls, curbs or other construction. Provide prefabricated pipe seals for pipe and conduit penetrations, properly cemented to membrane and sealed to pipe or conduit with stainless steel clamp and top bead of sealant.
2. Mechanical fasteners below counterflashing, where required at perimeter flashings, to be fully enclosed with suitable membrane to form water tight seal.
3. Minimum height of membrane flashing terminations to be 8" above top of membrane, unless otherwise indicated.

F. Install roof flashing and sheet metal work provided herein and furnished under Section 07 62 00.

G. PVC Walkway Pads: Locate pads as indicated. Maintain approximately 4" between pads. Secure pads to membrane as recommended by membrane manufacturer.

H. Blocking Shim blocking solidly as required to make top surface of blocking level with top of insulation.

I. Perform test cuts at lap edges (seams) to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
1. Perform test cuts after stoppages in the work and when recommended by roofing manufacturer after environmental changes.
2. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

J. Install membrane roofing and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty for existing membrane roofing system.

3.08 CLEANING AND PROTECTION

A. Patch installations by other trades and make all necessary repairs as required.

B. Upon completion of roofing work, clean gutters and drains of foreign materials and aggregate and remove all debris and surplus materials.

C. Protect finished roof areas from foot traffic and construction damage until Contract Completion.

END OF SECTION 07 54 23

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SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide fabricated flashing and sheet metal work as shown and specified.
   1. Gutters, and downspouts including brackets and supports.
      a. Scuppers, Leader Boxes, and Conductor Heads
   2. Shop fabricated formed copings, gravel stops and fascia.
   3. Shop fabricated formed flashing and counterflashing.
   4. Formed miscellaneous roof drainage flashings (valley, step, drip, flat/slope roof transition etc.).
   5. Miscellaneous rooftop and equipment concealed flashing.
   6. Sheet metal roofing and related flashing, trim and accessories.

B. Provide manufactured roof specialty work as shown and specified.
   1. Manufactured copings, gravel stops and fascia.
   2. Manufactured reglets and counterflashing.

C. Fasteners, sealants, solder and accessories to complete the work.

1.02 RELATED SECTIONS

A. Masonry Flashing: Section 04 00 00.

B. Aluminum Composite Materials: Section 07 42 44.

C. Metal roofing (standing seam) and related flashing (gutters, downspouts, etc.): Section 07 41 13.

D. Fluoropolymer Coatings: Section 05 05 13.

E. Sustainable Design Requirements: Section 01 81 13.

1.03 QUALITY ASSURANCE

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. General: Comply with Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) "Architectural Sheet Metal Manual" recommendations for materials, fabrication and installation of the work unless more stringent requirements are specified or shown on Drawings.

1.04 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ASCE 7-10 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; 2010.

C. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2024b.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

E. ASTM B32 - Standard Specification for Solder Metal; 2020.

F. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2022.

G. ASTM D523 - Standard Test Method for Specular Gloss; 2014 (Reapproved 2018).

H. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films; 2023.

I. American Society for Testing and Materials (ASTM).

J. American Architectural Manufacturers Association (AAMA)

K. AAMA 2605; Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing High Performance Organic Coatings on Architectural Extrusions and Panels.

L. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA):

M. SMACNA "Architectural Sheet Metal Manual".

N. Single Ply Roofing Industry: SPRI ES-1, Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.

1.05 QUALITY ASSURANCE

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. General: Comply with Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) "Architectural Sheet Metal Manual" recommendations for materials, fabrication and installation of the work unless more stringent requirements are specified or shown on Drawings.

C. Subcontractor: Subcontract sheet metal associated with roofing as a part of the roofing contract for undivided responsibility.
   1. Fabricator Qualifications: 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

D. Attachments to or penetrations in roofing systems to be made only with full approval of roofing manufacturer. Obtain approvals as required for installation of work under this section. Notify Architect if deviations from documents is required to obtain approval from roofing manufacturer prior to fabrication.

E. SPRI Wind Design Standard: Manufacture and install roof edge copings and fascia tested according to ANSI/SPRI ES-1 RE1, 2, 3, and ASCE 7-10 capable of meeting the design pressures indicated on the Structural Drawings.

F. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
   1. Temperature Change (Range): 120 degrees Fahrenheit (48.89 degrees Celsius), ambient; 180 degrees Fahrenheit (82.22 degrees Celsius), material surfaces.

G. Painted Finishes: Factory painted finish to be performed by an applicator specifically approved by the paint manufacturer. The applicator shall provide written notification of approval by paint manufacturer prior to application of the finish.

1.06 SUBMITTALS

A. Shop Drawings and Product Data: Submit on all sheet metal work specified herein. Drawings to show all expansion joint details, joint details, waterproof connections to adjoining work and at obstructions and penetrations, methods of attaching to building and all formed sections. Include the following:
   1. Identification of material, thickness, weight, and finish for each item and location in Project.
   2. Details for sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.

3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
4. Details of termination points and assemblies, including fixed points.
5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
7. Details of special conditions.
8. Details of connections to adjoining work.

B. Submit 8" square material samples for each type of sheet metal required.

C. Submit full width by 8" long samples of all manufactured and fabricated items. Provide with specified finish and color.

1.07 PROJECT CONDITIONS

A. Do not proceed with the installation of flashing and sheet metal work until substrate construction, blocking and other construction to receive the work are completed.
1. Metal roofing work is to follow progress of substrate as close as practical to limit exposure of insulation and wood materials.

1.08 WARRANTY

A. Warranty required for project membrane roofing system work shall include all related roof flashing and sheet metal work. Obtain roof specialties approved by manufacturer providing roofing-system warranty specified in Section.

B. Provide Contractor's guarantee for all sheet metal work under this Section to be free from defects of material and workmanship for a period of two years. Work that is not water tight or is damaged by winds that do not exceed 90 mph will be considered defective.

C. Provide manufacturer's guarantee of paint finish against failure of paint finish. Failure includes blistering, peeling, cracking, flaking, checking, excessive color change and chalking. Color change shall not exceed 5 N.B.S. units (per ASTM D523) and chalking shall not less than a rating of 8 per ASTM D4214.
1. Warranty Period: 20 years.

PART 2 PRODUCTS

2.01 FABRICATED MATERIALS

A. Prefinished Aluminum Sheet - All Flashings Exposed to View
1. Description: 3004 alloy aluminum sheet with factory applied finish.
2. Finish
a. Exposed Surfaces
1) Material/Manufacturer: Fluoropolymer baked enamel finish with Kynar 500 (70%) resins by ELF ATOCHEM OF NORTH AMERICA INC.; "Trinar" by AKZO; "Duranar" by PPG; "Fluropon" by VALSPAR or equal. Total dry film thickness not less than 1.0 mils (0.0254 mm)
2) Reference: Meet the requirements of AAMA 2605, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing High Performance Organic Coatings on Architectural Extrusions and Panels.
3) Color: As selected by Architect from paint manufacturer’s complete specified line.
4) Application: Apply coating systems in strict accordance with manufacturer's printed instructions and recommendations. Refer to Quality Assurance in Part 1.
3. Concealed Surfaces: Can be manufacturer's standard coating for concealed surfaces.
4. Thicknesses: Provide the following minimum thicknesses:
a. Flashing and Counterflashing: .032”
b. Gutters and Downspouts: .032”

c. Downspout Straps: .064”
d. Gutter Brackets and Supports: .125”
e. Coping: 040”
f. Gravel Stop/Fascia: 040”
g. Miscellaneous Flashing (not otherwise identified): .032”.

B. Galvanized Steel Sheet - All Flashings Exposed to View
1. Material: Galvanized steel, ASTM A653/A653M, G90 coating with factory applied finish.
2. Finish
a. Exposed Surfaces
1) Material/Manufacturer: Fluoropolymer finish containing not less than 70% PVDF (Kynar 500) resins; "Trinar" by AKZO; "Duranar" by PPG; "Fluropon" by VALSPAR. Total dry film thickness not less than 1.0 mils (0.0254 mm), or coatings meet or exceed the requirements of AAMA 2605.
2) Reference: Meet the requirements of AAMA 621, Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.
3) Color: As selected by Architect from paint manufacturer’s complete specified line.
4) Application: Apply coating systems in strict accordance with manufacturer's printed instructions and recommendations. Refer to Quality Assurance in Part 1.
b. Concealed Surfaces: Can be manufacturer's standard coating for concealed surfaces.
3. Thicknesses: Provide the following minimum thicknesses:
a. Flashing and Counterflashing: 0.0276”.(24 gage)
b. Gutters and Downspouts: 0.0396”. (20 gage)
c. Downspout Straps: 0.0635”. (16 gage)
d. Gutter Brackets and Supports: 0.0635”. (16 gage)
e. Copings: 0.0396”
f. Gravel Stop/Fascia: 0396”
g. Others: 0.0276”.](24 gage)

C. Miscellaneous Flashing - Not Exposed to View: Galvanized steel, ASTM A653/A653M G60. Mill phosphatized for paint adhesion. 0.0276”.(24 gage) minimum unless otherwise indicated.

D. Fasteners: Provide same metal as sheet metal or other non-corrosive compatible metal recommended by sheet metal manufacturer.

E. Bituminous coating: Acid and alkali resistant solvent type black bituminous mastic.

F. Joint Sealants: See Section 07 92 00. Color matched to factory finished materials at roofing, cornice, fascia, coping and similar type systems.

G. Metal accessories: Provide fasteners, solder, welding rods, separators, sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work; matching or compatible with material installed, non-corrosive, size and gage as required for performance.

H. Underlayment
1. Membrane: Bituthene Ice and Water Shield by W. R. GRACE; Polyken 640 Underlayment Membrane by POLYKEN TECHNOLOGIES; Polyguard Deck Guard by POLYGUARD PRODUCTS; Weather Watch by GAF; Winterguard by CERTAINTEED, a modified bituminous membrane, minimum 40 mils (1.016 mm) thick, self-adhering, self-sealing moisture barrier.
2. Slip sheet: 4 lb./100 sq. ft., rosin-sized building paper.

I. Wood members: Comply with requirements of Rough Carpentry, Section 06 10 00.

J. Sheet Metal Roofing and Flashing - Copper

1. Material: ASTM B370 cold-rolled copper except where soft temper copper is required for forming.
2. Weight: Minimum 16 ounce for sheets and 20 ounce for flashings and cleats.
3. Solder: ASTM B32, 50-50 tin/lead solder with rosin flux.
4. Fasteners: Pancake head stainless steel screws.
5. Finish: Provide patina accelerator, type as recommended by roofing manufacturer and approved by the Architect.

K. Terne-Coated Steel: "TC II" by FOLLANSBE STEEL CORPORATION. Steel base sheet, coated both sides with ZT ALLOY (50% Tin/ 50% Zinc).
1. Thickness
   a. Scupper, Conductor Heads, Gutters and Downspouts: 0.024".
   b. Roof Pans: 0.015".
   c. All Other Applications: 0.018".
2. Finish: Field painted. FOLLANSBE Rapidri Primer and Rapidri Finish Coat. Colors as selected by Architect.

L. Stainless Steel: AISI Type 304; .018” thick; ASTM A240/A240M ASTM A240.
1. Finish: NAAMM Manual AMP 503; Type 2D – Dull stainless steel finish; Architectural Quality

M. Roof Expansion Joint: Chlorinated polyethylene bellows with stainless steel flanges. AFCO Flexi-span LBH; WASCO/YORK Superflash Roof Expansion Joint; JOHNS MANVILLE Expando Flash.

2.02 MANUFACTURED MATERIALS

A. Coping: Provide with concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.
1. Cap: Fabricated in 10'-0" lengths to sizes indicated of smooth aluminum. Thickness to be determined and required to meet performance requirements. 0.040" minimum.
2. Special Shapes: Provide units fabricated to radius indicated on drawings and fabricated to curve indicated on drawings. Provide metal locking corners.
3. Coping-Cap Attachment Method: Snap-on to continuous cleat with back.
   a. Snap-on Coping Anchor Plates: Concealed, galvanized-steel sheet, with integral cleats. Thickness to be determined and required to meet performance requirements but not less than cap.
   b. Coping cover snapped-on to cleat spaced minimum 5'-0" on center.
4. Manufacturers
   a. OMG ROOFING PRODUCTS; “Permasnap Coping”.
   b. PETERSEN ALUMINUM CORP.; “Tite-Loc Coping”.
   c. ARCHITECTURAL PRODUCTS COMPANY; “Snap-Tight Coping”.
   d. CARLISLE SYN TEC, INC.; “SecurEdge 200 Coping”.
   e. FIRESTONE BUILDING PRODUCTS; “Firestone Coping System”.
   f. JOHNS MANVILLE, INC.; “Presto Lock Coping System”.
   g. METAL-ERA, INC., “Perma-Tite”.

B. Gravel Stop: Provide with concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching caps.
1. Cap: Fabricated in 10'-0" lengths to sizes indicated of smooth aluminum. Thickness to be determined and required to meet performance requirements. 0.040" minimum.
2. Special Shapes: Provide units fabricated to radius indicated on drawings and fabricated to curve indicated on drawings. Provide metal locking corners.
3. Coping-Cap Attachment Method: Snap-on to continuous cleat with back
   a. Snap-on Coping Anchor Plates: Concealed, galvanized-steel sheet, with integral cleats. Thickness to be determined and required to meet performance requirements but not less than cap.
   b. Cover snapped-on to cleat spaced minimum 5'-0" on center.

4. Manufacturers
    a. OMG ROOFING PRODUCTS, Model No. TE 8.25.
    b. METAL-ERA, INC.; Anchor-Tite Fascia.
    c. CARLISLE SYN TEC, INC.; Secur Edge 300 Fascia System.
    d. FIRESTONE BUILDING PRODUCTS; Edge Guard and Fascia.
    e. JOHNS MANVILLE, INC.; Presto-Lock Fascia System.

C. Reglet and Counterflashing
1. Description: Surface mounted type, roll formed, prefinished aluminum.
2. Manufacturer
3. METAL ERA, INC. two-piece Reglet #CFR2-500
    a. CHENEY FLASHING COMPANY; “Type B Reglet”.
    b. FRY REGLET CORPORATION; “MA Masonry Reglet”.
    c. OMG ROOFING PRODUCTS; “Drive-Lock-In-Wall Counter Flashing”.

D. Finish
1. Exposed Surfaces
    a. Material/Manufacturer: Fluoropolymer baked enamel finish with Kynar 500 (70%) resins by ELF ATOCHEM OF NORTH AMERICA INC.; "Trinar" by AKZO; "Duranar" by PPG, "Fluropon" by VALSPAR. Total dry film thickness not less than 1.0 mils (0.0254 mm)
    b. Reference: Meet the requirements of AAMA 2605 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing High Performance Organic Coatings on Architectural Extrusions and Panels.
    c. Color: As selected by Architect from paint manufacturer’s complete specified line.
    d. Application: Apply coating systems in strict accordance with manufacturer's printed instructions and recommendations. Refer to Quality Assurance in Part 1.
2. Concealed Surfaces: Can be manufacturer's standard coating for concealed surfaces.

E. Finish: Provide exposed aluminum surfaces factory finished with baked-on fluoropolymer coating with Kynar 500 (70%) resin, similar to finish specified for "Prefinished Sheet Aluminum" herein. Color selected by Architect.

2.03 SHOP FABRICATION

A. Shop fabricate sheet metal work to comply with standard industry standards as shown by SMACNA in the "Architectural Sheet Metal Manual."
1. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch (6.35 mm) in 20 feet (609.6 cm) on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

B. Form sections square, true and accurate to size and profile, free from distortion and other defects detrimental to appearance or performance.
1. Make all lines, edges, angles and moldings straight, sharp and true; reinforce for rigidity and strength.

C. Fabricate for watertight and weatherproof performance with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form exposed sheet metal work with exposed edges folded back to form hems.
1. Fabricate with seams overlapping in the direction of water flow.

D. Fabricate non-moving seams in sheet metal with flat lock or butt hairline joints except as otherwise indicated. Fabricate corners mitered, soldered and sealed as one piece. Locate corner joints 2'-0" from corners and intersections.

E. Seal movable non-expansion type joints with joint sealant. Form joints as indicated, when not indicated, in compliance with industry standards to receive joint sealants.

F. Provide for separation of metal from non-compatible or corrosive substrates by coating concealed surfaces with bituminous coating or other permanent separation as recommended

by the sheet metal manufacturer.

G. Gutters
   1. Form to size and shape as detailed or comply with (SMACNA) recommendations if not indicated. Provide adequate reinforcing, brackets, straps and fasteners for attachment to building as indicated and as required.
      a. Provide downspout outlets as indicated on drawings.

H. Downspout: Form to size and shape detailed or comply with (SMACNA) recommendations if not indicated.

I. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch- wide wall flanges to interior, and base extending 4 inches (101.6 mm) beyond cant or tapered strip into field of roof.

J. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim, and built-in overflows.

K. Roofing: Standing seam. SMACNA Figures 6.5, 6.6, and 6.7.
   1. Provide membrane underlayment over plywood sheathing. Lap joints to shed water.
   2. Install rosin paper over underlayment.
   3. Adhere membrane roofing, specified in Section 07 53 23, at gutter; extend minimum 2 feet (60.96 cm) above eave termination of metal roofing.
   4. Install metal roofing over rosin paper and lapping membrane roofing minimum 2 feet (60.96 cm).

L. Coping - Shop formed: SMACNA Page 3.9 (Figure 3-4) and 3.13 (Figure 3-6), as applicable with continuous cleats both sides and concealed fasteners. Slope to drain towards roof. Corners to be mitered and soldered or welded.
   1. Seams: SMACNA table 3-1 on Page 3.4. Butt joint and backup plate type, 12” wide centered on joint.
   2. Cleats: 0.050" stainless steel.

M. Step Flashing: Copper; Conform to design requirements of SMACNA Page 4-17, (Figure 4-8A). Where flashing for roof type applications exceeds 12 inches (304.8 mm) in width, provide standing seam covering conforming to SMACNA.

N. Trim for Roof Hatches: Provide galvanized sheet metal trim to cover all construction from bottom of roof deck to hatch or vent.
   1. Trim to form 90o bend at bottom of roof deck with minimum 3-inch return and lap hatch or vent curb not less than 2".
   2. Provide hemmed edge at curb.
   3. Provide lapped covers for joints or corners if trim package fabricated from more than one piece. Joint covers to lap joints by minimum 2" and have hemmed edges.

O. Flat Seam Roofing Panels
   1. Provide all finish metal panels to create a flat monolithic appearance. Included with the panels are all clips, flashing and trim.
   2. Panels to be square within 0.05 inches (1.27 mm) as measured diagonally.
   3. Dings, mars and scratches on the surface will not be acceptable. Do not allow mill to print alloy and mill location on finish side of the sheet.
   4. Require the sheets to be protected at the mill from decoiling scratches and mars.
   5. Fastener Heads: Countersink or otherwise make flush with sheathing.
   6. SMACNA Plate 119.
   7. Panel Exposure Size
      a. Width: 27” exposure (30” wide rolls).
      b. Length: Random lengths as indicated on drawings or as directed.

PART 3 EXECUTION

3.01 PREPARATION

A. Examine substrates and installation conditions. Do not install flashing and sheet metal work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

C. Coordinate flashing and sheet metal work with other work for the correct sequencing of items which make up the entire membrane or system of weatherproofing and rain drainage.

3.02 INSTALLATION

A. Comply with SMACNA "Architectural Sheet Metal Manual" recommendations, and drawing details for installation of the work.

B. Install prefabricated items in accordance with manufacturer's instructions and recommendations.

C. Anchor units securely in place by methods indicated, providing for thermal expansion. Conceal fasteners and expansion provisions whenever possible. Install joint sealants where indicated.

D. Set units true to lines and levels indicated. Install work with laps, joints and seams which will be permanently watertight and weatherproof.

E. Separate sheet metal work from dissimilar metals, treated wood, and cementitious materials. Provide roofing felt underlayment and rosin-sized paper slip sheet over treated wood surfaces.

F. Fabricate, support and anchor downspouts in a manner which will withstand thermal expansion, stresses and full loading by ice or water without damage, deterioration or leakage.

G. Standing Seam Metal Roof
   1. Provide membrane underlayment over plywood sheathing. Lap joints to shed water.
   2. Install rosin paper over underlayment.
   3. Adhere membrane roofing, specified in Section 07 53 23, at gutter; extend minimum 2 feet (60.96 cm) above eave termination of metal roofing.
   4. Install metal roofing over rosin paper and lapping membrane roofing minimum 2 feet (60.96 cm).

H. Continuously seal exposed joints where flashing or counter flashing terminates into reglets after sheet metal is adequately wedged and secured.

I. Metal flashings which may be built into masonry mortar joints shall be preformed with corrugations, ribs or crimps which will maintain integrity of mortar bond for masonry.

J. Coping
   1. Install membrane roofing flashing over top of parapet substrate prior to installing coping. See Section 07 53 23. Coordinate installation.
   2. Apply continuous bead of sealant on both sides of joints immediately prior to setting coverplates.

K. Flat Seam Metal Roofing
   1. Conform to referenced SMACNA Plates.
   2. Coordinate panel installation with placement of building paper underlayment.
   3. Install panels to parallel to face of building.
   4. Seams to be as located as indicated on the drawings, where not indicated, as directed by Associate.
   5. Solder all joints/seams as recommended by metal manufacturer.
   6. Edge flashings to be concealed as detailed.
   7. No exposed fasteners will be allowed.

8. Surface prep and paint finished flat seam metal roofing immediately after application or as soon as proper painting conditions prevail. Use methods as recommended by panel manufacturer. Provide one primer coat and one finish coat in thicknesses recommended by metal manufacturer.

END OF SECTION 07 62 00

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SECTION 07 84 00
FIRESTOPPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide firestop systems consisting of a material, or combination of materials installed to retain the integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and/or hot gases through penetrations, blank openings, construction joints, or at perimeter fire containment in or adjacent to fire-rated barriers in accordance with the requirements of the Building Code for this project.

B. Firestop systems shall be used in locations including, but not limited to, the following:
   1. Penetrations through fire resistance rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
   2. Penetrations through fire resistance rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
   3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
   4. Sealant joints in fire resistance rated construction.
      a. Gaps between the top of walls and ceilings, floor or roof assemblies. Includes filling metal deck flutes where applicable.
      b. Openings around structural members which penetrate floors or walls.
      c. Control joints.
      d. Floor joints not requiring expansion joints.
   5. Walls enclosing plenum spaces, rated and unrated.
      a. Gaps between the top of walls and ceilings or roof assemblies.
      b. Openings around items which penetrate walls.
   6. Joints at exterior curtain-wall/floor intersections.

1.02 RELATED SECTIONS

A. Coordinate Work of this Section with work of other similar or equivalent Specification Sections as required to properly execute the work, including:
   1. Gypsum Wallboard Partitions: Section 09 21 16.
   2. Deflection tracks for metal stud fire walls: Section 09 21 16.
   3. Plumbing: Division 22.
   4. HVAC: Division 23.
   5. Electrical: Division 26

1.03 DEFINITIONS

A. Firestopping: Material or combination of materials (assembly) to retain integrity of fire rated construction by maintaining an effective barrier against the spread of flame, smoke, and gases.

B. Through-penetration: Any penetration of a fire-rated wall or floor that completely breaches the barrier.

C. Through-Penetration Firestop Systems: Material or combination of materials which are field constructed of fill, void, or cavity materials and forming materials, designed to resist fire spread when installed as a complete firestop system.

D. Through-Penetration Firestop Devices: Factory built products designed to resist fire spread. Complete when delivered to site; ready for installation.

E. System: The use of a specific firestop material or combination of materials in conjunction with a specific wall or flow construction type and a specific penetrant(s).

F. Barrier: Any bearing or non-bearing wall or floor that has an hourly fire and smoke rating.

G. Membrane-penetration: Any penetration in a fire-rated wall that breaches only one side of the barrier.

H. Fire Resistive Joint: Any gap, joint, or opening, whether static or dynamic, between two fire rated barriers including where the top of a wall meets a floor; wall edge to wall edge applications; floor edge to floor edge configurations; floor edge to wall.

I. Perimeter Barrier: Any gap, joint, or opening, whether static or dynamic, between a fire rated floor assembly and a non-rated exterior wall assembly.

1.04 REFERENCE STANDARDS

A. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

C. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

D. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

E. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2015 (Reapproved 2019).

F. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems; 2020a.

G. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus; 2023b.

H. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2020a.

I. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

J. FM 4991 - Approval Standard of Firestop Contractors; 2013.

K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

N. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

O. Firestop Design Classification References
   1. Warnock Hersey Listing Manual
   2. UL Fire Resistance Directory - Vol. 1

1.05 SYSTEM PERFORMANCE REQUIREMENTS

A. System Design and Product Selection: Contractor responsible for selection of products and tested designs that fulfill the firestopping requirements of this section.

B. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gasses.

C. F-Rated Through Penteration Firestop Systems: Provide through penetration firestop systems with F ratings indicated as determined per ASTM E814, UL 1479 but not less than that equaling or exceeding the fire resistance rating of the constructions penetrated.

D. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T -rated assemblies are required where specified by codes or where the

following conditions exist:

1. Where firestop systems protect penetrations located outside of wall cavities.
2. Where firestop systems protect penetrations located outside fire resistive shaft enclosures.
3. Where firestop systems protect penetrations located in construction containing doors required to have a temperature rise rating.
4. Where firestop systems protect penetrating items larger than a 4 inch diameter nominal pipe or 16 square inch in overall cross sectional area.

E. L – Rated Through-Penetration Firestop Systems: Provide firestop systems with L ratings, in addition to F and T ratings, as determined per UL 1479, where indicated by Code.

F. Fire Resistive Joint Sealants: Provide joint sealants with fire resistance ratings indicated, as determined per ASTM E119, UL 1479 and UL 2079 but not less than that equaling or exceeding the fire resistance rating of the construction in which the joint occurs.

G. For firestopping exposed to traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions and will meet load requirements.
   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 required removal of insulation.

H. For through-penetration firestop systems exposed to view, provide products with flame spread of less than 25 and smoke developed ratings of less than 450, as determined per ASTM E84.

I. Where there is no specific third party tested and classified firestop system available for an installed condition, obtain from the firestopping material manufacturer an Engineering Judgment (EJ) to be submitted to the Approving Authority and Authority Having Jurisdiction for approval prior to installation. The EJ shall follow International Firestop Council (IFC) guidelines.

J. Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of one (1) or less as tested per ASTM G21.

K. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E1966 or UL 2079.
   1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

L. Joints at Exterior Curtain-Wall/Floor Intersections: Provide joint firestopping systems with rating determined per ASTM E2307.
   1. F-Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.

M. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).
   1. L-Rating: Not exceeding 5.0 cfm/ft. (0.00775 cu. m/s x m) of joint at both ambient and elevated temperatures.

1.06 SUBMITTALS

A. Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of UL or other nationally recognized independent testing laboratories firestop systems to be used, and manufacturer's installation instructions.
   1. Manufacturer's engineering judgement identification number and drawing details when no tested system is available.

B. Shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetratlon firestop system, and each kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop configuration for construction and penetrating items.
2. Where project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration approved by firestopping manufacturer with modifications marked.

C. Product certificates signed by manufacturers of firestopping products certifying that their products and installation comply with specified requirements. Certification shall be signed by the Installer.

D. Certification is required from manufacturer that Installer has been trained in the handling and installation of their products.

E. Firestopping installer shall provide a letter of certification stating that all firestopping systems have been installed in accordance with the Contract Documents.

F. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.07 QUALITY ASSURANCE

A. Meet requirements of ASTM E814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated and other ASTM Standards as applicable for the installation.
1. ASTM E84 “Test Method for Surface Burning Characteristics of Building Materials."
2. ASTM E119 “Test Methods for Fire Tests of Building Construction and Materials."

B. Requirements of Regulatory Agencies: Comply with the applicable requirements for fire separations and penetrations of the following:
1. NFPA 70.
2. NFPA 101.

C. Installer: Specialist in the installation of type(s) of firestopping required; trained and approved by the firestop manufacturer.
1. Shown to have successfully completed not less than 5 firestop projects similar in type and size to that of this Project.

D. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy".

E. Do not use any product containing solvents that require hazardous waste disposal or which after curing dissolve in water.

F. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.

G. Single Source Responsibility: Obtain firestop systems for each kind of penetration and construction condition indicated from a single primary firestop systems manufacturer.
1. Materials of different manufacture than allowed by the tested and listed system shall not be intermixed in the same firestop system or opening.
2. Tested and listed firestop systems are to be used before an Engineering Judgment (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA) is installed.

H. Fire - Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in "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 test and follow up inspection services for firestop systems acceptable to authorities having jurisdiction.
2. Through-penetration firestop systems are identical to those tested per ASTM E814. 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 listed by the following:
    1) UL in "Fire Resistance Directory".

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver firestopping undamaged products to project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacturer; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multi-component materials.
    1. Comply with recommended procedures, precautions, or remedies described in material safety data sheets as applicable.

B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

C. Do not use damaged or expired materials.

1.09 PROJECT CONDITIONS

A. Environmental Conditions: Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilation: Ventilate firestopping per firestopping manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

1.10 SEQUENCING AND SCHEDULING

A. Coordinate this Work as required with work of other trades. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

B. Do not cover up those firestopping installations that will become concealed behind other construction until Owner's inspection agency and authorities having jurisdiction, if required, have examined each installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide products from one or more of the following manufacturers according to the suitability of the product for the intended purpose.
    1. W.R. GRACE (Flamesafe System)
    2. FYRESLEEVE INDUSTRIES
    3. TREMCO
    4. HILTI, INC.
    5. SPECIFIED TECHNOLOGIES (STI).
    6. 3M FIRE PROTECTION PRODUCTS.
    7. THE RECTORSEAL CORPORATION (Metacaulk and Bio Fireshield).
    8. NELSON FIRESTOP PRODUCTS.

2.02 MATERIALS - GENERAL

A. As selected by Contractor. See SYSTEM PERFORMANCE REQUIREMENTS in Part 1 hereinbefore.

B. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.

1. All materials shall comply with ASTM E814 or ASTM E119 (UL 1429), and shall be manufactured of nontoxic, non-hazardous, asbestos free materials, and unaffected by water or moisture when cured.
2. Primers: Conform to manufacturer's recommendations for primers required for various substrates and conditions.
3. Backup Materials: Backup materials, supports, and anchoring devices shall be .provided as required by UL testing.
4. Provide all firestopping sealant materials within the VOC limits specified in Section 01 81 13.

C. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire resistance rated systems. Accessories include but are not limited to the following items:
1. Permanent forming/damming/backing materials must be noncombustible and may include the following:
a. Semi-refractory fiber (mineral wool) insulation.
b. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
c. Joint fillers for joint sealants.
2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.03 RATED STUD DEFLECTION ASSEMBLY

A. Deflection Track Ceiling Runner: See Section 09 21 16.

B. Gypsum Wallboard: See Section 09 21 16.

C. Insulation: Mineral wool, 3.5 PCF minimum density.

D. Firestopping Compound: Types as manufactured by listed manufacturers in 2.01A herein.

E. Accessories: Provide all fasteners, clips and other related installation accessories as required for a complete UL approved assembly.

2.04 MIXING

A. 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

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.
1. Verify penetrations are properly sized and in suitable condition for application of materials.

3.02 PREPARATION

A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:
1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.

2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. 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 systems seal with substances.

3.03 INSTALLING THROUGH-PENETRATION FIRESTOPS

A. General: Comply with the "System Performance Requirements" in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
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.

3.04 INSTALLING FIRE RESISTIVE JOINT SEALANTS

A. General: Comply with the "System Performance Requirements" in Part 1 with ASTM C1193, and with the sealant manufacturer's installation instructions and drawings -pertaining to products and applications indicated.

B. Install joint fillers to provide support of sealants during application and at position required to produce the cross sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire resistance rating required.

C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.

D. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint.
1. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.05 INSTALLING PERIMETER FIRE BARRIER SYSTEMS

A. General: Comply with “System Performance Requirements” article in Part 1 and with the firestop manufacture’s installation and drawings pertaining to products and applications indicated.

B. Install metal framing, curtain wall insulation, mechanical attachments, safing materials and firestop materials as applicable within the system design.

3.06 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

C. Special Inspections Penetration Firestops. When required per IBC 1705, inspections of penetration firestop systems shall be conducted by an approved inspection agency in accordance with ASTM E2174.
   1. Fire-resistant joint systems. Inspection of fire-resistant joint systems shall be conducted by an approved inspection agency in accordance with ASTM E2393.

D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

E. Manufacturer’s Field Services: During installation, contractor shall have manufacturer’s representative provide periodic training and visual observations with written documentation of the results.

F. Do not proceed to enclose firestopping with other construction until inspection agency has verified that the firestop installation complies with the requirements.

G. Where deficiencies are found, repair or replace the firestopping so that it complies with requirements of tested and listed system design.

3.07 IDENTIFICATION

A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. 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.

3.08 IDENTIFICATION & DOCUMENTATION

A. The firestop contractor is to supply documentation for each single application addressed. This documentation is to identify each penetration and joint location on the entire project.
   1. The Documentation form for through penetrations is to include:
      a. Sequential location number
      b. Date of installation
      c. Detailed description of the penetration’s location
      d. Tested system or engineered judgment number
      e. Type of assembly penetrated
      f. A detailed description of the size and type of penetrating item
      g. Size of opening
      h. Number of sides of assemblies addressed
      i. Hourly rating to be achieved
      j. Installer’s name

B. Compiled copies of these documents are to be provided to the Owner at the completion of the project.

3.09 CLEANING

A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure through-penetration firestop systems are without damage or deterioration at time of Contract 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 through-penetration firestop system complying with specified requirements.

END OF SECTION 07 84 00

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SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.01 SCOPE

A. General: Prepare joints and apply sealant or caulking at all locations which normally require sealing to prevent infiltration of air, water, and insects and to reduce transmission of sound.

B. Apply sealants to exterior and interior non-static joints. Do not seal normal drainage points or weep holes. Include the following:
   1. masonry control joints
   2. stone joints
   3. around louvers, exterior trim, windows, door frames, aluminum entrances and other penetrations or openings in exterior walls
   4. threshold bedding
   5. joints between different wall materials
   6. termination in joints between wall materials and adjacent materials
   7. perimeter seal of metal door and borrowed light frames where they abut masonry and where they abut drywall in shower rooms, toilet rooms and kitchens
   8. other applications indicated

C. Sealing of joints in concrete construction, including sidewalk joints, concrete paving joints and floor joints, tile floor expansion joints and other floor joints as indicated.

D. Sealing of all exterior and interior locations where materials or equipment do not fit together or against the adjoining surface with a hairline joint.

E. Sealing between wall and wall mounted plumbing fixtures and floor and floor mounted plumbing fixtures.

F. Sealing at intersection of countertops and side/backsplashes to each other and to wall.

G. Sealing at reglets and wall and roof flashings set in sealant.

H. Seal penetrations through ceramic tile work.

I. Trim exposed masonry flashing.

J. Latex type caulking of interior static joints. Include the following:
   1. intersection of exposed structure or ceiling construction with masonry walls
   2. perimeter seal of metal door and borrowed light frames where they abut drywall , except in shower rooms, toilet rooms and kitchens
   3. intersection of grilles and louvers with adjacent surfaces
   4. intersection of cabinets, casework and similar items applied to or recessed in walls
   5. other applications indicated

K. Joints, perimeter, and penetrations in fire-rated assemblies. Use firestopping specified in Section 07 84 00.

L. Joints, perimeter, and penetrations in sound-rated assemblies. See Section 09 21 16.

1.02 RELATED SECTIONS

A. Firestopping Sealants: Section 07 84 00.

B. Sustainable Design Requirements: Section 01 81 13.

C. VOC Limits: Section 01 81 16.

1.03 REFERENCE STANDARDS

A. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).

B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

C. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2023.

1.04 GENERAL PERFORMANCE

A. Except as otherwise indicated, joint sealant is required to establish and maintain airtight and waterproof continuous seals on a permanent basis, within recognized limitations of wear and aging as indicated for each application.

B. Failures of installed sealant to comply with this requirement will be recognized as failures of both materials and workmanship.

1.05 SUBMITTALS

A. Submit manufacturer's product data and installation instructions.
   1. Certification, in the form of manufacturer's standard data sheet or by letter, stating that each type of compound and sealant to be furnished complies with these specifications.
   2. Statement that each product to be furnished is recommended for the application shown and is compatible with all materials to which applied.
   3. Instructions for handling, storage, mixing, priming, installation, curing and protection for each type of sealant.

B. Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.
   3. Joint-sealant formulation.
   4. Joint-sealant color.

C. Submit manufacturer's color chart for color selections.

D. Submit cured sealant samples in colors required for the work. Architect's approval will be for color only. Compliance with other requirements is the Contractor's responsibility.

E. Qualification Data: For qualified testing agency.

F. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.

G. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:
   1. Joint-sealant location and designation.
   2. Manufacturer and product name.
   3. Type of substrate material.
   4. Proposed test.
   5. Number of samples required.

H. Preconstruction Laboratory 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 are needed for adhesion.

I. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified.

J. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.06 STORAGE AND HANDLING

A. Prevent inclusion of foreign matter or the damage of materials by water or breakage.

B. Procure and store in original containers until ready for use.

C. Materials showing evidence of damage shall be rejected.

1.07 WARRANTY

A. Installer's Warranty: Contractor and joint sealant applicator shall jointly warranty joint sealant work for two (2) years from date of final acceptance. Warranty shall include replacing joints which fail to perform as airtight; or fail in adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration and stain resistance, general durability or any other form of apparent deterioration (excluding inherent qualities and limitations clearly specified in the manufacturer's submitted product data).

B. Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section for ten (10) years from date of final acceptance

C. Warranties specified in this article exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from natural causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.

D. Comply with these specifications for repair or replacement of work.

1.08 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
   1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
   2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
   3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with applicable stone substrates.
   4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
   5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.

B. Preconstruction Field-Adhesion Testing: Before installing 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 kind of sealant and joint substrate.
   3. Notify Architect seven days in advance of dates and times when test joints will be erected.
   4. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
   5. 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.
   6. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
   7. 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.

PART 2 PRODUCTS

2.01 GENERAL

A. Definitions:
   1. The term "sealant" will be understood to be a urethane or silicone elastomeric type.
   2. The term "caulk" will be understood to be a synthetic resin base of highest quality acrylic latex compound.

B. General: Provide materials that comply with Project Sustainable Design Requirements and Low Emitting Material goals.
   1. 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 joint-sealant manufacturer, based on testing and field experience.
   2. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
   3. Colors: As selected by Architect from manufacturer's full range; selected colors to match adjacent materials. Indicate when custom colors required
   4. Where exposed to foot traffic, select materials of sufficient strength and hardness to withstand stiletto heel traffic without damage or deterioration of sealant system.

C. Manufacturers:
   1. BOSTIK
   2. DOW CORNING CORPORATION
   3. EUCLID CHEMICAL
   4. TREMCO MANUFACTURING COMPANY
   5. GENERAL ELECTRIC COMPANY/MOMENTIVE
   6. SIKA CHEMICAL CO.
   7. MAMECO INTERNATIONAL
   8. MASTER BUILDERS SOLUTIONS
   9. VULCHEM: SOPREMA CHEMLINK.
   10. Manufacturer's listed under the following applications are for basis of design. Equal products by above listed manufacturers are acceptable.

2.02 ELASTOMERIC MATERIALS

A. Exterior Vertical and Overhead Joints: Single-component neutral curing silicone sealant meeting ASTM C920, Type S, Grade NS, Class 50.
   1. DOW 791
   2. GE SCS9000 Silpruf NB
   3. TREMCO Spectrum 3
   4. PECORA 895 NST

B. Metal to Metal Bed Joint: High Temperature Type
   1. TRMCO JS-773

C. Fluid Applied Air Barrier and Self Adhering Membranes:
   1. DOW DowSil 758

D. Horizontal Wearing Expansion Joints; Interior and Exterior
   1. Type: Two-part polyurethane based elastomeric sealant, complying with ASTM C920, Class 25, Type M, Grade P, Use T. Self-leveling or gun grade type as recommended by manufacturer for application shown.
   2. Location: For joints in exterior concrete pavements, sidewalks and interior floors.
      a. BOSTIK Chem-Calk 555-SL
      b. EUCLID Eucolastic II
      c. SONNEBORN Sonolastic SL 2
      d. TREMCO THC 900/901

E. Interior Vertical and Overhead Joints: Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT. Do not use where painted.
   1. DOW 799
   2. GE SCS2000 SilPruf
   3. TREMCO Spectrum 2
   4. PECORA 895 NST

F. Interior Vertical and Overhead Joints: Use at joints requiring movement and to be painted. Single or multi-component polyurethane hybrid gun-grade, non-sag sealant complying with ASTM C920, Type S or M, Class 25, Use NT, M, A, Grade NS.
   1. EUCLID Eucolastic I or II
   2. BASF Sonolastic NP 1 or NP 2
   3. BOSTIK Chem-Calk 900
   4. TREMCO Dymonic

G. Sealants at Countertops, Backsplashes and Plumbing Fixtures: ASTM C920, Type S, Grade NS, Class 25. Provide with mildew resistive additive.
   1. Sealant Colors
      a. Countertops and Backsplashes: Clear.
      b. Plumbing Fixtures: white, unless colored fixtures are selected, then sealant color shall match fixture color.
   2. Manufacturers/Products
      a. DOW 786
      b. GE SCS1700 Sanitary.
      c. SONNEBORN Sonolastic Omniplus
      d. TREMCO Tremsil 200
      e. PECORA 898 Sanitary Sealant

H. Exterior and Interior Joints Subject to Water Immersion: Two-part elastomeric polysulfide sealant, meeting ASTM C920, Type M, Grade NS, Class 25.
   1. SONNEBORN Sonolastic Two-Part
   2. EPOXY SYSTEMS 913
   3. CMI Sealtight Deck-O-Seal

2.03 LATEX CAULK

A. Caulk Joints – Interior, Static - Paintable: High quality acrylic latex compound, non-staining non-bleeding complying with ASTM C834 Type OP, Grade NF with a maximum volume shrinkage of 30%.
   1) BASF BUILDING SYSTEMS; Sonolac.
   2) PECORA CORPORATION; AC-20+.
   3) TREMCO INCORPORATED; Tremflex 83

2.04 ACCESSORIES

A. Joint Primer/Sealer: Non-staining type, recommended by sealant manufacturer; compatible with joint forming material.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming material.

C. Bond Breaker Tape: Pressure sensitive polyethylene or plastic tape, recommended by sealant manufacturer, to suit applications where bond to substrate should be avoided for proper joint sealant performance.

D. Joint Backing: Compressible, non-gassing rod stock conforming to ASTM C1330, Type B; material 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

E. Solvents: Cleaning agent recommended by the manufacturer of the sealant in writing to Architect.

PART 3 EXECUTION

3.01 INSPECTION

A. Pre-Installation Meeting
   1. Prior to sealant installation, and at the Contractor's direction, meet at project site to review material selections, joint preparations, installation procedures, weather conditions and coordination with other trades.
   2. Include sealant installer, Contractor, Architect, manufacturer's representative and representatives of other trades or subcontractors affected by the sealant installation.

B. Examine substrates and installation conditions. Do not proceed with joint sealant work until unsatisfactory conditions have been corrected.

C. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Clean, seal and prime surfaces in accordance with manufacturer's recommendations. Confine primer/sealant to areas of sealant bond.

B. Remove dust, dirt, loose coatings, moisture and other substances which could interfere with sealant bond.

C. Remove lacquers and protective films from metal surfaces.

D. Architectural Concrete and Stone: Apply masking around joints to protect adjacent surfaces from defacement and staining during sealing operations. Repair damaged masking until sealant is installed.

3.03 INSTALLATION

A. Apply joint sealant as late as possible in construction, preceding painting and following cleaning operations. Do not apply sealant during inclement weather conditions or when temperature is above or below manufacturer's limitations for installation.

B. Install joint sealant materials and accessories in strict accordance with manufacturer's installation instructions.

C. Set joint filler units at depth or position in joint as indicated to coordinate with other work. Do not leave voids or gaps between ends of joint filler units.

D. Install sealant backer rod, except where recommended to be omitted by sealant manufacturer for application indicated. Use rod diameter that will cause compression when installed.

E. Install bond breaker tape and where required by manufacturer's recommendations to ensure that sealants will perform as intended.

F. Apply joint sealants in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces on both sides. Fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. At horizontal joints between a horizontal surface and vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt. Hand tool and finish all joints.

G. Install joint sealants within recommended temperature ranges and to depths indicated or when not indicated, as recommended by sealant manufacturer. For normal moving vertical and horizontal joints, fill joints to a depth equal to 50% of joint width, but not more than 1/2" deep nor less than 1/4" deep, measured at the center section of bead.

H. Confine materials to joint areas with masking tapes or other acceptable methods. Remove excess sealant materials promptly as work progresses and clean adjoining surfaces.

I. Masonry Flashing: Where sealant joint is in direct contact with flexible masonry flashing, trim flashing flush with face of masonry after sealant in installed and cured. Verify during this

procedure that weep holes have not been compromised during sealing operations.

3.04 CLEANING

A. Upon completion, remove and dispose of masking materials; remove all excess sealing materials; clean adjacent materials of all soil and stain resulting from sealing operations.
   1. Replace damaged material and material which cannot be properly cleaned.

END OF SECTION 07 92 00

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SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:

B. Standard steel doors and frames.

C. Fire-rated steel doors and frames.

D. Borrowed light frames.

E. Plumbing chase access doors and frames. Provide rated doors and frames in rated walls.]

F. Acoustic doors and frames.

1.02 RELATED SECTIONS

A. Sustainable Design Requirements: Section 01 81 13.

B. Wood Doors: Section 08 14 00.

C. Door Hardware: Section 08 71 10

1.03 REFERENCE STANDARDS

A. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2024.

B. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2020.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.

D. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames; 2022.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023, with Editorial Revision.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

H. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

I. ASTM E 152 - ASTM E152; STANDARD METHOD OF FIRE TEST OF DOORS.

J. ASTM E 1408 - Standard Test Method for Laboratory Measurement of the Sound Transmission Loss of Door Panels and Door Systems (Withdrawn 2009); ASTM E 1408.

K. ASTM E413 - Classification for Rating Sound Insulation; 2022.

L. NAAMM HMMA 865 - Guide Specifications for Sound Control Hollow Metal Door and Frame Assemblies; 2013.

M. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.

N. SDI 100 - SDI 100; 2023.

O. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

P. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

Q. Wherever the following abbreviations are used herein, they shall refer to the corresponding standard.ANSI: American National Standards Institute.

1. ANSI: American National Standards Institute.
2. ASTM: American Society for Testing and Materials.
3. SDI: Steel Door Institute
4. DHI: Door and Hardware Institute.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.

B. Manufacturer Qualifications: Provide hollow metal doors and frames from SDI Certified manufacturer: https://steeldoor.org/sdi-certified/#sle.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

D. Provide metal doors and frames fabricated by one manufacturer to ensure uniformity in appearance and construction.

E. Fire rated doors and frames: Provide units that comply with NFPA 80, are identical to door and frame assemblies tested for fire-test-response characteristics per ASTM E 152 And are labeled and tested by Factory Mutual (FM), Underwriters Laboratories (UL), or other National Recognized testing agency. Units shall bear testing agency labels.
   1. Provide UL labels permanently fastened on each door and frame which is within the size limitations established by NFPA and UL for labeling.
   2. Provide anchors for UL labeled frames required by the authority having jurisdiction.

F. Sound transmission class: Provide certificate that door assemblies have been tested in accordance with ASTM E413 and ASTM E 1408 to achieve minimum sound transmission class (STC) specified.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Submit manufacturer's product data and installation instructions for each type of standard metal door and frame required.

C. Submit shop drawings. Identify doors and frames in accordance with drawing door schedule. Indicate:
   1. Elevations of each door design.
   2. Hardware locations, installation methods and hardware reinforcements.
   3. Dimensions and shapes of materials, anchorage and fastening methods.
   4. Door frame types, profile of molding and details.
   5. Wall opening construction and connection to other work.

D. Samples: Submit two samples of metal, 2 by 2 inches (51 by 51 mm) in size, showing factory finishes, colors, and surface texture.

E. Samples: Submit two samples of metal, 2 by 2 inches (51 by 51 mm) in size, showing factory finishes, colors, and surface texture.

F. Design Submittals: Manufacturer to submit anchor design analysis calculations for blast-resistant doors signed and sealed by specialty design engineer experienced in this type of work and licensed in the State in which the Project is located.

G. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

H. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

I. Manufacturer's Qualification Statement.

J. Installer's Qualification Statement.

1.06 CERTIFICATES DOCUMENTING:

A. Fire testing: Fire-rated units have been successfully tested in accordance with Paragraph 1.03C.

B. Sound transmission class (STC): Acoustically rated doors have been successfully tested in accordance with Paragraph 1.03D.

C. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver metal doors and frames cartoned or crated for protection during transit and job delivery. Provide sealed wrapping for factory.

B. Store doors and frames inside the building in a dry, well-ventilated area. Protect from damage, wetting and deterioration in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: STEELCRAFT MFG. CO; CECO CORP.; PIONEER INDUSTRIES; REPUBLIC BUILDERS PRODUCTS CORP.; CURRIES; METAL PRODUCTS INC (MPI).

2.02 MATERIALS AND COMPONENTS

A. Materials
   1. Metallic-Coated Steel: Commercial quality, hot dipped, A-60 galvannealed steel in accordance with ASTM A653/A653M, “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process”.
   2. Cold-Rolled Steel: Commercial Steel in accordance with ASTM A1008/A1008M, “Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low-Alloy and High Strength with Improved Formability”; Type B; suitable for exposed applications.
   3. Hot-Rolled Steel Sheet: Commercial Steel in accordance with ASTM A1011/A1011M, “Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High Strength Low-Alloy with Improved Formability, and Ultra-High Strength”; Type B; free of scale, pitting, or surface defects; pickled and oiled.

B. Comply with SDI 100 /ANSI/SDI A250.8 material and fabrication recommendations and as specified.

2.03 HOLLOW METAL DOORS

A. Provide flush seamless type doors with seamless faces and edges, 1-3/4" thick, internally reinforced. Top and bottom closed flush.
   1. Provide glass lites where indicated.

B. Exterior Doors: Provide doors complying with requirements of ANSI/SDI A250.8 for Level 3 (extra heavy duty) and Model 2 (seamless design) and ANSI/SDI A250.4 for physical endurance Level A.
   1. Fabricated from metallic-coated (galvanized) steel face sheets, mill phosphatized
   2. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.38 deg Btu/F x h x sq. ft. (2.16 W/K x sq. m) when tested according to ASTM C518.
   3. Tops and bottoms closed with flush galvanized steel caps.
   4. Door thickness 1 3/4"

C. Interior Doors Non Fire Rated: Provide doors complying with requirements of ANSI/SDI A250.8 for Level 2 (heavy duty) and Model 2 (seamless design) and ANSI/SDI A250.4 for physical endurance Level A
   1. Fabricated from cold rolled steel; stretcher-leveled standard flatness.

2. Core: Kraft resin impregnated honeycomb or polystyrene slab core bonded to door face sheets with thermal adhesive.
3. Door thickness: 1 3/4"

D. Fire-Rated Doors:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
a. Level 2 - Heavy-duty.
b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
c. Model 2 - Seamless.
d. Door Face Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.
2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
3. Temperature-Rise Rating (TRR) Across Door Thickness: In accordance with local building code and authorities having jurisdiction.

E. Hardware Reinforcements: Meet or exceed ANSI/SDI A250.6 requirements.

F. Edge Profile: 1/8" bevel in 2" core on hinge and lock edges.

G. Astragals for pairs of doors: Manufacturer's standard for labeled and non-labeled openings. Factory prepare for hardware as scheduled in Section 08 71 10. Mount astragal to overlap on key side of doors.

H. Louvers: Inserted fixed type, minimum free area of 38%.

I. Downsize width of doors where full mortise continuous gear hinges are scheduled.

J. Type ___ , Sound-Rated Interior Doors:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
a. Level 2 - Heavy-duty.
b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
c. Model 2 - Seamless.
d. Door Face Metal Thickness: 20 gauge, 0.032 inch (0.8 mm), minimum.

2.04 STANDARD METAL FRAMES

A. FABRICATION
1. Door and Frame Fabrication
2. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
3. Frame Finish: Factory finished.
4. Shop Painting
a. Clean, bonderize or chemically treat and paint exposed surfaces of steel door and frame units, including galvanized surfaces.
b. Clean steel surfaces of mill scale, rust oil, grease, dirt and other foreign materials before application of paint. Sand free of imperfections.
c. Apply one baked-on shop coat of rust-inhibitive prime paint in accordance with ASNI A224.1. Provide a smooth, uniformly finished surface ready to receive finish paint.

B. Exterior Door Frames: Knock-down type.
1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
2. Frame Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.
3. Frame Finish: Factory finished.
4. Weatherstripping: Separate, see Section 08 71 00.

C. Interior Door Frames, Non-Fire Rated: Slip-on type at gypsum board walls, and knock-down type at masonry walls.
1. Terminated Stops: Provide at interior doors; closed end stop terminated 6 inch (150 mm), maximum, above floor at 45 degree angle.
2. Frame Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.

3. Frame Finish: Factory finished.

D. Door Frames, Fire-Rated: Knock-down type.
   1. Fire Rating: Same as door, labeled.
   2. Terminated Stops: Provide at interior doors; closed end stop terminated 6 inch (150 mm), maximum, above floor at 45 degree angle.
   3. Frame Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.
   4. Frame Finish: Factory primed and field finished.

E. Sound-Rated Door Frames: Knock-down type.
   1. Frame Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.
   2. Frame Finish: Factory finished.

F. Door Window Frames: Door window frames with glazing securely fastened within door opening.
   1. Size: ___ inch wide by ___ inch high (___ mm wide by ___ mm high).
   2. Frame Material: 18 gauge, 0.0478 inch (1.21 mm), galvanized steel.
   3. Metal Finish: _____ polyester powder coating.
   4. Glazing: 1/4 inch (6.4 mm) thick, tempered glass, in compliance with requirements of authorities having jurisdiction.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates, rough openings and installation conditions. Do not proceed with metal door and frame work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

A. Install metal doors and frames in accordance with manufacturer's instructions and recommendations.

B. Placing Frames
   1. General
      a. Comply with ANSI/SDI A250.11 (SDI 105) "Recommended Erection Instructions for Steel Frames."
      b. Erect frames in proper position to receive partition work before construction of enclosing walls. Set frames accurately in position, plumbed, aligned with heads level and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders.
      c. Grout frames as indicated on the drawings. Coordinate grout placement with adjoining materials and door hardware.
   2. At Masonry Construction: Locate wall anchors at 16" on center. Building-in of anchors and grouting of frames is specified in Section 04 00 00.
   3. Fire-Rated Frames: In accordance with NFPA 80 and SDI 118.
   4. Metal Stud Partitions: Install at least 3 wall anchors per jamb at hinge and strike levels. Attach wall anchors to studs with tapping screws.

C. Door Installation
   1. Install doors plumb and in true alignment in prepared openings. Fit metal doors accurately in frames, within clearances specified in ANSI/SDI A250.8 (SDI100).
   2. Install fire-rated doors with clearances as specified in NFPA 80 and SDI 118.
   3. Install door hardware as specified in Section 08 71 00.

D. Immediately after erection, sand smooth rusted or damaged areas of door and frame coat and apply touch-up prime coat of compatible air-drying primer.

3.03 FIELD QUALITY CONTROL

A. Final Adjustment: Provide final adjustment as follows:
   1. Door Contact with Silencers: Doors shall strike a minimum of two (2) silencers without binding lock or latch bolts in strike plate.
   2. Head, Strike and Hinge Jamb Clearance: 1/8”.
   3. Meeting Edge Clearance, Pairs of Doors: +1/16”
   4. Bolts and Screws: Leave tight and firmly seated.

END OF SECTION 08 11 13

SECTION 08 14 00
WOOD DOORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide the following types of wood doors:
   1. Solid core
   2. Fire rated
   3. Stile and rail
   4. Acoustic
   5. Lead lined

1.02 RELATED SECTIONS

A. Hollow Metal Door Frames: Section 08 11 13.

B. Door Hardware Section 08 71 10.

C. Sustainable Design Requirements: Section 01 81 13.

D. VOC Limits: Section 01 81 16.

E. Reference Standards

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

C. FS QQ-L-201F - Lead Sheet; 1965.

D. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.

E. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

F. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

G. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2021, with Errata (2022).

H. Architectural Wood Work Institute: AWI "Quality Standards, Guide Specification" requirements.

1.04 QUALITY ASSURANCE

A. Provide wood doors fabricated by one manufacturer to ensure uniformity in appearance and construction.

1.05 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of wood door required.
   1. Include details of core and edge construction.
   2. Include certification indicating compliance with specification requirements.

B. Submit Shop Drawings
   1. Indicate location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking and other pertinent data.
   2. Identify doors in accordance with drawing door schedule.

C. Submit sample corner section, 12" square, showing required veneer and edge construction.

D. Finish Samples
   1. Factory Finished Doors: Submit three (3) flitch samples of each species of face veneer with factory applied stain and finish as specified and indicated illustrating expected range of color and grain variation.

2. Field Finished Doors: Submit three (3) flitch samples of each species of face veneer as specified and indicated illustrating expected range of grain variation. Samples will be used to select and approve field stain color as specified in Section 09 91 00.

E. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store and protect doors in accordance with manufacturer's recommendations and WDMA.

B. Following are general guidelines. For more specific information refer to WDMA's Appendix Section “Care and Installation at Job Site.”
1. Deliver doors in manufacturer's original unopened protective packaging or wrapper.
a. Store doors flat and off the floor on a level surface in a dry, well-ventilated building. Do not store on edge. Protect doors from dirt, water and abuse.
b. Do not subject interior doors to extremes in either heat or humidity. HVAC systems should be operational and balanced, providing a temperature range of 50 to 90 degrees Fahrenheit and 30% to 50% relative humidity.
c. When handling doors, always lift and carry. Do not drag across other doors or surfaces. Handle with clean hands or gloves.
d. Each door will be marked on top rail with opening number.

1.07 LABEL DOOR REQUIREMENTS

A. Fire Ratings Compliance: Comply with the label requirements of NFPA and applicable local codes. Fabricate doors and frames in accordance with requirements of NFPA 80 and U.L. Standards as follows:
1. Positive Pressure Testing UL 10C

B. Ratings Certifications
1. Provide U.L. labels permanently fastened on each door that is within the size limitations established by NFPA and U.L. for labeling.
2. Provide anchors for U.L. labeled frames required by the authority having jurisdiction.

1.08 WARRANTY

A. 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 Period for Solid-Core Exterior Doors: Two years from date of Substantial Completion.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. General: Provide materials that comply with Project Sustainable Design Requirements and Low Emitting Material goals.

B. Interior Flush Doors Solid Core: Meet or exceed WDMA I.S. 1A Industry Standard for Wood Flush Doors requirements and as specified. WDMA I.S. 1A Performance Grade – Extra Heavy Duty.
1. Interior Flush Doors Solid Core – Non-Rated and 20 Minute Rated Fire Doors: Provide one of the following cores with hardwood veneers:
a. Particleboard-Core: ANSI A208.1, Grade LD-1 or Grade LD-2.
b. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware

1) 5-inch top-rail blocking, in doors indicated to have closers.
2) 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.

c. Provide doors with glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.
d. Structural Composite Lumber Core (SCLC-5) is an engineered hardwood composite sometimes referred to as LSL (Laminated Strand Lumber). The material complies with WDMA minimum performance levels for interior applications with screw holding power of 540 lbs., modulus of rupture of 6,500 psi, and density of 38 lbs per cubic foot. Formaldehyde free.

2. Interior Flush Fire Doors – Above 20 Minute Rated: FD solid core with hardwood face veneer.
   a. Rating as indicated on drawings.
   b. Provide one of the above cores or the following as required to maintain fire rating:
      1) Non-combustible mineral composite material that is necessary for higher hourly ratings per manufacturer's approval
3. Acoustic (Sound) Door: Door manufacturer's sound dampening core; STC 39 rating per ASTM E90. Provide for all doors indicated on door schedule as Sound Door or Acoustic Door.
4. Lead Lined Door: Particle board (PC-5), stave lumber (SLC-5) or structural composite lumber (SCLC-5) core with continuous lead sheets from edge to edge located in center of door.

C. Moldings: Trim louver and glass openings with recessed bead type wood moldings, species matching door face veneer species. Profiles as selected by the Architect from manufacturer's standard profiles.
   1. Glass Lites in Fire Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire rating indicated. Include concealed metal glazing clips where required for opening size and fire rating indicated.

D. Louvers: Where scheduled, provide sightproof, fixed, welded, inverted V-shaped blade type, formed of 20 gage cold-rolled steel blades and frames, primed painted finish. ANEMOSTAT Model CHDL-2F, NATIONAL GUARD PRODUCTS Model L-A700-BF, AIR LOUVERS INC. 600 A-1.

2.02 FABRICATION

A. Flush Doors: Fabricate doors in accordance with WDMA I.S. 1A, [Premium with Grade AA faces] [Premium with Grade A faces] [Custom with Grade A faces] Grade requirements for transparent stained finish. Formaldehyde free.
   1. Core Construction: Bond stiles and rails to core and sand entire unit prior to assembly of face veneers.
   2. Number of Plies: 5.
   3. Face Veneers: Minimum 1/50" thick before sanding, plain sliced red oak hardwood.
      a. Veneer Figure: Biological defects of grain, color and effects including but not limited to - blisters, flake, quilts, rope, burl, crotch, mottle patterns, shall not exceed approved veneer samples.
   4. Door Thickness: 1-3/4" thick.
   5. Adhesive: Type I, waterproof.
   6. Edge Strips: Stile edges hardwood species matching face veneer; bonded to core; 1-1/8" minimum width after trimming. Top and bottom edges hardwood of mill option.
   7. Match Between Veneer Leaves:
      a. Plain Sliced Veneer: Book matched for color and grain.
      b. Rift or Quarter Sawn Veneer: Slip match for color and grain.
   8. Assembly of Veneer Leaves on Door Faces: Running match.

9. Hardware: Factory machine for mortise hardware using template provided by hardware manufacturer.
10. Reinforcement: Reinforce doors to receive hardware specified.
    a. Hinge Attachment: Stiles and rails to be continuously glue bonded to the core so that screw stress is transmitted directly to the core.
    b. Closure, Exit Device and Other Surface Mounted Hardware: Provide top rail 2-1/2" or more in width to hold closer fasteners and solid wood blocking for all other surface applied hardware.

B. Fire Rated Doors: Conform to "Flush Door" requirements specified above. Provide doors of U.L. classification indicated.
1. Reinforcement: Reinforce doors to receive hardware specified.
    a. Surface applied hardware that is located where screws cannot penetrate the above mentioned stiles or wood rails shall be through bolted.

C. Stile and Rail Wood Doors: Fabricate doors in accordance with WDMA "Premium Grade" requirements for transparent stained finish. Formaldehyde free.
1. Stiles: Hardwood laminated stave core.
2. Rails: Solid hardwood core.
3. Joints: Hardwood doweled and glued.
4. Face Veneers: Minimum 1/50" thick before sanding, plain sliced Grade A red oak hardwood. Book matched.
5. Door Thickness: 1-3/4" thick.
6. Adhesive: Type I, waterproof.
7. Edge Strips: Stile edges hardwood species matching face veneer; bonded to core; 1-1/8" minimum width after trimming. Top and bottom edges hardwood of mill option.
8. Hardware: Factory machine for mortise hardware using template provided by hardware manufacturer.
9. Panels: Mitered rim; tongue and grooved; hardwood veneer.
10. Moldings: Trim glass openings with recessed bead type wood moldings, species matching door face veneer species. Profile as selected by Architect.

D. Lead Lined Doors: Conform to applicable requirements of “Flush Door” specified herein and the following:
1. Type: Premium quality; solid core (stave lumber), lead under veneer design. Provide two continuous lead sheets for a total thickness of 1/8”.]
2. Lead: FS QQ-L-201F, Grade C; 99.97% pure.
3. Adhesive: Type recommended by door manufacturer to bond core, lead, cross banding and veneer in one application.

E. Factory Finish
1. 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.
    a. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
2. Finish: WDMA TR-4 conversion varnish.
3. Staining: Color as selected by Architect.
4. Effect: Filled finish.
5. Sheen: Satin.

F. Individually package doors at factory with manufacturer's standard packaging or wrapping for delivery to job site.

G. Manufacturers: MASONITE; EGGERS - VT INDUSTRIES, OSHKOSH; LAMBTON DOORS.
1. Stile and Rail Doors: Above listed manufacturers.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substances, rough openings and installation conditions. Do not proceed with wood door installation until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Verify metal frame dimensions and hardware mortises in metal frames with metal frame manufacturer.

3.03 INSTALLATION

A. Condition doors to average prevailing humidity in installation area before hanging.

B. Install doors in accordance with manufacturer's installation instructions. Job fit and prepare doors to receive hardware. Bevel 1/8" in 2" at strike edges for clearance in arc of swing. Seal cut surfaces, tops, bottoms and edges with sanding sealer after fitting and machining.

C. Hang doors straight, plumb and square securely anchored into position. Adjust doors to provide uniform clearance and to contact stops uniformly. Remove and replace doors that are warped, bowed or otherwise damaged and cannot be properly fit to the opening.

D. Install fire-rated doors in corresponding fire-rated frames in accordance with requirements of NFPA No. 80.

3.04 PROTECTION

A. Protect installed doors from soiling, staining and damage until final acceptance.

B. Repair or replace doors damaged beyond acceptable repair as directed by the Architect.

END OF SECTION 08 14 00

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SECTION 08 31 13
ACCESS DOORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide wall, partition and ceiling access doors for access to mechanical and electrical equipment as indicated.
   1. Provide fire-rated where indicated or specified.

B. Provide floor access door as indicated.

1.02 RELATED SECTIONS

A. Finish Painting: Section 09 91 00.

B. Roof Hatch: Section 07 72 33.

C. Plumbing chase access doors: Section 08 11 13. OSU Projects

1.03 REFERENCE STANDARDS

A. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

B. ASTM E413 - Classification for Rating Sound Insulation; 2022.

C. ASTM E1332 - Standard Classification for Rating Outdoor-Indoor Sound Attenuation; 2022.

1.04 QUALITY ASSURANCE

A. Coordination: Furnish inserts and anchoring devices that must be built into other work for installation of access panels. Coordinate delivery with other work to avoid delay.

1.05 SUBMITTALS

A. Submit product data and shop drawings for each item. Include installation instructions for conditions involved.

PART 2 PRODUCTS

2.01 MATERIALS AND FABRICATION - WALL AND CEILING TYPES

A. General: Provide access panel assembly manufactured as an integral unit, complete with all parts and ready for installation. Fabricate units of continuous welded steel construction, unless otherwise indicated. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of support shown.

B. Standard Access Door
   1. Description: Minimum 14 gage steel panels with minimum 16 gage steel frames. Units to have concealed hinges.
   2. Provide with exposed 1” frame flange.
   3. Manufacturer: Provide panels by one of the following, subject to the above requirements.
      a. J. L. INDUSTRIES INC. Model TM
      b. LARSEN’S MANUFACTURING Model L-MPG
      c. BABCOCK-DAVIS Model B-NT
      d. NYSTRON Model NT/NW/NP

C. Fire-Rated Access Door
   1. Description: Minimum 20 gage interior and exterior steel panels with minimum 16 gage steel frames and masonry wall type anchors welded to frame.
      a. Automatic Closing: Provide self-closing spring device to assure positive latching.
      b. Fire-Rating: U.L. label equal to wall rating indicated on drawing.
      c. Provide interior lock/latch release device.
      d. Core: Fire-rated mineral fiber.
   2. Manufacturer: Provide panels by one of the following, subject to the above requirements.
      a. J. L. INDUSTRIES INC. Model FD

b. LARSEN'S MANUFACTURING Model L-FRAP
c. BABCOCK-DAVIS Model B-IT
d. NYSTRON Model IT/IW/IP

D. Acoustic/Fire Rated Assembly: Provide in stair towers to above ceiling mechanical spaces. Assembly consists of the following two doors:
1. Upward Swing Floor Type Access Door
a. Description: 1/4" raised pattern (checkered plate) steel plate door leaf with minimum 1/4" steel formed steel channel frame. Provide frame with continuous angle anchor flanges or bent bar anchors welded to frame. Door to open 90o and automatically lock in that position. Provide with shop applied prime coat.
1) Provide 2" thick 3.0 pcf fiberglass insulation adhered to underside of leaf. Line leaf and insulation with 22 gage perforated steel sheet, spot welded to underside of leaf.
2) Provide continuous closed cell neoprene gasket installed at perimeter of hatch between frame and door leaf.
b. Lock/Handle: Removeable stainless steel snap lock. Provide with interior release handle.
c. Hinges: Manufacturer's standard cam action type.
d. Design Loadings: Reinforce and design unit to withstand a live load of 300 psf with a maximum deflection of l/150 of the span.
e. Size: As indicated on drawings.
f. Manufacturer: BILCO Model #J or equal.
2. Downward Swing Access
a. Description: Minimum 16 gage steel panels recessed 1" with minimum 13 gage steel frames custom formed to install flush with concrete slab as indicated on drawings. Units to have concealed hinges.
b. Provide 2" thick 3.0 psf fiberglass duct liner insulation secured to top surface of door leaf.
c. Provide continuous closed cell neoprene gasket installed at perimeter of hatch between frame and door leaf.
d. Sizes: As indicated on drawings.
e. Manufacturer: KARP Model #RDW or equal by NRYCO/MILCOR, or J.L. INDUSTRIES, subject to the above requirements.

E. Sound-Rated Access Door
1. Access panels shall be tested, labeled, and meet the following minimum ratings:
a. Sound Transmission Class (STC) Rating: When tested in accordance with ASTM E90, the panel shall have an STC Rating of 47 when installed in an STC-Rated wall of the same or lower rating and shall be classified in accordance with ASTM E413 and ASTM E1332.
2. Frame: 16-gauge steel with 1-inch (25.40-mm) flange.
3. Insulated Panel: 20-gauge steel mounted to frame with continuous heavy-duty hinge (provide not less than 110-degree opening); 2-1/4 inch (57 mm) thickness.
a. Insulation: Proprietary sound-blocking insulation.
4. Gasketing: Continuous, heavy duty EPDM rubber compression gasket, attached to frame.
5. Latch Feature: Compression latch.
6. Manufacturer: Provide panels by one of the following, subject to the above requirements.
a. J. L. INDUSTRIES INC.
b. LARSEN'S MANUFACTURING
c. BABCOCK-DAVIS
d. NYSTRON

F. Insulated Exterior Access Panel
1. Description: Weatherproof assembly, with face of door fit flush with frame and with exposed frame. Include extruded door gaskets and nominal 1- 3/4 inch (19.05 mm) - thick

closed-cell polyurethane insulation.
   a. Size and Locations: As indicated
   b. Door Material: Galvannealed; 0.0276 inch (0.7 mm), 24 gauge, paint grip finish
   c. Latch and Lock: Cam latch operated by handle, with separate mortise lock.
   d. Options: Frame drip cap.
2. Manufacturer: NYSTRON XT series or equal by:
   a. J. L. INDUSTRIES INC.
   b. LARSEN'S MANUFACTURING
   c. BABCOCK-DAVIS

G. Locks: Provide cylinder locks on all access doors. Provide 2 keys per access door. Key all access doors alike.

H. Factory Prime Finish: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which access panels are to be installed.

B. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 INSTALLATION

A. Comply with manufacturer's instructions for installation of access panels.

B. Coordinate installation with work of other trades.

C. Set frames accurately in position and securely anchor to supports with face panels level in relation to adjacent finish surfaces.

3.03 ADJUST AND CLEAN

A. Adjust hardware and panels after installation for proper operation.

B. Remove and replace panels or frames that are warped, bowed or otherwise damaged.

END OF SECTION 08 31 13

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SECTION 08 41 13
ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work under this section includes the design of the aluminum entrance and window systems and all materials, labor and equipment for the complete installation of the work as shown on the drawings and specified herein. Work includes:
   1. Aluminum entrance doors.
   2. Aluminum entrance framing system for entrances and vestibule, including sidelight and transom frames as indicated.
   3. Aluminum storefront system.
   4. Aluminum windows.
      a. Fixed
      b. Operable
   5. Sloped glazing system.
   6. Glass and glazing of the systems.
   7. Hardware.
   8. Anchors, fasteners, flashings, trim and accessories to complete the work.
   9. Sealants required within entrance and window construction.
   10. All gaskets, sealants and tapes required in final assembly of the work.
   11. Installation of lock cylinders furnished under Section 08 71 10.

1.02 RELATED SECTIONS

A. Joint Sealants: Section 07 92 00.

B. Glazing: Section 08 81 00.

C. Hardware: Section 08 71 10.

D. Glazed Aluminum Curtainwalls: Section 08 44 13.

E. Sliding Automatic Entrances: Section 08 42 29.

F. Fluoropolymer Metal Coatings: Section 05 05 13.

G. Vapor/Air Barrier Transition Membranes: Section 07 27 26.

H. Sustainable Design Requirements: Section 01 81 13.

1.03 REFERENCE STANDARDS

A. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

E. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023, with Editorial Revision.

F. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

G. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

I. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2020.

J. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube; 2020.

K. ASTM C1184 - Standard Specification for Structural Silicone Sealants; 2023.

L. ASTM D523 - Standard Test Method for Specular Gloss; 2014 (Reapproved 2018).

M. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films; 2023.

N. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

O. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

P. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

Q. SSPC-PS 12 - Guide to Zinc-Rich Coating Systems; 2007.

1.04 QUALITY ASSURANCE

A. Provide aluminum doors and framing system manufactured by a single firm specializing in the production of this type of work.

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

C. Painted Finishes: Factory painted finish to be performed by an applicator specifically approved by the paint manufacturer. The applicator shall provide written notification of approval by paint manufacturer prior to application of the finish.

1.05 SUBMITTALS

A. Submit the following:
   1. Framing system details.
   2. Door details.
   3. Window details.
   4. Installation instructions.
   5. Itemized schedule of door hardware.
   6. Finish samples showing the light and dark range limits of the anodizing colors. These finish samples will be used in the field as a check for items specified in this section. Anodized items whose color does not fall within the range indicated by these samples are unacceptable and shall not be used in the finished work.

B. Tests: Submit two copies of test reports made or witnessed by an independent testing laboratory showing the results of tests conducted on previously manufactured windows of the type used on this project. The reports shall verify conformance to thermal movement, air and water infiltration and structural properties as described herein.

C. Building Shop Drawings: Include complete evaluations of all systems including doors; details and methods of anchorage; details of construction finishes; methods of assembly; location and installation of hardware and reinforcement for same; size, shape and thickness of materials; joints and connections; details of joining with other work.
   1. Scale: Include typical unit elevation of each system at 1/2" scale and details at full scale where practical.

2. Calculations: Show section moduli of load-bearing members, and calculations of stresses and deflections for performance under design loading. Such calculations shall be done by a structural engineer licensed to practice in the **State of Ohio**. Calculation submission must coincide with shop drawing submission.

D. Product Data: Submit manufacturer's specifications for materials and fabrication of work, and instructions and recommendations for installation and maintenance. Include certified test reports showing compliance with requirements where a test method is indicated.

E. Samples: Submit samples of each type and color and finish required by this Section, on 12" sections of extrusions or formed shapes and on 6" squares of sheet/plate. Include two or more samples in each set.
1. Architect reserves right to require fabrication samples showing prime members, joinery, anchorage, expansion provisions, glazing and similar details, profiles and intersections.

F. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.06 DELIVERY, STORAGE AND HANDLING

A. Pack, deliver, handle, store and protect materials from damage in accordance with AAMA Curtain Wall #10, "Care and Handling of Architectural Aluminum" recommendations.
1. Remove paper type wrappings when unloading.
2. Store materials inside the buildings whenever possible in clean, dry ventilated areas free of dust or corrosive fumes.
3. Stack members vertically or on edge, shim between components to provide water drainage and ventilation. Protect with adequate coverings, placed to provide adequate air circulation.
4. During installation, protect materials from lime mortar, run-off from concrete and copper, weld splatter, acids, roofing materials, solvents and abrasive cleaner.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.08 WARRANTIES

A. Submit written warranty signed by manufacturer, Contractor, and installer agreeing to repair or replace work which fails in materials or workmanship within three (3) years of the date of project acceptance.
1. Failure of materials or workmanship shall include excessive leakage or air infiltration, excessive deflections and defects in accessories, weather seals and other components of work.

B. Finish: Provide paint manufacturer's guarantee of paint finish against failure of paint finish. Failure includes blistering, peeling, cracking, flaking, checking, excessive color change and chalking. Color change shall not exceed 5 N.B.S. units (per ASTM D523) and chalking shall not less than a rating of 8 per ASTM D4214.
1. Warranty Period: 20 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Drawings and specifications are based on products by KAWNEER CO.

B. Other Acceptable Manufacturers: Equal products by the following manufacturers are acceptable providing they meet or exceed the requirements specified herein and conform to the design intent indicated on the drawings:
1. CRL – U.S. ALUMINUM
2. EFCO

3. OLDCASTLE BUILDING ENVELOPE
4. TUBELITE DIVISION, INDAL, INC.
5. YKK AMERICA
6. BOYD ALUMINUM

2.02 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   1. Sheet and Plate: ASTM B209/B209M.
   2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.
   3. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
   4. Structural Profiles: ASTM B308/B308M.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS 12; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
   1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
   2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
   3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

2.03 STOREFRONT, WINDOW FRAMING AND ENTRANCE DOOR SYSTEMS

A. Type: An integrated system of extruded aluminum sections, glazing devices, sealing devices, doors and hardware and operable windows.

B. Materials: Provide aluminum alloy and temper for each shape as recommended by manufacturer and processor to comply with requirements of performance, fabrication, and application of finish.
   1. Thickness: As required to meet design requirements with a minimum of 1/8" for major sections.

C. Framing: KAWNEER 451T, framing for 1" insulating glass.
   1. Type: Thermally broken, outside glazed, fixed type framing as indicated on drawings.
   2. Frame
      a. Members: Main frame members designated specifically for manufacture of aluminum windows extruded from 6063-T5 aluminum alloy.
      b. Glazing: Extruded snap-in type bead. Units to accept 1" insulating glass.
      c. Trim: Provide all trim, sills, flashings and closures to complete installation.
      d. Size
         1) Sightline: Nominal 2".
         2) Depth: 4-1/2”.
      e. Provide subframing as required for power operated entrance door application. See Section 08 42 29.
   3. Glazing Plane: As indicated
   4. Special Framing Shapes: Provide as detailed or as required to maintain design intent as indicated on building elevations drawings and section drawings. Aluminum extruded shapes and bent aluminum sheet, minimum 0.063", finished after fabrication.
   5. Vestibule Framing: Non-thermally broken; dimensions to match exterior framing. KAWNEER Trifab II 451. Units to accept 1/4" glass.
   6. Interior Framing: Non-thermally broken. KAWNEER Trifab II 451. Units to accept glass thickness indicated.
      a. Designed to resist a 200 lb/SF concentrated load in any direction where indicated on the drawings.
      b. Size
         1) Sightline: Nominal 2".
         2) Sill Sightline: Nominal 4-1/2”

3) Depth: 4-1/2”.

7. Provide extruded solid backed framing shapes where framing abuts solid wall conditions.

D. Performance Requirements: Exterior window wall system (excluding doors) shall meet or exceed the following performance requirements.
   1. Wind loads: Provide storefront system; include anchorage, capable of withstanding wind load design pressures indicated on the drawings.
   2. Thermal Movement: Window framing system shall be designed to provide for expansion and contraction of component materials caused by a surface temperature range of 180o F., without causing buckling, stresses on glass, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or other detrimental effects.
      a. Doors: Function properly over the above specified temperature range.
   3. Air Infiltration: Air leakage shall not exceed 0.06 cfm per square foot of fixed wall area when tested in accordance; with ASTM E283/E283M at test pressure not less than 6.24 psf.
   4. Water Infiltration
      a. Provide drainage to exterior face of framing any water entering at joints.
      b. No uncontrolled water penetration shall occur when tested in accordance with ASTM E331, at test pressure not less than 8.0 psf.
   5. Structural Properties - Uniform Load: A static air design load of 20 psf shall be applied in the positive and negative direction in accordance with ASTM E330/E330M. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.
   6. Thermal Properties
      a. Thermal Transmittance (U-factor): When tested to AAMA 1503, the thermal transmittance (U-factor) shall not be more than (Glass to Center) 0.44 (low-e) BTU/hr/ft sq./degree F
      b. Condensation Resistance (CRF): When tested to AAMA 1503, the condensation resistance factor shall not be less than (Glass to Center) 62 frame and 68 glass (low-e)

E. Glazed Aluminum Entrance Doors: Standard duty, medium stile, manufacturer's standard, single acting aluminum entrances.
   1. Stiles: Nominal 3 1/2" wide.
   2. Rails
      a. Top: 3 1/2" high.
      b. Bottom: 10" high.
   3. Intermediate Rail: Provide if indicated.
   4. Section Wall Thickness: .125" for major components; 0.05" for glazing moldings.
   5. Door Thickness: 1-3/4".
   6. Corners: Stiles through design, joined by concealed bolts and weld.
   7. Provide complete with snap-in glazing stops and gaskets.
   8. Sizes: As indicated. Provide single or pairs of doors as scheduled.
   9. Exterior Entrance Weatherstripping: Stile with dual pile weathering with polymeric fin and bulb polymeric weatherstripping and pile weathering with polymeric fin in door frame system or equal by other approved manufacturer. Locate weatherstripping at jambs, head and meeting stiles (as applicable). Provide bottom rail with EPDM blade gasket sweep. Size sweep to close against door threshold. Sweep housing finish to match door finish.
   10. Glazing: 1/4", unless otherwise indicated.

F. Glazed Aluminum Entrance Doors: Standard duty, wide stile, manufacturer's standard, single acting aluminum entrances. Provide thermally broken units without vestibules
   1. Stiles: Nominal 4 ¼” to 5" wide.
      a. Rails

b. Top: 4 ¼” to 5" wide.
c. Bottom: 10" high.
2. Intermediate Rail: Provide if indicated.
3. Section Wall Thickness: .125" for major components; 0.05" for glazing moldings.
4. Door Thickness: 1-3/4” in vestibules. Provide thermally broken 2 ¼” units without vestibules.
5. Corners: Stiles through design, joined by concealed bolts and weld.
6. Provide complete with snap-in glazing stops and gaskets.

G. Sizes: As indicated. Provide single or pairs of doors as scheduled.
1. Exterior Entrance Weatherstripping: Stile with dual pile weathering with polymeric fin and bulb polymeric weatherstripping and pile weathering with polymeric fin in door frame system or equal by other approved manufacturer. Locate weatherstripping at jambs, head and meeting stiles (as applicable). Provide bottom rail with EPDM blade gasket sweep. Size sweep to close against door threshold. Sweep housing finish to match door finish.
2. Glazing: 1/4" thick in vestibules, insulated units without vestibules, unless otherwise indicated.

H. Glazed Aluminum Entrance Doors: Heavy Duty, wide style, single acting aluminum entrances. Drawings and specifications are based on KAWNEER Tuffline Series heavy duty types by the other listed manufacturers are acceptable provided they meet the requirements specified herein.
1. Sizes: As indicated. Provide single or pairs of doors as scheduled.
2. Exterior Entrance Weatherstripping: Manufacturer's standard continuous interlocking type. Locate weatherstripping at jambs, head and meeting stiles (as applicable). Provide bottom rail with EPDM blade gasket sweep. Size sweep to close against door threshold. Sweep housing finish to match door finish.
3. Glazing: 1/4" thick in vestibules, insulated units without vestibules, unless otherwise indicated.
4. Section Wall Thickness: .185" for major components; .125" for glazing pockets.
5. Corners: Stiles through design, joined by concealed bolts and/or welds.
6. Provide complete with snap-in glazing stops and gaskets.
7. Door Thickness: 2" minimum.

I. Flush Aluminum Entrance Doors: Flush doors, single acting, aluminum entrances.
1. Exterior and Interior Surfaces: Architectural quality 5005 alloy #10 patterned 0.064" aluminum sheet.
2. Impact Reinforcement: Tempered hardboard, 1/8" thick, at exterior and interior.
3. Core: Foamed-in-place polyurethane foam, 3 lb./cu. ft. density.

2.04 FINISHES

A. Finish: Fluoropolymer baked enamel finish with Kynar 500 (70%) resins by ELF ATOCHEM OF NORTH AMERICA INC.; "Trinar" by AKZO; "Duranar" by PPG; "Fluropon" by VALSPAR. Total dry film thickness not less than 1.0 mils (0.0254 mm), or coatings meet or exceed the requirements of AAMA 2605.
1. Color: As selected by Architect from paint manufacturer’s complete specified line.
2. Application: Apply coating systems in strict accordance with manufacturer's printed instructions and recommendations. Refer to Quality Assurance in Part 1.
3. Concealed members may be mill finished, providing they cannot be seen through the glass.

B. Finish: Fluoropolymer two coat baked on finish with Kynar 500 (70%) resins. See section 05 05 13.

C. All exposed aluminum surfaces shall receive an Architectural Class 1, medium bronze anodized coating; AA-M12C22A42, minimum 0 inch (0.02 mm) thickness.

2.05 ENTRANCE DOOR HARDWARE

A. Prepare and reinforce doors and frames for hardware. Factory fit and install hardware in accordance with Section 08 71 10 and manufacturer's requirements.

B. Prepare and reinforce doors and frames for hardware. Factory fit and install hardware.

C. Hardware
   1. Offset Pivots: Provide top, intermediate and bottom pivots. Baked-on epoxy finish to match finish of door.
   2. Closers: LCN 4041 CUSH each leaf. Spray painted to approximate framing finish.
   3. Exit Device: VON DUPRIN Series 99 for wide stile doors and Series 33 for narrow and medium stile doors. Concealed vertical rod for both leafs of pairs of doors and rim device for single doors. Devices shall include the following as applicable: panic device, crash bar, vertical rods, top and bottom latch housings, roller strike, and lock mechanism. Cylinder shall be furnished and keyed in accordance with Section 08 71 00. Cylinder finish shall match exit device.
      a. Provide exit device with finish to match framing.
      b. Trim: Provide 9947TP and 9947DT for all pairs of doors; and 99TP trim for all single doors.
   4. Threshold: Extruded aluminum, natural anodized finish, maximum 1/2" high, provide on all exterior doors. Provide stainless steel fasteners.

2.06 ACCESSORIES

A. Fasteners: Aluminum, non-magnetic stainless steel or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum components. Finish exposed fasteners to match aluminum work.

B. Flashing, Trim and Accessories: Provide as required to complete the work. Finish shall match aluminum entrances and storefront finishes. Work includes:
   1. Aluminum closure panels, flashing and trim.
   2. Concealed Flashing: Dead-soft stainless steel, 26 gauge minimum, type selected by manufacturer for compatibility.
   3. All trim materials shall be finished after fabrication, unfinished exposed edges at holes and trim terminations are not acceptable.

C. Brackets and Reinforcements: Manufacturer's high strength aluminum units where feasible; otherwise, nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A123/A123M.

D. Bituminous Coatings: Cold applied asphalt mastic complying with SSPC-PS 12, compounded for 30 mil (0.762 mm) thickness per coat.

E. Structural Sealant: Designed to carry gravity loads of glazing and capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed storefront/strip windows without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
   1. Structural Glazing Sealants: ASTM C1184, chemically curing silicone formulation that is 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 storefront/strip windows assembly indicated.
      a. Color: As selected by Architect from manufacturer's full range of colors.
   2. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.07 FABRICATION

A. Provide manufacturer's standard fabrication and accessories that comply with indicated requirements. Minor dimension differences will be accepted in order to utilize manufacturer's standard products.

B. Fit and assemble the work at the shop to the greatest extent possible. Disassemble only as required for shipment and erection. Maintain true continuity of line and accurate relation of planes and angles. Provide secure attachment and support at mechanical joints, with hairline fit of contacting members. Conceal fasteners wherever possible.

C. Reinforce aluminum work as necessary at points of support or anchorage and at mechanical joints and points of attachment to meet performance requirements and for support of the system. Separate dissimilar metals with bituminous paint or preformed separators that will prevent corrosion. Separate metal surfaces at moving joints with plastic inserts or other non-abrasive concealed inserts.

D. Coordinate work of this section with other work for proper sequence of construction without delays. Verify dimensions of supporting structure and other elements that precede wall system work before fabrication of required components. Provide for erection tolerances for other work where field measurements cannot be obtained.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates supporting structure, and installation conditions. Do not proceed with aluminum entrances erection until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

A. General
   1. Do not install component parts that are observed to be defective, including warped, bowed, dented, abraded and broken members.
   2. Remove and replace members that have been damaged during installation or thereafter before time of acceptance.
   3. Do not cut or trim component parts during erection, in a manner which would damage finish, decrease strength or result in a visual imperfection or a failure in performance of the work.

B. Install components in accordance with the manufacturer's installation instructions and recommendations.

C. Install component parts level, plumb, true to line and with uniform joints and reveals. Secure to structure with non-staining and non-corrosive shims, anchors, fasteners, spacers and fillers.

D. Assembly and Anchorage: Anchor component parts securely in place, by bolting or other permanent mechanical attachment system, which will comply with performance requirements and permits movements as required.
   1. Anchor storefront sill to a continuous interior aluminum anchor.

E. Apply a bituminous coating or other suitable separator on concealed contact surfaces of dissimilar materials, before assembly or installation to prevent corrosive or electrolytic action.

F. Set sill members and entrance thresholds in a bed of sealant compound, or with joint fillers or gaskets to provide weathertight requirements.

G. Install glass and glazing, in accordance with Section 08 81 00 and the manufacturer's requirements.

H. Install joint sealants specified in Section 07 92 00, in accordance with the manufacturer's requirements.

I. Coordinate installation of storefront framing with installation of air/vapor barrier transition membrane.

J. Adjust operating hardware to function properly, without binding, and to provide tight proper fit at contact points and weatherstripping.

3.03 CLEANING AND PROTECTION

A. Protect glass from breakage immediately upon installation, by attachment of streamers to framing held away from glass. Do not apply markings of any type to surfaces of glass.

B. Remove protective coating when completion of construction activities no longer require its retention.

C. Immediately before acceptance of the work, clean the aluminum entrance systems thoroughly, inside and out. Demonstrate proper cleaning methods to Owner's maintenance personnel during final cleaning. Prepare a "Cleaning and Maintenance Manual" listing types of cleaning compounds, cleaning methods, sealants and glazing materials used for cleaning, repair and maintenance of work and turn over to Owner upon acceptance of the work.

END OF SECTION 08 41 13

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SECTION 08 53 13
VINYL WINDOWS AND PATIO DOORS

PART 1 GENERAL

1.01 SCOPE

A. Provide exterior single hung vinyl windows and sliding patio doors.
   1. Glass and glazing of the various window systems.
   2. Anchors, fasteners, flashings, trim and accessories to complete the work.

1.02 RELATED SECTIONS

A. Sealant: Section 07 92 00.

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights; 2022, with Errata (2023).

B. ASTM C1036 - Standard Specification for Flat Glass; 2021.

C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

D. ASTM E547 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference; 2000 (Reapproved 2016).

E. ASTM F2090 - Standard Specification for Window Fall Prevention Devices with Emergency Escape (Egress) Release Mechanisms; 2021.

1.04 QUALITY ASSURANCE

A. Standards: Comply with the applicable provisions of American Architectural Manufacturers Association (AAMA) "Voluntary Specifications for Aluminum and Poly (Vinyl Chloride) (PVC) Prime Windows and Glass Doors, AAMA 101".

B. Manufacturer: Current member of the American Architectural Manufacturers Association

C. Windows that require additional opening for egress are to be equipped with an ASTM F2090-10 compliant device, such as a Window Opening Control Device, which initially limits the opening of the window to no more than 4” as defined above, and provides a two-step mechanism allowing further operation to full egress.

1.05 SUBMITTALS

A. Submit the following in accordance with the General Conditions and Section 01 33 23.
   1. Submit manufacturer's product data and installation instructions. Submit shop drawings for fabrication and installation of windows. Include elevations and detail sections of every typical member.
   2. Submit finish samples.

1.06 WARRANTY

A. Warranty for all work in this Section to operate properly and be weathertight for the standard manufacturer’s warranty.

B. Provide Contractor's guarantee for all work under this Section to be free from defects of workmanship for a period on one year.

PART 2 PRODUCTS

2.01 SINGLE HUNG WINDOW

A. Manufacturer: Drawings and specifications are based on 500 Series windows by WINCORE WINDOWS AND DOORS. Windows by SIMONTON, JELDWEN, or PELLA must be approved by the Owner, through the Architect, during bidding. Approval process includes submission of product data, catalog cuts, design information and, where requested, a full size sample.

B. Type: Single hung units complying to AAMA/WDMA/CSA 101/I.S.2/A440 for DH-R30 specifications.
   1. Design Pressure (Performance Class): 30 psf.
   2. Structural Test Pressure (Design Pressure x 1.5): 45 psf.
   3. Water Resistance Test Pressure - ASTM E547: 4.5 psf.

C. Frame and Window
   1. Member: Main frame and window members designed specifically for manufacturers of vinyl windows using hollow extrusions of rigid PVC.
   2. Minimum Wall Thickness:
      a. Main Frame: 062".
      b. Fixed Meeting Rail: 07".
   3. Main Frame Corners: Welded construction.
   4. Glazing: Extruded snap-in type PVC bead, allowing exterior glazing. Units to accept 7/8 inch (22.22 mm) thick insulating glass.
   5. Weatherstripping: Provide around entire perimeter of all operating sash.
   6. Screens: Fiberglass fabric, roll formed aluminum frame, finish to match window.

D. Hardware
   1. Sash Balance: Stainless steel constant force springs or similar type as approved by Architect.
   2. Locks: Two cam-type on each operable sash.
   3. Screws, Clips and Other Fasteners: Manufacturer's standard non-corrosive type materials compatible with aluminum.
   4. Limit Devices: Provide concealed friction adjustor, adjustable stay bar or Concealed support arms with adjustable, limited, hold-open limit devices designed to restrict sash opening. Limit clear opening to 4 inches (101.6 mm) for ventilation; with custodial key release.

E. Colors: Black

2.02 SLIDING PATIO DOORS

A. Manufacturer: Drawings and specifications are based on Series 995 patio doors by CAPITOL WINDOWS AND DOORS (DIVISION OF METAL INDUSTRIES). Windows by other manufacturers must be approved by the Owner, through the Architect, during bidding. Approval process includes submission of product data, catalog cuts, design information and, where requested, a full size sample.

B. Frames
   1. Member: Fabricated from extruded aluminum 6063-T5. Provide with polyurethane thermal break. Clad head and jamb frame members with .05” rigid vinyl extrusion. Provide weep slots in sill.
   2. Minimum Wall Thickness
      a. Sill: 062".
      b. Head and Jambs: 05".
   3. Sills in Wheelchair Accessible Units: Provide extruded aluminum threshold extension for wheelchair access. Similar to # CM-92033 and CM-92034.

C. Door Panels: Vinyl extrusions; mechanically fasten at corners using welded construction.

D. Weatherstripping: Provide around entire perimeter and meeting stiles; interlock endseals are adjustable.

E. Hardware
   1. Roller Assembly: Corrosive resistant adjustable, ball-bearing type.
   2. Lock: Clam type latch.
   3. Pulls: Manufacturer’s standard.

F. Screen: Rolling type fabricated from roll-formed sections; corners mitered and fitted. Finish to match door.
   1. Fabric: Fiberglass mesh.
   2. Wheels: Adjustable; mounted in top and bottom rails.

G. Colors: As selected by Architect from manufacturer's standard colors.

2.03 GLAZING

A. Factory glaze sash.

B. General: Preassembled units consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space as well as with other requirements specified for glass characteristics, air space, sealing system, sealant, spacer material, corner design and desiccant.

C. Windows - Glass Type: Provide manufacturer's standard insulating glass; Type I, Class 1 for clear glass, Quality q3, conforming to ASTM C1036.

D. Patio Doors: Provide tempered insulating glass; Kind FT, Condition A, Type I, Class 1 for clear glass, conforming to ASTM C1048.

2.04 UNIT / OPENING PERFORMANCE

A. U-Factor:
   1. Fixed Fenestration: 0.36
   2. Operable fenestration: 0.45
   3. Entrance doors: 0.63

B. Solar Heat-Gain Coefficient (fixed / operable)
   1. Projection factor < 0.2: 0.38 / 0.33
   2. 0.2 <= projection factor < 0.5: 0.46 / 0.40
   3. Projection factor >= 0.5: 0.61 / 0.53

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates, supporting structure and installation conditions. Do not proceed with window or door erection until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

A. General
   1. Do not install component parts which are observed to be defective, including warped, bowed, dented, abraded, and broken members. Remove and replace members which have been damaged during installation or thereafter before time of acceptance.
   2. Do not cut or trim component parts during erection, in a manner which would damage finish, decrease strength or result in a visual imperfection of a failure in performance of the work.

B. Install windows and doors in accordance with the manufacturer's instructions and recommendations for the installation of window components.

C. Install component parts level, plumb, true to line and with uniform joints and reveals. Secure to structure with non-staining and non-corrosive shims, anchors, fasteners, spacers and fillers. Use erection equipment which will not mar or stain finished surfaces, and will not damage component parts.

D. Assembly and Anchorage: Anchor component parts securely in place by bolting or other permanent mechanical attachment system which will comply with performance requirements and permit movements as required.

E. Set sill members in a bed of sealant compound or with joint fillers or gaskets to provide weathertight requirements. Do not seal drainage holes (slots).

3.03 CLEANING AND PROTECTION

A. Protect glass from breakage immediately upon installation, by attachment of streamers to framing held away from glass.
   1. Do not apply markings of any type on surfaces of glass.

B. Immediately before acceptance of the work, clean the window thoroughly, inside and out.

END OF SECTION 08 53 13

SECTION 08 71 10
DOOR HARDWARE

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Commercial door hardware.
   2. Cylinders for doors specified in other Sections.
   3. Electrified door hardware.

1.02 REFERENCE STANDARDS

A. BHMA A156.2 - Bored and Preassembled Locks and Latches; 2022.

B. BHMA A156.3 - Exit Devices; 2020.

C. BHMA A156.13 - Mortise Locks & Latches Series 1000; 2022.

D. BHMA A156.18 - Standard for Materials and Finishes; 2020.

E. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.

F. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

G. UL 305 - Standard for Panic Hardware; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Include details of electrified door hardware and wiring diagrams.

C. Samples: For each exposed finish.

D. Door Hardware Schedule: Organized into door hardware sets indicating type, style, function, size, label, hand, manufacturer, fasteners, location, and finish of each door hardware item. Include description of each electrified door hardware function, including sequence of operation.

E. Keying Schedule: Detail Owner's final keying instructions for locks.

F. Product certificates.

1.04 QUALITY ASSURANCE

A. Supplier Qualifications: Person who is or employs a qualified DHI Architectural Hardware Consultant.

B. Source Limitations: Obtain electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that are listed to perform electrical modifications, by a testing and inspecting agency acceptable to authorities having jurisdiction, are acceptable.

C. Keying Conference: Conduct conference at Project site. Incorporate keying conference decisions into final keying schedule.

D. Pre-installation Conference: Conduct conference at project site.

E. Keys: Deliver keys to Owner by registered mail.

F. Templates: Obtain and distribute templates for doors, frames, and other work specified to be factory prepared for installing door hardware.

G. Standards: Comply with BHMA A156 series standards, Grade 1.

H. Certified Products: Provide door hardware that is listed in BHMA directory of certified products.

1.05 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 warranty period. Warranty includes materials and installation.

1. Warranty Period for Locks: 7 years from date of Contract Completion.
2. Warranty Period for Manual Closers: 10 years from date of Contract Completion.
3. Warranty Period for Exit Devices: 3 years from date of Contract Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Product: Subject to compliance with requirements, provide the product named for each door hardware item indicated in Door Hardware Sets.

B. Basis-of-Design Product: Product named for each door hardware item indicated in Door Hardware Sets establishes the basis of design. Provide either the named product or a comparable product by one of the manufacturers specified for each type of hardware item.

C. Manufacturers used in the specification: review for each project

PRODUCTS	MANUFACTURE SPECIFIED	ACCEPTABLE EQUALS
HINGES	MCKINNEY	HAGER, IVES
LOCKSETS	SARGENT	
CYLINDERS	SARGENT KESO	
EXIT DEVICES	VON DUPRIN 99 SERIES	SARGENT
CLOSERS	LCN 4041	
OVERHEAD STOPS	GLYNN JOHNSON	RIXSON, ABH
PUSH/PULLS, STOPS	IVES	HAGER, ROCKWOOD
FLUSHBOLTS	IVES	HAGER, ROCKWOOD
THRESHOLDS/SEALS	NATIONAL GUARD	HAGER, PEMKO
POWER TRANSFERS/SUPPLIES	VON DUPRIN	SARGENT
AUTO. OPERATORS	BESAM	

2.02 DOOR HARDWARE

A. Scheduled Door Hardware: Provide door hardware according to Door Hardware Sets at the end of Part 3. Manufacturers' names are abbreviated.

2.03 HINGES

A. General: 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:
   1. Exterior Hinges: Stainless steel, with stainless-steel pin.
   2. Interior Hinges: Steel, with steel pin.
   3. Hinges for Fire-Rated Assemblies: Steel, with steel pin.

C. Non-removable Pins: Provide set screw in hinge barrel that prevents removal of pin while door is closed; for out-swinging exterior doors.

D. Screws: Phillips flat-head screws; screw heads finished to match surface of hinges.
   1. Metal Doors and Frames: Machine screws (drilled and tapped holes).
   2. Wood Doors and Frames: Wood screws.

2.04 MECHANICAL LOCKS AND LATCHES

A. Mortise Locks
   1. Locks shall be BHMA A156.13, Grade 1 mortise locksets, Manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
   2. Locks to have a standard 2-3/4” backset with a full 3/4" throw stainless steel mechanical anti-friction latch bolt. Deadbolt shall be a full 1” throw, constructed of stainless steel.
   3. Lever trim shall be cast or forged in the design specified, with 2-1/8” diameter roses. Levers to be thru-bolted to assure proper alignment. Trim shall be applied by threaded

bushing “no exposed screws”.

B. Cylindrical Locks
   1. Locks shall be BHMA A156.2, Series 4000 Grade 1 UL Listed for 3-hour doors. Manufactured from heavy gauge cold rolled steel mechanisms that are corrosion treated for normal conditions.
   2. Locks to have standard 2-3/4” backset with a full 1/2" reversible dead latch. Thru-bolted mounting post for positive interlock to the door with concealed mounting screws.
   3. Lever trim shall be pressure cast zinc to match finishes. The design specified, with 3-7/16” diameter roses. Trim shall be applied by “no exposed screws”.

C. Lock Functions
   1. Keypad Cylindrical Locks – Sargent KP-77 series.
   2. Keypad Mortise series – Sargent #KP8200.
   3. Storeroom / Closet – Sargent #10G04.
   4. Entrance/Office – Sargent #10G05.
   5. Classroom – Sargent #10G37.
   6. Passage – Sargent #10U15.
   7. Privacy/Bathroom – Sargent #10U65.
   8. Keypad lockset – Sargent #KP10G77.
   9. Hospital Latch – Sargent #115 Push-Pull with 2-3/4 backset

2.05 BOLTS

A. Shall have forged bronze faceplate with extruded brass lever wrought brass guide and strike. Flush bolts for hollow metal doors shall be extension rod type door up to 7’6” in height shall have 12” steel or brass rods, manual flush bolts for doors over 7’6” in height shall be increased by 6” for each additional 6” of door height. Wood doors shall have corner-wrap type. Provide dust proof strikes for all bottom bolts.

2.06 EXIT DEVICES

A. Panic Exit Devices: Listed and labeled for panic protection, based on testing according to UL 305.

B. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled for fire and panic protection, based on testing according to UL 305 and NFPA 252.

C. All lever design shall match mortise or cylindrical lock lever designs as approved by Architect.

D. All devices to incorporate a security dead-latching feature. Provide roller strikes for all rim and surface mounted vertical rod devices, ASA strikes for mortise devices, and manufacturer’s standard strikes for concealed vertical rod devices.

E. Removable Mullions: BHMA A156.3.
   1. Fire-Exit Removable Mullions: Complying with NFPA 80 that are listed and labeled 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.

F. Carry-Open Bars: Provide carry-open bars for inactive leaves of pairs of doors, unless automatic or self-latching bolts are used.

2.07 CLOSERS

A. Surface-Mounted Closers
   1. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and back check.
   2. All closers will not be seen on the public side or hallway side of the door. The appropriate drop plate or mounting plates will be used as conditions dictate.
   3. Install with sex bolts.

2.08 PROTECTIVE TRIM UNITS

A. Protective Trim Units: Sized 2” inches less than door width on push side and 1” inch less than door width on pull side, by height scheduled or indicated. Fasten with exposed machine or self-tapping screws.

2.09 STOPS AND HOLDERS

A. Stops and Holders: Provide wall stops for doors, unless other type stops are scheduled or indicated. Where wall stops are not appropriate, provide overhead stops.

B. Silencers for Door Frames: Neoprene or rubber; fabricated for drilled-in application to frame.

2.10 DOOR GASKETING AND THRESHOLDS

A. Door Gasketing: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide non-corrosive fasteners for exterior applications and elsewhere as indicated.

2.11 KEYING

A. Match Owner’s existing keying system as directed by Owner. Schedule keying meeting with Owner. No keying work is permitted until keying meeting is completed.

2.12 AUTOMATIC DOOR OPERATOR

A. Description: Self-contained, low energy, electro-mechanical design. Powered open with spring force closing. Motor is to be off when door is in closing mode. Door can be manually operated with power on or off without damage to the operator.
   1. Operation: Manual/Automatic. Manual when pushed open; automatic when actuated by push button switch or card reader.
   2. Provide operator with the following variable adjustments complying with Standard ANSI A156.19.
      a. Opening Speed: 3 to 5 seconds.
      b. Closing Speed: 3 to 5 seconds.
      c. Time Delay Before Closing: 1.5 to 30 seconds.
   3. Opening and Closing Force (Measured 2" out from lock stile of door): Adjustable from 5 to 15 pounds of force to stop door when operating in either direction.
   4. Provide operator with feature to turn off opening force when door is stopped for one second. Door then begins to close. Operator immediately resets and will accept another opening signal.
   5. Cover: Extruded aluminum.
      a. Entrance Doors: Fluoropolymer finish to match door. See Section 08 41 13.
      b. Interior Doors: Clear anodized finish.
   6. Controls: Provide 6" diameter stainless steel push button switch with handicapped insignia. Locate where indicated.
   7. Electrical: 120 VAC, 60 cycle, 1 phase, 15 amp service to the operator.
   8. Manufacturer: BESAM (BES) SW200i Series.

B. Bollard: 6” x 6” x 42” high aluminum; clear anodized; similar to CURRAN ENGINEERING. Coordinate with recessed round push plate.

2.13 FABRICATION

A. Base Metals: Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials if different from specified standard.

B. Fasteners: Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated. Provide steel machine or wood screws or steel through bolts for fire-rated applications.

C. Spacers or Sex Bolts: For through bolting of hollow metal doors.

D. Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended Fasteners for Wood Doors."

E. Finishes: Comply with BHMA A156.18.

PART 3 EXECUTION

3.01 INSTALLATION

A. Examine doors and frames for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

B. Steel Door and Frame Preparation: Comply with DHI A115 series. Drill and tap doors and frames for surface-applied hardware according to SDI 107.

C. Wood Door Preparation: Comply with DHI A115-W series.

D. Mounting Heights: Comply with the following requirements, unless otherwise indicated:
   1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
   2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
   3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

E. Adjust and reinforce attachment substrates as necessary for proper installation and operation. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
   1. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Section 07 92 00 Sealants.

F. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with accessibility requirements.
   1. Door Closers: Adjust sweep period so that from an open position of 70 degrees, the door will take at least three seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

3.02 FIELD QUALITY CONTROL

A. Inspections: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

END OF SECTION 08 71 10

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SECTION 08 81 00
GLASS AND GLAZING

PART 1 GENERAL

1.01 SCOPE

A. Work Included: Provide glass and glazing for all exterior and interior openings as indicated on the drawings and specified herein. Work also includes the following:
   1. Glass for metal framed skylight systems.
   2. Unframed mirrors.
   3. Etch look decorative film.
   4. Interior manufactured extruded aluminum framing system for glass.
      a. Butt glazed type (glazed channel bottom and top frame).
   5. Back-painted glass panel assembly.

B. Work Not Included: Glass and glazing not provided under this Section are as follows:
   1. Framed Mirrors: Section 10 28 13.

1.02 RELATED SECTIONS

A. Sustainable Design Requirements: Section 01 81 13.

B. VOC Limits: Section 01 81 16.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM C1036 - Standard Specification for Flat Glass; 2021.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2019.

G. ASTM C1184 - Standard Specification for Structural Silicone Sealants; 2023.

H. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2022.

I. ASTM D785 - Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials; 2023.

J. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2017.

K. ASTM D1044 - Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion by the Taber Abraser; 2019.

L. ASTM D1822 - Standard Test Method for Determining the Tensile-Impact Resistance of Plastics; 2021.

M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

N. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

O. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

P. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

Q. GANA (GM) - GANA Glazing Manual; 2022.

R. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (Reaffirmed 2016).

S. IGMA TM-4000 - Insulating Glass Manufacturing Quality Procedures; 2002 (Reaffirmed 2007).

T. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.

U. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

V. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies; 2022.

1.04 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 thicknesses indicated or specified are minimums and are for detailing purposes only. Confirm glass thickness by analyzing project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet, as a minimum, the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E1300, according to the following requirements:
    a. Specified Design Wind Loads: 30 psf.
    b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical under wind action.
        1) Load Duration: 60 seconds or less.
    c. Probability of Breakage for Sloped Glazing: 1 lite per 1000 lites set more than 15 degrees off vertical and under wind and snow action.
        1) Load Duration: 30 days.
    d. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1", whichever is less.
        1) For monolithic glass lites, heat treated to resist wind loads.
        2) For insulating glass.
        3) For laminated glass lites.
    e. Minimum Glass Thickness for Exterior Lites" ¼".

C. Thermal Movements: 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.

1. Temperature Change (Range): 120° F, ambient; 180o F, material surfaces.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this project and who employs glass installers for this project who are certified under the National Glass A

B. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this project.

C. Fire-Rated Door Assemblies: Provide 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.

D. Safety Glass Standards: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.

1. Each lite shall bear permanent, non-removable label manufacturers designation of safety glazing standard for which it complies.

E. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or on at least one component lite of unit with appropriate certification label of Insulating Glass Certification Council (IGCC).

F. Allowable Tolerances: Thicknesses of glass specified are nominal; provide glass manufactured to tolerances listed in GANA (GM).
1. Interior Glass Partition Thickness: Provide recommended minimum thickness for fully tempered glass used in fixed interior panels mounted or restrained at top and bottom or fully captured systems as required.

G. Fire- Rated Glass: Each lite shall bear permanent, non-removable label of UL certifying it for use in tested and rated fire protective assemblies.

H. Fire-Rated Window Assemblies: Provide 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 257.

1.06 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of glass, glazing sealants and accessories required.
1. Indicate structural, physical and environmental characteristics, size limitations, special handling requirements, etc.

B. Submit insulating glass manufacturer's certification indicating units meet or exceed specified requirements.

C. Submit laminated glass manufacturer's certification indicating units meet or exceed specified requirements.

D. Shop Drawings: Required data for shop drawings on glazing may be incorporated with shop drawings for framing members. Show thicknesses of glass; proposed "bites" in frames, sizes and locations of blocks, clips, beads, stops edge treatments; note quality, type and strength of each lite.
1. Butt glazed type (extruded aluminum glazed channel bottom and top systems).
a. Include complete elevations of all systems, details and methods of anchorage, details of construction, finishes, methods of assembly, location and installation of hardware and reinforcement for same, size, shape and thickness of materials, joints and connections, details of joining with other work.
2. Back-painted glass panel assembly.
a. Design and include complete elevations of all systems, details and methods of anchorage, details of construction, finishes, methods of assembly, location and installation of hardware and reinforcement for same, size, shape and thickness of materials, joints and connections, details of joining with other work.

E. Samples: Submit and obtain approval of samples before proceeding with glass fabrication. Minimum two 12" x 12" samples of each glass type required, except clear monolithic glass. Submit color samples of exposed sealants and/or gaskets.

F. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle glazing materials in accordance with manufacturer's recommendations to prevent damage and deterioration.

B. Various items to receive glazing as specified elsewhere may be factory-glazed or site-glazed at Contractor's option.

C. Deliver glazing compounds and sealants in manufacturer's unopened labeled containers.

D. Deliver glass with manufacturer's labels intact. Do not remove labels until glass has been installed.

1.08 PROJECT CONDITIONS

A. Field verify measurements and conditions of installations.

B. Examine all details. Provide proper fitting for details indicated.

C. Do not perform work under adverse weather or job site conditions. Install liquid sealants when temperatures are within lower or middle third of temperature range recommendations by manufacturer.

D. Protect work from damage during and after installation until project acceptance.

1.09 WARRANTY

A. Contractor to guarantee work under this Section against defects of materials, fabrication and installation. Guarantee period is one year, except where specified otherwise. Defects include, but are not necessarily limited to:
   1. Weather tightness: Two (2) year warranty.

B. Insulating Glass: Submit manufacturer's written warranty that for ten (10) years from date of substantial completion, a replacement will be provided (furnished and installed) for any unit which develops edge separation, thermal stress cracks, or other defects which materially obstruct vision through the glass or affect thermal and physical integrity of insulating glass units, except warranty shall not cover glass breakage from other than natural causes. Defective units shall be replaced at no additional cost to the Owner.

C. Coated Glass: Submit manufacturer's written warranty that for five (5) years from date of substantial completion, a replacement will be provided for defective units. Defects are defined as peeling, cracking or deterioration in coating due to normal conditions and not due to handling or installation contrary to glass manufacturer's published instructions. Defective units shall be replaced at no additional cost to the Owner.

D. Laminated Glass: Submit manufacturer's written warranty that for five (5) years from date of substantial completion a replacement will be provided for laminated glass having manufacturing defects which result in edge separation or other defects which materially obstruct vision through the glass. Defective units shall be replaced at no additional cost to the Owner.

E. Mirror: Submit manufacturer's ten (10) year warranty against silver spoilage. A replacement will be provided for mirrors that develop visible defects. Defective units shall be replaced at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturers and Fabricators: Specifications herein are based on glass and materials manufactured or fabricated by the following companies. Not all firms listed manufacture or fabricate all the items specified herein. However, to ensure consistent quality of appearance and performance, provide each type or kind of glass or material from a single source. Manufacturers for specialty products are listed within the specification to establish a particular type, color, pattern, etc. Equal products by the manufacturers listed are acceptable providing they meet the type, color, pattern, etc. as approved by the Architect.
   1. Manufacturers
      a. AGC FLOAT GLASS NORTH AMERICA
      b. VITRO
      c. GUARDIAN INDUSTRIES
      d. SAINT GOBAIN
   2. Fabricators
      a. VIRACON
      b. OLDCASTLE BUILDINGENVELOPE
      c. ARCH ALUMINUM & GLASS LLC

d. TRULITE GLASS AND ALUMINUM

2.02 PRIMARY FLOAT GLASS

A. Conformance: Type I, Class 1 for clear glass, Class 2-tinted heat-absorbing and light-reducing; Class 3 for tinted, light-reducing glass, Quality q3, conforming to ASTM C1036.

B. Thickness: 1/4", unless otherwise indicated.

C. Color: Clear.
   1. When used in insulating units, provide color specified under each insulating unit.

2.03 HEAT TREATED FLOAT GLASS

A. Conformance: Condition A, Kind FT, Type I, Class 1 for clear glass, Class 2-tinted heat-absorbing and light-reducing; Class 3 for tinted, light-reducing glass, conforming to ASTM C1048.
   1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
   2. Roll Wave Maximum Distortion Tolerance: 0.003 inch (0.08 mm) target with 0.005 inch (0.13 mm) maximum peak to valley measurement.
   3. Bow and Warp Maximum Tolerance: 50 percent of the maximum allowed in ASTM C1048.

B. Thickness: 1/4", unless otherwise indicated.

C. Color: Clear.
   1. When used in insulating units, provide color specified under each insulating unit.

D. Locations: Safety glazing locations as designated and required by applicable code(s) and where indicated.

2.04 COATED FLOAT GLASS

A. General: Provide coated glass complying with this article and in schedules at the end of Part 3.

B. Low E, Sputter Coated Float Glass: Float glass with metallic-oxide or metallic nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), complying with requirements specified in schedules at end of Part 3.

C. Coated Spandrel Float Glass:
   1. General: Heat treated with ceramic frit color coating fused to inside surface.
   2. Conformance: Condition B, Kind FT Kind HS, Type I, Class 1, conforming to ASTM C1048.
   3. Thickness: 1/4", unless otherwise indicated.
   4. Color: As selected by Architect.

2.05 WIRE GLASS

A. Wire Glass: USE PROHIBITED.

2.06 LAMINATED GLASS

A. Conformance: Kind LHS conforming to ASTM C1172 "Laminated Architectural Flat Glass" and ANSI Z97.1.ASTM C1172 - Kinds: LA - 2 lites annealed transparent C1036; LD - 2 lites 1 or both decorative C1036 or C1048 or both; LHS - 2 lites both heat-strengthened C1048; LM - 2 lites 1 or both are mirrored; LP - 2 lites 1 or both are patterened; LR - 2 lites 1 or both are reflective C1036 or C1048 or both; LSP - 2 lites 1 or both is spandrel C1036 or C1048 or both; LT - 2 lites both tempered C1048; LW - 2 lites wire C1036; LX - Combinations not previously mentioned.
   1. Kind LHS conforming to ASTM C1172 "Laminated Architectural Flat Glass" and ANSI Z97.1.

B. Thickness: Each pane 1/8" inch. (Total thickness equals both panes plus interlayer).

C. Thickness
   1. Interior: Each pane 1/8" inch. (Total thickness equals both panes plus interlayer).

2. Skylight: Each pane 1/4" inch.

D. Interlayer: As indicated below; clear or in colors/patterns indicated; with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation. Provide interlayer type as recommended by manufacturer for application intended (safety, decorative, security, structural or acoustical).
   1. Manufacturer: KURARAY Trosifol or approved equal.

E. Laminating Process: Fabricate to produce glass free of foreign substances and air or glass pockets as follows:
   1. Laminate lites with polyvinyl butyral interlayer in autoclave with heat plus pressure.

2.07 INSULATING GLASS

A. Sealed Insulating Glass: General: Provide preassembled units consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E2190 for performance classification indicated as well as with other requirements specified for glass characteristics, air space, sealing system, sealant, spacer material, corner design and desiccant.
   1. For properties of individual glass making up units, refer to requirements specified in schedule at the end of Part 3 as applicable to types, kinds, classes and conditions.
   2. 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 to comply with glass design requirements. Provide Kind FT (fully tempered) where safety glass is indicated or required.

B. Warm Edge Spacer Construction: Combination of stainless steel and polypropylene. Double sealed with a primary seal of polyisobutylene and a secondary seal of silicone. Delete low-E coating prior to fabrication of insulating units according to coated glass manufacturer's instructions.
   1. Spacer to be black; clear aluminum color not permitted.

2.08 MISCELLANEOUS GLASS TYPES

A. Unframed Mirror
   1. Description: Clear float glass conforming with ASTM C1036, Type 1, Class 1, Quality q2, with full silver coating, copper coating and protective back coating.
   2. Film Backing for Safety Mirrors: Film backing and pressure-sensitive adhesive; both compatible with mirror backing paint as certified by mirror manufacturer.
   3. Thickness: 1/4".
   4. Size: As indicated on schedule.
   5. Adhesive: Type as recommended by mirror manufacturer produced specifically for setting mirrors by spot application on all types of substrates encountered. PALMER PRODUCTS CORPORATION "Mirro-Mastic", SOVEREIGN SPECIALTY CHEMICAL "Nail Power Mirror Mastic, ROYAL ADHESIVES & SEALANTS "Gunther Pro".

B. One-Way Vision Glass: Clear ¼" thick float glass with stainless steel metalic coating on viewer side. Transparent Mirror by GUARDIAN or equal.

C. Fire-Rated Glass
   1. 20 Minute - For use in 20 minute rated doors only. Superlite I manufactured by SAFTI FIRST, PyroEdge-20 by AGC GLASS COMPANY, SGG Pyroswiss US by Vetrotech SAINT GOBAIN or Fireglass 20 by Technical Glass Products. ¼" thick tempered glass with a 20 minute fire-rating.
   2. 45 Minute - For use in 45 minute door and window applications. Superlite II-XL manufactured by SAFTI FIRST, Pyrobel by AGC GLASS COMPANY, SGG Swissflam-45 by Vetrotech SAINT GOBAIN or Pyrostop by PILKINGTON. ¾" thick unit comprised of inboard and outboard tempered lites protecting a fire resistive interlayer.
   3. 60 or 90 minute Doors - For use in 60 or 90 minute door applications, must comply with CPSC Category I and limited to 100 square inches in size. Superlite X-90 manufactured by SAFTI FIRST, Pyran Platinum L by SCHOTT, SGG Keralite FR-L by Vetrotech SAINT

GOBAIN or Firelite Plus by Technical Glass Products. ¾" thick safety rated glass.

4. 60, 90 or 120 Minute - For use in 60, 90, or 120 door/window/wall applications, must comply with ASTM E119 requirements as a barrier to radiant heat. Superlite II-XL manufactured by SAFTI FIRST, Pyrobel by AGC GLASS COMPANY, SGG Contraflam by Vetrotech SAINT GOBAIN or Pyrostop by PILKINGTON. 1" to 1-1/2" in thickness depending on rating, unit comprised of inboard and outboard tempered lites protecting a fire resistive interlayer. For use in Fire-Resistive framing from glass manufacturer only, standard hollow metal is not acceptable.
5. 180 Minute Doors - For use in 180 minute door applications, must comply with CPSC Category I and limited to 100 square inches in size. Pyran Platinum F fabricated by SAFTI FIRST, Pyran Platinum F by SCHOTT or FireLite NT by Technical Glass Products. Nominal ¼" thick polished ceramic glazing with impact film applied to one side.
6. All fire-rated glazing to have Logo: Each piece of fire-rated glazing shall be labeled with a permanent logo including name of product, name of manufacturer, testing laboratory, fire rating period, and safety glazing standards.

D. Obscure Tempered Glass (Patterned)
   1. Reference: ASTM C1036, Type II, Class 1, Form 3, Quality q8, Finish f1, Pattern p3.
   2. Thickness: ¼ inch.
   3. Amount of pattern or frost as approved by Architect.

2.09 BACK-PAINTED GLASS PANEL ASSEMBLY.

A. Glass Reference: ASTM C1036 and ASTM C1048, heat treated HS with polished square edges.
   1. Low - Iron Back Painted Glass: Painted on one surface and highly opaque, silk screened with ceramic frit, or roller coat, or sprayed.
   2. Thickness: ¼"
      a. Color and Manufacturer: As indicated. Equals by GENERAL GLASS INTERNATIONAL, BENDHIEM, ELEMENTS DESIGN acceptable upon Architects approval.

B. Installation: In configurations shown, provide tape adhered extruded aluminum z-clip or direct tape adhered to wall substrate method.
   1. Z-Clip: 6063-T6 aluminum. Provide all fastening as required.
   2. Tape: High-strength, double-sided acrylic foam 0.063" thick. 3M VHB or equal.
      a. Apply tape and to the outside perimeter of the backpainted glass panel (1/2" from the edge) around all sides. Select tape designed for the type of substrate being bonded and weight of the glass.
      b. Tape Primer: As recommended.

2.10 ACRYLIC PANELS

A. Laminated unfilled acrylic with embedding material manufactured by 3FORM DESIGNTEX, LIGHTBLOX
   1. Performance Properties
      a. Tensile Strength – ASTM D638: 10,000 psi (68947.60 kPa).
      b. Flexural Strength – ASTM D790: 14,600 psi (100663.50 kPa).
      c. Abrasion Resistance – ASTM D1044
      d. 10 Cycles: Haze 15%
      e. 200 Cycles: Haze 50%
      f. Hardness (Rockwell) – ASTM D785: M-93.
      g. Tensile Impact Strength – ASTM D1822: 20 feet (609.6 cm) lbs./in2.
   2. Thickness: As detailed on the drawings.
   3. Frost type pattern; as selected by Architect.

2.11 GLAZING MATERIALS AND ACCESSORIES

A. Glazing Sealants and Compounds: General: Provide materials that comply with Project Sustainable Design Requirements and Low Emitting Material goals.
   1. Comply with manufacturer's recommendations for selection of hardness. Select materials and variations or modifications for compatibility with surfaces contacted in the installation.
   2. Exterior Glazing: Compatible with one another and with other materials they 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. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
      a. Glazing Sealant: One-part neutral-curing silicone glazing sealant, ASTM C920 Class A, Type S, Grade NS, Class 100/50, Use NT; for high movement joints at metal-to metal and glass to metal.
         1) Dow Corning Corporation; 790
         2) GE Advanced Materials - Silicones; SilPruf LM SCS2700
         3) Pecora Corporation; 890
         4) Tremco Incorporated; Spectrem 1
      b. Glazing Sealant: One-part neutral-curing silicone glazing sealant, ASTM C920, Type S, Grade NS, Class 50, Use NT; for general applications in glazing installation subject to high movement including perimeter; use non-staining formula at absorbent perimeter applications
         1) DOW CORNING CORPORATION; 795 or 756 SMS
         2) GE ADVANCED MATERIALS -SILICONES; SilPruf NB SCS9000 or SilPruf SCS2000
         3) PECORA CORPORATION; 864
         4) TREMCO INCORPORATED; Spectrem 2
      c. Glazing Sealant: One-part neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 25, Use NT; for general applications in glazing installation including perimeter; use non-staining formula at absorbent perimeter applications.
         1) DOW CORNING CORPORATION; 791
         2) GE ADVANCEDMATERIALS-SILICONES; UltraGlaze SSG4000 or UltraGlaze SSG4000AC
         3) TREMCO INCORPORATED; Proglaze SSG or Tremsil 600
      d. Structural Glazing Sealant: ASTM C1184, chemically curing silicone formulation that is 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 glazing assembly indicated.
         1) DOW CORNING CORPORATION; 995.
         2) GE ADVANCED MATERIALS -SILICONES; UltraGlaze SSG4000.
         3) PECORA CORPORATION; 896.
         4) TREMCO INCORPORATED; Proglaze SG.
   3. Interior Glazing: Compound of polymerized butyl rubber and inert fillers, with or without polyisobutylene modification, solvent based, 95% solids, formed and coiled on release paper, tack-free in 24 hours, paintable, non-staining.

B. Miscellaneous Glazing Materials
   1. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
   2. Setting Blocks: Neoprene or EPDM, 80-90 durometer hardness, with proven compatibility with sealants used.
   3. Spacers: EPDM, 40-50 durometer hardness with proven compatibility with sealants used.

4. Compressible Filler (Rod): Closed cell or waterproof jacketed rod stock of synthetic rubber or plastic form, compatible space with sealants used, flexible and resilient, with 5-10 psi (68.95 kPa) compression strength for 25% deflection.

C. Glazing Film: Translucent, dimensionally stable, cast PVC film, 2-mil- minimum thickness, with pressure-sensitive, clear adhesive back for adhering to glass and releasable protective backing. Ensure components and materials are compatible with specified accessories and adjacent materials
   1. Manufacturer: Fasara Interior Design Film manufactured by 3M ENERGY CONTROL PRODUCTS or equal by VISTA FILMS, CP FILMS, EASTMAN PERFORMANCE FILMS - SOLUTIA or DECORATIVE FILM, LLC.
   2. Design: Etched glass appearance. Amount of etch look as selected by Architect from manufcaturers full range. Selection to be in the 50% range.
   3. Adhesive: Clear, pressure sensitive, permanent adhesive.
   4. Provide die-cut pattern, graphic or letters that complies with requirements indicated.

D. Applied Safety Glazing Film: Provide safety glazing film meeting ANSI Z97.1, Section 5.1 for impact resistance and ASTM E84 for surface burning characteristics.
   1. EXAMPLE - Apply to corridor side of all existing glass at list rooms, corridors
   2. EXAMPLE - Apply to existing glass entrance doors.
   3. 3M Scotchshield Ultra Film; SHATTERGARD INC. Safety Glazing Film; LLUMAR Window Film; BEKAERT SPECIALTY FILMS.

2.12 GLAZING SYSTEM - BUTT GLAZED

A. Type: An integrated system of extruded aluminum sections, glazing devices, sealing devices.

B. Framing: C.R.L - BLUMCRAFT C-7500 with surface mounted base channel.
   1. Sizes: 2” head and 1” sill with anchors as required.
   2. Section Wall Thickness: .125" for major components; 0.05" for glazing moldings.
   3. Provide complete with setting blocks and gaskets.
   4. Glazing: 3/8" tempered minimum.
   5. Complete fabrication, assembly, finishing, and other Work to the greatest extent possible before shipment.

C. Other Manufacturers: Subject to compliance with the specified requirements and the design intent indicated, provide products manufactured by C.R.L - BLUMCRAFT, OLDCASTLE, DORMAKABA., ACI GLASS PRODUCTS, DORALCO ARCHITECTURAL METAL SOLUTIONS or VIRGINIA GLASS

D. Preformed Glazing Strip: C.R.L. Clear Copolymer EZCC10.

E. Accessories: All fasteners gaskets, sealants and tapes required for complete system.

F. Anchors and Fastenings: Manufacturer's standard concealed anchors and fastenings. Do not use exposed fasteners.

2.13 FABRICATION

A. General: Fabricate glass and other glazing products in sizes required to glaze openings indicated, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.
   1. Glass Thickness: Design analyze and comply with published recommendations of glass product manufacturers and organizations listed herein.

B. Glass Cutting: Cut glass to accurate sizes and shapes as indicated on drawings. Allow edge clearances and tolerances in accordance with GANA (GM) recommendations.
   1. Edges: Provide factory-cutting and factory-formed edges for all butt-glazed, heat tempered and insulating glass. Provide ground edges for all drilled holes, notches and other fabrication or finishing techniques.
   2. Butt-Glazed Systems: All work in accordance with manufacturer’s recommendations.

a. Edges Exposed to Air: Polished finish.
b. Edges Receiving Sealant: “Suede” finish.
c. Concealed Edges: Factory option.

C. Heat Strengthened and Tempered Glass
1. Heat Strengthened: Heat treated to strengthen glass in bending to not less than 2.0 times annealed strength for the strengthened glass.
2. Tempered: Heat treated to strengthen glass in bending to not less than 4 to 5 times annealed glass strength for the strengthened glass.
3. 3Cut glass to required size before tempering. Comply with Glass Tempering Association recommendations.
4. Provide tongless tempered glass. When size limitations require tong edges, support each piece during tempering process so that tong marks will be concealed in the glazed system.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates, substructure and installation conditions. Do not proceed with glazing work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PROTECTION AND PREPARATION

A. Protect glass from edge damage during handling and installation. Remove and legally dispose damaged glass off of the project site. Damaged glass is defined as glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and/or appearance.

B. Do not cut, seam, nip or abrade tempered glass.

C. Inspect each piece of glass immediately before installation and eliminate any which have observable edge damage or face imperfections.

D. Unify appearance of each series of lights by setting each piece to match other pieces, as nearly as possible. Inspect each piece and set with pattern, draw, and bow oriented in same direction as other pieces.

E. Clean glazing channels and other framing members to receive glass immediately before glazing. Remove loose coatings. Apply primer to joint surfaces receiving sealants when recommended by sealant manufacturer.

3.03 INSTALLATION - GENERAL

A. Comply with combined recommendations and technical reports of manufacturer's of glass and glazing materials used with GANA (GM), except when more stringent requirements are indicated.

B. Install insulating units to comply with recommendations by IGMA TM-3000 and IGMA TM-4000, except as otherwise specifically indicated or recommended by glass and sealant manufacturers.

C. Glazing channel dimensions shown are intended to provide for necessary bite on glass, minimum edge clearance and adequate sealant thickness, with reasonable tolerance. Adjust as required by job conditions at time of installation.

D. Install setting blocks in sill rabbets, properly 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.

E. Install primers, sealants, tapes, and gaskets in accordance with manufacturer's recommendations. Set glass without springing and install securely to prevent rattling or breakage.

F. Where wedge-shaped gaskets are driven into one side of the channel to pressurize the sealant or gasket on the opposite side, provide adequate anchorage to ensure gasket will not "walk" out when subjected to dynamic movement. Anchor gasket to stop with matching ribs, or by proved adhesives, including embedment of gasket tail in cured heal bead.
   1. Miter cut and bond gasket ends together at corners where gaskets will not pull away from corners and result in voids or leaks in the glazing system.

G. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

H. Coordinate aluminum framing systems work with other work for proper sequence of construction. Verify dimensions of supporting structure and other elements which precede wall system work before fabrication of required components. Provide for erection tolerances for other work where field measurements cannot be obtained.

I. Glazing Film: Apply in accordance with film manufacturers written instructions for adhesive set application. Apply uniformly smooth, and free from tears, air bubbles, wrinkles, and rough edges, in pattern indicated on Drawings to the back face of clean glass, according to manufacturer's written instructions, including surface preparation and application temperature limitations.

3.04 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. BInstall tapes edge-to-edge, but not necessarily in one continuous length. Do not stretch tapes to make them fit openings.

C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these 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. 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.

3.05 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance 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 gaskets 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.

3.06 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 sealant to provide a substantial wash away from glass.

3.07 PROTECTION AND CLEANING

A. Protect glass from breakage immediately upon installation by attachment of streamers to framing held away from glass. Do not apply markers of any type to surfaces of glass. Remove non-permanent labels and clean surfaces.

B. Maintain glass in a reasonable clean condition during construction so that it will not be damaged by corrosive action, and will not contribute (by wash off) to the deterioration of glazing materials and other work. Remove and replace glass which is broken, chipped, cracked, abraded, or damaged in other ways during construction period, including natural causes, accidents and vandalism.

C. Wash and polish on both faces not more than four days before acceptance of the work. Comply with glass manufacturer's recommendations for final cleaning.

END OF SECTION 08 81 00

SECTION 08 83 00
MIRRORS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following types of silvered flat glass mirrors.
   1. Annealed monolithic glass mirrors.
   2. Tempered monolithic glass mirrors.

1.02 RELATED SECTIONS

A. Glass and Glazing: Section 08 81 00.

B. Section 10 28 13: Toilet Accessories (Framed Mirrors).

C. Sustainable Design Requirements: Section 01 81 13.

D. VOC Limits: Section 01 81 16.

1.03 DEFINITIONS

A. Deterioration of Mirrors: Defects developed from normal use that are attributable to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning mirrors contrary to mirror manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1.04 PERFORMANCE REQUIREMENTS

A. Provide mirrors that will not fail under normal usage. Failure includes glass breakage and deterioration attributable to defective manufacture, fabrication, and installation.

1.05 SUBMITTALS

A. Shop Drawings: Include mirror elevations indicating vertical joint layout, edge details, mirror hardware, and attachments to other work.

B. Samples: For each type of mirror product required, in the form indicated below:
   1. Mirrors, 12 inches square, including edge and frame treatment on 2 adjoining edges.

C. Product Certificates: For each type of mirror and mirror mastic, signed by product manufacturer.

D. Qualification Data: For Installer.

E. Mirror Mastic Compatibility Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing film and substrates on which mirrors are installed.

F. Warranty: Special warranty specified in this Section.

G. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed mirror glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in mirror installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under NGA's Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

B. Source Limitations for Mirrors: Obtain mirrors from one source for each type of mirror indicated.

C. Source Limitations for Mirror Glazing Accessories: Obtain mirror glazing accessories from one source for each type of accessory indicated.

D. Glazing Publications: Comply with the following published recommendations:

1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
2. GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

E. Safety Backed Mirrors: For annealed mirrors applying a sheet of adhesive backed polyethylene material to the back per CPSC 16 CFR 1201 and ANSI Z97.1 standards.

F. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing film and various substrates on which mirrors are installed.

1.07 REFERENCE STANDARDS

A. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

B. ASTM C1036 - Standard Specification for Flat Glass; 2021.

C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

D. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2024.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide mirrors by one of the following:
1. ARCH ALUMINUM & GLASS CO., INC.
2. GARDNER GLASS PRODUCTS.
3. GUARDIAN INDUSTRIES CORP.
4. LENOIR MIRROR COMPANY.
5. VIRGINIA MIRROR COMPANY, INC.

2.02 SILVERED FLAT GLASS MIRROR MATERIALS

A. Tempered Clear Glass Mirrors: Comply with ASTM C1503, Mirror Glazing Quality, for blemish requirements in annealed float glass before silver coating is applied, for coating requirements, and with other requirements not affected by tempering process; and comply with ASTM C1048 for Kind FT, Condition A, tempered float glass before silver coating is applied.
1. Nominal Thickness: ¼".

B. Annealed Clear Glass Mirrors: Comply with ASTM C1503, Mirror Glazing Quality; clear float glass conforming with ASTM C1036, Type 1, Class 1, Quality q^2.
1. Nominal Thickness: ¼".

2.03 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastomeric material with a Type A Shore durometer hardness of 85, plus or minus 5.

B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

C. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. GUNTHER MIRROR MASTICS.
b. PALMER PRODUCTS CORPORATION.
c. FRANKLIN INTERNATIONAL; TITEBOND

2. Adhesive shall have a VOC content of not more than 70 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.
   1. Bottom: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than 0.04 inch.
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) EPCO Model 2010.
         2) C. R. LAURENCE Standard J-Channel
         3) SOMMER and MACA INDUSTRIES Aluminum Shallow Nose "J" Moulding Lower Bar.
   2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch in height, respectively, and a thickness of not less than 0.04 inch.
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) EPCO Model 2013
         2) C. R. LAURENCE Deep J-Channel
         3) SOMMER and MACA INDUSTRIES Aluminum Deep Nose "J" Moulding Upper Bar.
   3. Finish: Clear anodized.
   4. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

2.04 FABRICATION

A. Mirror Sizes: To suit Project conditions, and before tempering, cut mirrors to final sizes and shapes. See drawings for sizes. At wall-to-wall conditions, field verify dimensions prior to fabricating mirrors.

B. Cutouts: Fabricate cutouts before tempering for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

C. Mirror Edge Treatment: Flat polished.
   1. Seal edges of mirrors after edge treatment to prevent chemical or atmospheric penetration of glass coating.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance.
   1. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.
   2. Proceed with mirror installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.02 PREPARATION

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating surfaces with mastic manufacturer's special bond coating where applicable.

3.03 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

B. Provide a minimum air space of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. For wall-mounted mirrors, install mirrors with [mastic and] mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
   1. Top and Bottom Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel
   2. Install mastic as follows:
      a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
      b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
      c. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8 inch between back of mirrors and mounting surface.

3.04 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

END OF SECTION 08 83 00

SECTION 08 91 19
FIXED LOUVERS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2023.

C. AMCA 511 - Certified Ratings Program Product Rating Manual for Air Control Devices; 2021, with Editorial Revision (2022).

D. AMCA 550 - Test Method for High Velocity Wind Driven Rain Resistant Louvers; 2022.

E. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

F. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.

G. NAAMM AMP 500-06 - Metal Finishes Manual; 2006.

H. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.02 SCOPE

A. Provide wall louvers as indicated. All louvers on exterior of building to be provided under this Section.

1.03 RELATED SECTIONS

A. Sealant: Section 07 92 00.

B. Sustainable Design Requirements: Section 01 81 13.

1.04 QUALITY ASSURANCE

A. Performance Requirements: Provide units whose performance ratings have been determined in compliance with AMCA 500-L and AMCA 511 .

B. Water Penetration and Free Area: Meet AMCA 550 Standard for louvers specified.

C. Wind Load: Design louvers and supports for 20 pounds per square foot wind load.

D. Comply with SMACNA (ASMM) recommendations for fabrication, construction details and installation procedures, except as otherwise indicated.

E. Field Measurements: Verify size, location and placement of louver units prior to fabrication wherever possible.

F. Shop Assembly: Coordinate field measurements with fabrication and shop assembly.

G. Factory painted finish to be performed by an applicator specifically approved by paint manufacturer. The applicator shall provide written notification of approval by paint manufacturer prior to application of the finish.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's specifications; certified test data, where applicable; and installation instructions for required products, including finishes.

B. Shop Drawings: Submit plans, elevations and details of sections and connections to adjoining work. Indicate materials, finishes, fasteners, joinery and other information to determine compliance with specified requirements.

C. Samples: Submit three samples, 6" square, of each required aluminum fluoropolymer finish. Prepare samples on metal of same gage and alloy to be used in the work.

D. Samples: Submit finish samples showing the light and dark range limits of the anodizing color. These finish samples will be used in the field as a check for items specified in this Section. Anodized items whose color does not fall within the range indicated by these samples are unacceptable and shall not be used in the finished work.

E. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aluminum Sheet: ASTM B209/B209M, Alloy 3003 or 5005 with temper as required for forming or as otherwise recommended by the metal producer to provide the required finish.

B. Aluminum Extrusions: ASTM B211/B211M, Alloy 6063-T5, 6063-T6 or 6061-T6.

C. Fasteners: Stainless Steel, 300 series.

D. Anchors and Inserts: Use non-ferrous metal anchors and inserts for exterior installation.

E. Bituminous Paint: Acid and alkali resistant solvent type black bituminous mastic.

2.02 FABRICATION, GENERAL

A. Provide louvers and accessories of design, materials, sizes, depth, arrangement and metal thicknesses indicated, or if not indicated, as required for optimum performance with respect to airflow; water penetration; strength; durability and uniform appearance as suited to applications shown and intended use.

B. Fabricate frames including integral sills to suit adjacent construction with adequate tolerances for installation including application of sealant in joints between louvers and adjoining work, where applicable.

C. Include supports, anchorages and accessories required to achieve a complete assembly, properly installed.

D. Provide sill extensions and loose sills made of same material as louvers, where indicated or required, for drainage to exterior and to prevent water penetrating to interior.

E. Glazing Adapter: Where louvers are combined with storefront or curtainwall assemblies, provide manufactures recommended 0.081 inch (2.06 mm). thick 6063T5 extruded aluminum glazing adapter at louver perimeter. Coordinate gasketing and sealants for complete installation.

F. Join frame members to one another and to stationary louver blades by field bolted connections made necessary by size of louvers. Maintain equal blade spacing including separation between blades and frames at head and sill to produce a uniform appearance.

G. Provide hinged louver section where indicated. Hinged panel to appear as frameless from building exterior. Louver blades on hinged section to align with fixed panels at jambs.
   1. Hinge: Minimum .093” thick aluminum; 3” continuous type’ ¼” diameter pin. Finish to match louver blades. Provide with 6” stainless steel screws at maximum 6” on center.
   2. Lock: Provide aluminum plates, shaped and located as detailed on the drawings. Padlock provided by University.
   3. Finish: Finish all exposed surfaces of hinged louver section to match louver blades.

2.03 STATIONARY EXTRUDED ALUMINUM WALL LOUVERS

A. Horizontal Blade Louvers: Size and depth indicated, with blades of profile, slope and spacing indicated, or if not indicated, to meet performance requirements.
   1. Heads, sills, jambs and mullions to be one piece structural aluminum members with integral caulking slot and retaining beads. Mullions shall be sliding interlock with internal drains. Blades to be one piece aluminum extrusions with gutters designed to catch and direct water to jamb and mullion drains. Compression gaskets shall be provided between

bottom of mullion or jamb and top of sill to insure leak tight connections.

2. Extrusion Thickness: Not less than .081" for blades.
   a. Heads, and sills: 0.060”, jambs and mullions: 0.125”
3. Furnish units complying with following AMCA performance requirements.
   a. Free Area: Not less than 45%.
   b. Water Penetration: Not more than 0.01 oz. per square foot of free area at an minimum intake airflow of 1000 fpm free area velocity.

B. Manufacturer and Type: Provide louver vane profile to match CONSTRUCTION SPECIALTIES A6177 or equal by AIROLITE; AIRLINE; ARROW; INDUSTRIAL LOUVERS; AMERICAN WARMING AND VENTALATING; RUSKIN.

2.04 LOUVER SCREENS

A. Provide screens for exterior louvers.

B. Fabricate screen frames of the same metal and finish as the louver units to which secured, unless otherwise indicated.

C. Provide frames consisting of U-shaped metal for permanently securing screen mesh.

D. Screens to be 18 x 16 aluminum mesh 0.011” (0.279mm) diameter wire insect screens secured within 0.055” (1.40mm) thick extruded aluminum frames. Frames to have mitered corners and corner locks.

E. Locate screens on inside face of louvers. Secure screens to louver frames with machine screws, spaced at each corner and at 12" o.c. between.

2.05 BLANK-OFF PANELS

A. Blank-Off Panels: Laminated panels consisting of rigid extruded polystyrene or polyurethane insulation core and .032 aluminum facing sheets.
   1. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080-inch nominal thickness, with corners mitered and with same finish as panels.
   2. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
   3. Furnish where indicated on the drawings blank-off panels fabricated by louver manufacturer.
   4. Finish: Provide with finish to match louvers.

2.06 METAL FINISHES

A. Aluminum Finishes: Fluoropolymer finish containing not less than 70% PVDF (Kynar 500) resins; "Trinar" by AKZO; "Duranar" by PPG; "Fluropon" by VALSPAR. Total dry film thickness not less than 1.0 mils (0.0254 mm), or coatings meet or exceed the requirements of AAMA 2605.
   1. Color: As selected by Architect from paint manufacturer’s complete specified line.
   2. Application: Apply coating systems in strict accordance with manufacturer's printed instructions and recommendations. Refer to Quality Assurance in Part 1.

B. Finish: Fluoropolymer finish with Kynar 500 (70%) resins. See section 05 05 13.

C. Aluminum Finishes: Comply with NAAMM AMP 500-06 for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory after products are assembled. Protect finishes on exposed surfaces with protective covering, prior to shipment. Remove all scratches and blemishes from exposed surfaces which will be visible after completing finishing process.
   1. Finish: All exposed aluminum surfaces shall receive an Architectural Class 1, medium bronze anodized coating; AA-M12C22A42, minimum 0.7 mil (0.01778 mm) thickness.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and openings, with Installer present, 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. Coordinate setting drawings, diagrams, templates, instructions and directions for the installation of anchorages which are to be embedded in concrete or masonry construction. Coordinate the delivery of such items to the project site.

3.03 INSTALLATION

A. Locate and place louver units plumb, level and in proper alignment with adjacent work.

B. Use concealed anchorages wherever possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealant and joint fillers as indicated.

D. Repair damaged finishes. Restore finishes so that there is no evidence of corrective work. Return items which cannot be refinished in the field to the shop, make the required alterations, and refinish the entire unit, or provide new units, as directed by Architect.

E. Protect galvanized and non-ferrous metal surfaces from corrosion or galvanic action by application of a heavy coating of bituminous paint on surfaces which will be in contact with concrete, masonry or dissimilar metals.

F. Provide concealed gaskets and flashing and install as the work progresses to make the installations weathertight.

G. Refer to Section 07 92 00 for sealant in connection with installation of louvers.

3.04 CLEANING

A. Clean louver surfaces in accordance with manufacturer's instructions. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces in accordance with manufacturer's instructions.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

END OF SECTION 08 91 19

SECTION 09 29 00
GYPSUM WALLBOARD

PART 1 GENERAL

1.01 SCOPE

A. Provide gypsum board systems consisting of wall board, trim and accessories. Work includes:
   1. Gypsum board wall systems.
   2. Exterior gypsum board sheathing.
   3. Suspended gypsum board ceilings and soffits including suspension framing system.
   4. Fire-rated gypsum board construction where indicated.
   5. Exterior soffits and ceilings.
   6. Edge trim, corner beads, control joints, accent reveals, fasteners, joint treatment materials and other accessories required for a complete installation.
   7. Includes installation of acoustical insulation specified in Section 07 21 00.
   8. Installation of metal access doors, including those provided by Plumbing and HVAC Contractors. See Section 08 31 13 and Divisions 22 and 23.
   9. Includes taping, spackling and finishing of joints at preformed gypsum column covers. See Section(s) 05 58 13, 09 27 13, and 09 27 14.
   10. Spray-on ceiling texture.

1.02 REFERENCE STANDARDS

A. ASTM C473 - Standard Test Methods for Physical Testing of Gypsum Panel Products; 2019.

B. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

D. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).

E. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2023.

F. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2022.

G. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.

H. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

I. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

J. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.

K. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

L. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2023.

M. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019, with Editorial Revision (2020).

N. ASTM D1037 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials; 2012 (Reapproved 2020).

O. ASTM D2394 - Standard Test Methods for Simulated Service Testing of Wood and Wood-Based Finish Flooring; 2017.

P. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

Q. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

R. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

S. ASTM E413 - Classification for Rating Sound Insulation; 2022.

1.03 RELATED SECTIONS

A. Rough Carpentry: Section 06 10 00.

B. Acoustical Insulation: Section 07 21 00.

C. Access Doors: Section 08 31 13.

D. Cold-Formed Metal Framing: Section 05 40 00.

E. Sustainable Design Requirements: Section 01 81 13.

F. VOC Limits: Section 01 81 16.

1.04 QUALITY ASSURANCE

A. Gypsum Board Systems: Comply with ASTM C840 "Recommended Specifications for Application and Finishing of Gypsum Board", and as specified.

B. Reference Standards: Wherever the following abbreviations are used herein they shall refer to the corresponding standard:
   1. ASTM: American Society for Testing and Materials.
   2. GA: Gypsum Association.
   3. FS: Federal Specification.

C. Allowable Tolerances: Provide framing fabricated and erected to conform to the following allowable tolerances:
   1. Ceiling Framing: Level within 1/8" in 10'-0" and erected so that deflection of any component does not exceed l/360 of its span after installation of finish materials and equipment.

D. Fire-Rated Construction: Comply with fire resistance ratings indicated on drawings and as required by governing authorities and codes. Provide materials, accessories and application procedures that have been listed by Underwriters Laboratories or tested in accordance with ASTM E119 for the type of construction shown.

E. Guarantee: Submit written guarantee stating that cracks, delaminations or other imperfections in the drywall work which may develop within a period of 2 years from date of acceptance will be repaired at no cost to the Owner.

F. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

G. Job Mock-Up:
   1. Prior to start of gypsum board systems, a project mock-up is to be prepared. A designated room is to receive, wood framing, fire rated construction, acoustical treatments and related materials including resilient furring, wall board joint and screw taping and spackling, sanding and surface preparation. Job mock-up must demonstrate compliance with fire rating and acoustical assemblies required and be acceptable to Architect before beginning gypsum board finishing operations. Retain and maintain mock-up throughout remainder of project as a minimum workmanship standard. Gypsum board finishing quality must meet or exceed the quality of job mock-up.

H. Pre-Installation Conference: Conduct a pre-installation conference at Project site to review manufacturer’s recommendations and referenced requirements for locating control joints in gypsum board walls and ceilings a minimum of one (1) week prior to beginning this portion of the Work. Have manufacturer’s representative, contractor’s representative and Architect

present at this meeting.

1.05 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each gypsum board system component.

B. Submit manufacturer's certification that fire-rated assemblies proposed meet project requirements, including evidence of approved test reports acceptable to governing building code enforcing authority, that assemblies when installed with proposed materials, will meet or exceed fire ratings required.

C. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened labeled containers.

B. Store, protect and handle materials in accordance with manufacturer's recommendations to prevent damage, soiling and deterioration.

C. Protect adjoining surfaces against damage and soiling.

1.07 JOB CONDITIONS

A. Coordinate installation sequencing with work of other trades.

B. Sprayed Fireproofing
   1. All attachments to structural steel framing receiving sprayed fireproofing to be installed prior to application of sprayed fireproofing, if possible, to preclude removal of fireproofing.
   2. Where necessary to remove fireproofing and where fireproofing becomes damaged, provide for restoration in accordance with original fireproofing specifications at no additional cost to Owner.

C. Verify completion of other work, including that of other trades, that will be concealed by gypsum drywall construction before installation of wallboard.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gypsum Board: U.S. GYPSUM CO.; CERTAINTEED CORP.; GEORGIA-PACIFIC CORP.; NATIONAL GYPSUM COMPANY; CONTINENTAL BUILDING PRODUCTS.

B. Others as listed for specific products.

C. Products General: Provide materials that comply with Project Sustainable Design Requirements and Low Emitting Material goals.

2.02 INTERIOR GYPSUM BOARD

A. General: Comply with ASTM C1396.

B. Fire Rated Gypsum Wallboard: Type “C” or "X" (special fire retardant) to meet fire ratings for construction shown. Tapered edges. Thickness 5/8" unless otherwise indicated. Use at all locations indicated as meeting a specific fire resistance rating.
   1. Provide 5/8”, Type X board at all locations not indicated to receive a specific type board.

C. Moisture and Mold Resistant Gypsum Wallboard 151%$
   1. ASTM C1396 (Section 5), Type X.
   2. Edges: Tapered.
   3. Thickness: 5/8 inch, unless otherwise indicated.
   4. Acceptable products: Mold Tough and Mold Tough Firecode (Type X) by USG; XP and XP Fire-Shield by NATIONAL; ToughRock and ToughRock Type X by GEORGIA-PACIFIC; Mold Defense and Mold Defense Type X by CONTINENTAL BUILDING PRODUCTS or equal by other gypsum board manufacturers listed in 2.01A.

5. Water Absorption: ASTM C473, the average water absorption for panels is not greater than 5 percent by weight after two-hour immersion.
6. Resistance to Mold Growth: ASTM D3273, “Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber,” the panel score was 10.
7. Use on non-ceramic tiled walls, ceilings and soffits in toilet rooms, shower rooms and drying rooms; on ceramic tiled non-wet walls in toilet rooms; walls and partitions above ceilings. Maintain ratings where wall is required to be rated.]

D. Moisture and Mold Resistant, Glass-Mat Gypsum Wallboard:
1. ASTM C1396/C1396M (Section 5) and applicable sections ASTM C1658/C1658M.
2. Type X.
3. Edges: Tapered.
4. Thickness: 5/8 inch.
5. Acceptable Products: Basis of design is e²XP Interior Extreme by National Gypsum. Other acceptable product include DensArmor Plus Firecode (Type X) by GEORGIA-PACIFIC or equal by other gypsum board manufacturers listed in 2.01A.
6. Water Absorption: ASTM C473, the average water absorption for panels is not greater than 5 percent by weight after two-hour immersion.
7. Resistance to Mold Growth: ASTM D3273, “Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber,” the panel score was 10.
8. Use on non-ceramic tiled walls, ceilings and soffits in toilet rooms, shower rooms and drying rooms; on ceramic tiled non-wet walls in toilet rooms; walls and partitions above ceilings. Maintain ratings where wall is required to be rated.]

E. Abuse Resistant Gypsum Wallboard: ASTM C1396/C1396M and ASTM C1629/C1629M.
1. Classification (ASTM C1629): Level 2 (Moderate Duty).
2. Minimum Physical Properties:
   a. Thickness: 5/8 inch.
   b. Fire Rating: Type X.
   c. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D 3274
3. Manufacturers: SheetRock Glass Mat mold Tough AR by USG, Hi-Abuse XP by NATIONAL GYPSUM COMPANY, TuffRock Abuse Resistant by GEORGIA PACIFIC, Protecta AR 100 by CONTINENTAL BUILDING PRODUCTS or equal by other gypsum board manufacturers listed in 2.01A.

F. Impact Resistant Gypsum Wallboard: ASTM C1396/C1396M and ASTM C1629/C1629M, manufactured to produce greater resistance to surface indentation and through-penetration than standard gypsum panels. Long edges tapered. Provide where indicated. 294%$
1. Classification (ASTM C1629/C1629M): Level 3 (Heavy Duty).
2. Minimum Physical Properties:
   a. Thickness: 5/8 inch.
   b. Type X.
   c. Mold Resistance: minimum score of 10 per ASTM D3273
   d. Soft Body Impact: Level 3.
3. Manufacturers: SheetRock Glass Mat Mold Tough VHI by USG, Hi-Impact XP by NATIONAL GYPSUM COMPANY, Dens-Armor Impact by GEORGIA PACIFIC, Protecta HIR 300 by CONTINENTAL BUILDING PRODUCTS or equal by other gypsum board manufacturers listed in 2.01A.

G. Mold Resistant Gypsum Shaftliner Board: ASTM C1396/C1396M, Type X, 1" thick gypsum core with mold resistant core and faces and chamfered edges.

H. Curved Walls - Interior: Provide ¼” Flexible Board where required. Meet all indicated fire ratings. Provide multiple plies to achieve thicknesses indicated. Stagger joints of adjacent plies. 198%$

I. Tile Backer Board: See Section 09 30 00

2.03 EXTERIOR GYPSUM BOARD AND SHEATHING

A. Exterior Sheathing and Ceiling Board: Use for exterior sheathing and where indicated on drawings. Provide in conformance with ASTM C1177/C1177M, water repellent treated core and fiberglass face sheets.
   1. Thickness: 5/8" thickness unless otherwise indicated.
   2. Fire Rating: Type “C” or "X" (special fire retardant) to meet fire ratings for construction shown..
   3. Acceptable Products: Dens-Glas by GEORGIA-PACIFIC, GlasRoc by CERTAINTEED, Weather Defense by CONTINENTAL BUILDING PRODUCTS, EXP Sheathing by NATIONAL, or Secure Rock by USG.
   4. Roof Parapets and Similar Roof Conditions:
      a. Where used as roofing substrate, provide high density, water repellent treated core with fiberglass mat and specifically designed for roofing membrane adhesion. Dens-Deck Prime Roof Board by GEORGIA-PACIFIC, USG Gypsum Fiber or equal by other gypsum board manufacturers listed in 2.01A. Coordinate with roofing assembly.

B. Exterior Ceiling and Soffit Board: Tapered edges, 5/8" thickness unless otherwise indicated. Water resistant gypsum core and treated paper facing to withstand effects of moisture and mold penetration. ASTM C1396/C1396M. Use for exterior covered walls, soffits and ceilings.
   1. Thickness: 5/8" thickness unless otherwise indicated.
   2. Acceptable Products: Mold Tough USG or equal by other gypsum board manufacturers listed in 2.01A.

C. Exterior Curved Walls – Cement Board (Exterior Sheathing)
   1. Thickness: ½”
   2. Physical Properties
      a. Compressive Strength – ASTM D2394: 1022 psi
      b. Water Absorption – ASTM C473 (Weight in 24 hours): Less than 8%.
      c. Impact Resistance – ASTM D1037 (Falling Ball 12” Drop): Pass.
   3. Model/Manufacturer: PermaBase Flex by NATIONAL GYPSUM or equal by other manufacturers listed in Article 2.01.
   4. Location: At curved sheathing locations.

2.04 ACCESSORIES

A. Fasteners: Drywall screws and metal framing screws per manufacturer's instructions and recommendations for type and size, based on construction and conditions involved.
   1. Steel Drill Screws: ASTM C1002.
   2. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick specified in Section 05 40 00.

B. Trim: ASTM C1047.
   1. Manufecturers:
      a. Metal: BEADEX MANUFACTURING; CLARK DIETRICH BUILDING SYSTEMS; listed gypsum board manufacturers
      b. Vinyl: VINYL TECH; VINYL CORP.; TRIM TEX
   2. Corner Beads - Outside, Square Corners: 1-1/4 inch x 1-1/4 inch heavy gauge galvanized steel or vinyl, perforated.
   3. Corner Beads - Outside, Non-square Corners: BEADEX B-1 Splay Flexible Corner or equal. Concealed metal; two galvanized continuous strips laminated with paper trim; for application without mechanical fasteners.
   4. Curved Edge Cornerbead: Notched or flexible edge.
   5. Exposed Edges (Casing Beads): L-bead or LC-bead; exposed long flange receives joint compound. Size to suit wallboard. J-shaped bead that does not receive joint compound is not permitted.

6. Expansion (Control) Joints: Tape protected 1/4" wide x nominal 7/16" deep control slot.

C. Interior Joint Treatment Materials: ASTM C475/C475M.
   1. Joint Tape. Width to adequately cover joint.
      a. Interior Gypsum Board: Paper.
      b. Exterior Gypsum Soffit Board: Paper.
      c. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
   2. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
      a. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
      b. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
         1) Use setting-type compound for installing paper-faced metal trim accessories.
      c. Fill Coat: For second coat, use setting-type, sandable topping compound.
      d. Finish Coat: For third coat, use setting-type, sandable topping compound.
      e. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.
   3. Joint Compound for Tile Backing Panels:
      a. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.
      b. Cementitious Backer Units: Section 09 30 00.

D. Exterior Joint Treatment Materials: ASTM C475/C475M.
   1. Joint Compound for Exterior Applications:
      a. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
      b. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.

E. Additional Item: All additional accessories to complete work including nails and anchors to secure frames to walls and floors.

F. Reveal Trim Beads: Aluminum, Softforms STR-050-050 by PITTCON, DRMZ-50-50 by FRY REGLET, 312-1/2 by GORDON or DWSM-50-50 by FLANNERY. Factory primed painted.

G. Extruded Corner Trim
   1. Material: Extruded aluminum 1 ¼” legs with 7/8” joint receptor.
   2. Basis of Design: FRY REGLET DMCT-1250
   3. Other Manufacturers: Equal products by PITTCON or GORDON

H. Acoustic Materials
   1. Insulation
      a. Type: Semi-rigid mineral fiber (glass fiber, slag wool or rock wool) blankets. Conform to ASTM C665, Type I, unfaced .
      b. Thickness: 3 inch, unless otherwise indicated.
      c. Manufacturer: Thermafiber by U.S. GYPSUM; JOHNS MANVILLE; OWENS-CORNING FIBERGLAS; CERTAINTEED.
   2. Sealant: Nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
      a. Manufacturers
         1) USG Acoustical Sealant
         2) TREMCO Acoustical Sealant
         3) PECORA BA-98
      b. BASF MasterSeal NP 520

c. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Neoprene impregnated sealant tape.
4. Head of Wall Insulation: Pre-manufactured, high-density mineral fiber acoustical insulation shaped to fit the trapezoidal flutes, typical of metal decking and complying with ASTM E119 as safing insulation.

I. Electrical/Acoustical Box Pads: Moldable Polybutene pads, minimum 1/8 inch thick. 3M Putty Pads, 3M FIRE PROTECTION PRODUCTS or equal

PART 3 EXECUTION

3.01 GENERAL

A. Comply with the requirements of ASTM C840 "Standard Specification for the Application and Finishing of Wallboard", unless otherwise specified or recommended by the manufacturer.

3.02 PREPARATION

A. Maintain uniform building temperature range not less than 55 degrees F., for 24 hours before, during and after gypsum panel installation and joint finishing treatment.

B. Provide adequate lighting and ventilation during installation and joint finishing treatment.

3.03 INSPECTION

A. Examine substrates and installation conditions. Do not proceed with gypsum wallboard work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.04 FRAMING INSTALLATION

A. Install framing for walls and ceilings/soffits receiving gypsum wallboard finish.
1. See Section 061000, Rough Framing, for materials and methods of installation.

3.05 GYPSUM BOARD INSTALLATION

A. General
1. Pre-installation Conference: Before start of gypsum board installation, meet at the project site with the Architect and installers of related work, including work requiring openings, access panels, support, similar integrated requirements and mechanical and electrical trades. Review potential interferences and conflicts and coordinate layout and sequencing requirements for proper installation and integration of the work.
a. Do not proceed with gypsum board installation until framing, bracing and other supports for subsequently applied work have been installed, reviewed and accepted by the Architect.
b. Do not install gypsum board until work concealed by gypsum board has been installed.

B. Application
1. Install gypsum board face side out. Do not install imperfect, damaged or damp boards.
2. Butt boards together for a light contact at edges and ends with not more than 1/16 open space between boards. Do not force into place.
3. Locate either edges or end joints over supports. Position boards so that both tapered edge joints abut. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
4. Attach gypsum board to framing and blocking as required for additional support at openings and cutouts.
5. Floating Construction: Install gypsum board with "floating" internal corner construction, unless isolation of the intersecting board is indicated.
6. In addition to compliance with the standards, comply with specific requirements indicated for each type of arrangement of gypsum wallboard system shown. Space fasteners in

accordance with manufacturer's recommendations and complying with referenced standards.

a. Walls and Partitions: Apply sheets horizontally or vertically. Provide maximum sheet lengths to minimize end joints with edges or ends over supports. In two layer applications, stagger joints of second layer from joints of first layer.
b. Cut and install panels to eliminate vertical joints in corners of door frames to ceiling.
c. Make cutouts to fit within wall plate, register and grille flanged. All cutouts made by knife or saw.
d. Make angles and corners clean, true, plumb and square; walls plumb, flat and straight and ceilings flat and level.
e. Ceilings: Apply gypsum board on ceilings, before application on walls and partitions. Install in direction and manner to minimize end joints. Stagger end joints over supports. In two layer applications, stagger joints of second layer from joints of first layer.

3.06 EXTERIOR SHEATHING AND SOFFIT BOARD

A. Comply with GA-253 and with manufacturer's written instructions.
   1. Install exterior sheathing board perpendicular to supports, stagger end joints over supports, use maximum lengths possible to minimize joints.
   2. Install with 1/4 inch open space where boards abut other work.
   3. Space screws 4 inches o.c. around perimeter of board and 8 inches o.c. on intermediate framing members and on diagonal braces. Locate fasteners minimum 3/8 inches from edges and ends of sheathing panels. Drive fasteners to bear tight against and flush with sheathing surface. Do not countersink.
   4. Apply sealant around sheathing perimeter at interface with other materials.
   5. Board Joints: Provide seam sealing tape or joint sealant at Contractor's option, as follows:
      a. Seam Sealing Tape, Horizontal Applications.
         1) Apply primer to joints and fasteners, allow to dry.
         2) Seal joints using tape specified herein or other similar type method recommended by board manufacturers for application indicated. Apply at time of sheathing, to sealed, dry, dust-free joints. Apply seam sealing tape along all edges, overlapping at intersections by width of tape.
         3) Apply sealant to exposed fasteners with a trowel so fasteners are completely covered.
         4) Seal other penetrations and openings.
         5) Coordinate sheathing and placement of through-wall flashing. Tape top of through-wall sealant to sheathing to provide a water-tight joint.
      b. Sealant
         1) Apply minimum 3/8" bead of sealant to joints and trowel to provide a layer approximately 2" wide by 1/16" thick spanning the joint. Apply enough to each fastener to cover completely when troweled flat. Use backer rod for openings larger than 1/8".
         2) Apply sealant to exposed fasteners with a trowel so fasteners are completely covered.
         3) Seal other penetrations and openings.
         4) Coordinate sheathing and placement of through-wall flashing. Tape top of through-wall flashing to sheathing to provide a water-tight joint.

3.07 INSTALLATION OF SOUND RATED PARTITIONS

A. Provide sound-rated construction where indicated.

B. Acoustic Insulation: Install single layer of acoustic batt insulation in designated partitions after one side of gypsum board is installed, filling width and height of partition completely. Attach to gypsum board with adhesive spots to prevent subsequent displacement.

C. Extend partition stud system through acoustical ceilings to substrate. Apply gypsum board base panels full height, both sides of partition.

D. 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 C919 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.

E. Seal partition perimeters. Provide continuous beads of acoustical sealant at juncture of both faces of runners or plates with floor and ceiling construction and wherever work abuts dissimilar materials. Seal prior to installation of sound attenuation insulation and gypsum board panels.

F. Provide continuous beads of sealant at juncture of gypsum board and abutting surface. Install gypsum board with 1/8" relief for sealant. Sealants to be contained within depth of gypsum board, not as a fillet.

G. At openings and cutouts, fill open spaces between edges of gypsum board and fixtures, cabinets, ducts, and other flush or penetrating items, with continuous bead of acoustical sealant.

H. If sound-rated partitions intersect non-sound-rated partitions, extend sound construction to completely close-off sound flanking paths through non-rated construction. Seal joints between face layers at vertical interior angles of intersecting partitions.

I. Exercise particular care at walls surrounding toilet areas and walls and ceilings surrounding mechanical spaces to provide properly constructed sound-rated gypsum board partition and ceiling systems.

J. Verify that electrical boxes are not located back-to-back; back-to back boxes to be offset at least one stud space. Do not close off non-complying conditions before notifying and receiving direction from Architect.

3.08 TRIM AND ACCESSORIES

A. Install corner beads at external corners of gypsum wallboard work. Use longest practical lengths.

B. Install edge trim wherever edge of gypsum board would be exposed or semi-exposed.
   1. Provide beaded trim to receive joint compound at all gypsum wallboard work.
   2. Provide L-type trim where work is abutted to other work and Kerf-type where work is kerfed to receive kerf leg.
   3. Provide U-type trim where edge is exposed, revealed, gasketed or sealant filled, including expansion joints.

C. Control Joints
   1. Install control joints to isolate gypsum board surfaces as recommended in ASTM C840. Verify locations with Architect prior to installation. Generally locate joints as follows when:
      a. Ceiling or partition abuts a structural element, dissimilar wall or partition or other vertical penetration.
      b. Construction changes within the plane of ceiling or wall.
      c. Wall dimensions exceed 30'-0".
      d. Ceiling dimensions exceed 50' in either direction with perimeter relief; 30'-0" without relief.
      e. Exterior soffits exceed 20'-0" in either direction; align with window mullions, when applicable.
      f. Wings of "L", "U", and "T"-shaped ceiling areas are joined.

3.09 FINISHING

A. Comply with manufacturer's instructions for mixing, handling and application of materials.
   1. Apply treatment at joints both directions, at flanges of trim accessories, penetrations of gypsum board, fastener heads, surface defects and elsewhere indicated.

2. Apply in manner that will result in each of these items being concealed when applied decoration has been completed.

B. Prefill open joints of more than 1/16" with special chemical-hardening type bedding compound, before bedding joint tape.

C. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.

D. Do not use topping compound for bedding joint tape.

E. Apply joint compound for the final coat of joint treatment, unless specifically recommended by the manufacturer for that use.

F. Leave all exposed interior surfaces smooth and even, ready for painting.

G. Walls Above Acoustical Ceiling Systems: Tape and fill joints with two coats of joint compound, sanding not required.

H. Leave all exposed surfaces smooth and even, ready for painting.

I. Provide where indicated on the drawings levels of finish as specified in ASTM C840, "Recommended Specification on Levels of Gypsum Board Finish". Levels of finish consist of:
   1. Level 1 - **Areas Above Ceilings:** All joints and interior angles shall have tape embedded in joint compound. Provide surface free of excess joint compound. Tool marks and ridges are acceptable.
   2. Level 2 – **As a Substrate for Ceramic Tile:** All joints and interior angles to have tape embedded in joint compound and one separate coat of joint compound applied over all joints, angles, fastener heads, and accessories. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.
   3. Level 3: All joints and interior angles to have tape embedded in joint compound and two separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. All joint compound shall be smooth and free of tool marks and ridges.
   4. Level 4 – **All Areas Not Indicated to Receive Levels 1, 2 or 5:** All joints and interior angles to have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. All joint compound shall be smooth and free of tool marks and ridges.
   5. Level 5 – **All Areas to Receive Semi-Gloss or Gloss Coatings:** All joints and interior angles to have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. A thin skim coat of joint compound, or a material manufactured especially for this purpose, shall be applied to the entire surface. Excess material is to be removed leaving a film covering over the gypsum board paper surface.

3.10 ADJUST AND CLEAN

A. Nail Pop
   1. Repair nail pop by driving new nails approximately 1-1/2" from nail pop and reseat nail.
   2. When paper face is punctured, drive new nail or screw approximately 1-1/2" from defective fastener and remove defective fastener. Fill damaged surface with compound.

B. Ridging
   1. Do not repair ridging until condition has fully developed: approximately 6 months after installation or one heating season.
   2. Sand ridges to reinforcing tape without cutting through tape.
   3. Fill concave areas on both sides of ridge with topping compound.
   4. After fill is dry, blend in topping compound over repaired area.

C. Fill cracks with compound and finish smooth and flush.

D. 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
TILE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Extent of tile work is shown on drawings and schedules, and as specified herein.

B. Types of tile work required including the following:
   1. Ceramic wall tile, floor tile and base.

1.02 RELATED SECTIONS

A. Sealant: Section 07 92 00.

B. Concrete slab preparation: Section 01 73 00.

1.03 REFERENCE STANDARDS

A. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2023.

B. ANSI A108.02 - General Requirements: Materials, Environmental, and Workmanship; 2019.

C. ANSI A108.5 - Setting of Ceramic Tile with Dry-Set Cement Mortar, Modified Dry-Set Cement Mortar, EGP (Exterior Glue Plywood) Modified Dry-Set Cement Mortar, or Improved Modified Dry-Set Cement Mortar; 2023.

D. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017 (Reaffirmed 2022).

E. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs; 2020.

F. ANSI A118.1 - American National Standard Specifications for Dry-Set Cement Mortar; 2023.

G. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2019.

H. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2019.

I. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2023.

J. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2023.

K. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.

L. ANSI A326.3 - American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials; 2021.

M. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

N. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

O. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2018.

P. ASTM C1288 - Standard Specification for Fiber-Cement Interior Substrate Sheets; 2023.

Q. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2022, with Editorial Revision (2023).

1.04 QUALITY ASSURANCE

A. Manufacturer: Provide tile of each type produced by a single manufacturer. Provide materials obtained from one source for each type and color of tile, grout, and setting materials.

B. Installer: A firm with not less than 5 years experience in installing tile in applications similar to those required for this work.

C. Ceramic Tile Manufacturing Standard: TCA 137.1. Furnish tile complying with Standard Grade requirements unless indicated otherwise.

D. Proprietary Materials: Handle, store, mix and apply proprietary setting and grouting materials in compliance with manufacturer's instructions.

E. Installer to verify locations of all flexible joints required by the provisions of this section, by the recommendations of TCA, and by the recommendations of the related manufacturers. See Article 3.06.
   1. Joint locations may or may not be indicated on the drawings.

F. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

1.05 PERFORMANCE REQUIREMENTS

A. Dynamic Coefficient of Friction: For tile installed on walkway surfaces subject to traffic while wet, provide products with a dynamic coefficient of friction not less than 0.42 as determined by testing identical products per ANSI A137.1. and ANSI A326.3 in each appropriate category.

1.06 SUBMITTALS

A. Product Data: Submit manufacturer's technical information and installation instructions for materials required. Include certifications and other data to show compliance with these specifications.

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 in tile substrates and finished tile surfaces.

C. Samples: Submit manufacturer's color charts consisting of actual tiles or sections of tiles showing full range of colors available, for each type of tile specified. Include samples of grout and accessories requiring color selection. Submit full size sample for each type of trim, accessory and color. Submit samples of metal edge strip.

D. Certification: Furnish Master Grade Certificate for each type of tile, signed by manufacturer and Installer.

E. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.07 PRODUCT HANDLING

A. Deliver packaged materials and store in original containers with seals unbroken and labels intact until time of use, in accordance with manufacturer's instructions.

1.08 JOB CONDITIONS

A. Maintain environmental conditions and protect work during and after installation in accordance with referenced standards and manufacturer's printed recommendations.

PART 2 PRODUCTS

2.01 CERAMIC TILE

A. Ceramic Wall Tile, Floor Tile and Base: Standard grade, impervious porcelain ceramic tile conforming to ANSI A137.1. Provide trim pieces as required.
   1. Basis of Design: Manufacturer, Styles and Colors: As indicated on the drawings.
   2. Other Acceptable Manufacturers: Ceramic tile manufactured by other manufacturers will be considered if materials meet the requirements of the Basis of Design and the sizes and colors are an acceptable match as approved by the Architect prior to bid opening. These additionally approved manufacturers will be included by Addendum. An unacceptable

pattern or color match is reason for disapproval of product and manufacturer. No substitutions will be considered after bid opening.

2.02 MORTAR, GROUT AND ACCESSORIES

A. Source: Setting mortar and grout to be from same manufacturer.
   1. Adhesives, Epoxies, Mortar and Grout Manufacturers: CUSTOM BUILDING PRODUCTS, BOSTIK, MAPEI, LATICRETE, BOSTIC, TEC (H.B. FULLER) and BONSAL AMERICAN.
   2. Manufacturer's listed under the following applications are for basis of design. Equal products by above listed manufacturers are acceptable.

B. General - All Adhesives, Epoxies, Mortar and Grout: See Tile Installation Systems in Part 3 of this Section.
   1. Provide materials that comply with Project Sustainable Design Requirements and Low Emitting Material goals.

C. Modified Dry Set Cement Mortar - Thin Set: Factory mixed mortar of Portland cement/sand, field gauged with undiluted latex admixture. Conform to ANSI A118.4, Latex-Portland Cement Mortar. Provide type suitable for “medium-set” for tiles with a dimension larger than 15”.
   1. Provide one of the following:
      a. BOSTIK, Durabond D-50 or D-60.
      b. MAPEI, Keraflex Super.
      c. CUSTOM BUILDING PRODUCTS, ProLite Tile and Stone Mortar
      d. LATICRETE, 255 MultiMax.
   2. Thinset Mortar for Glass Tile: Complies with ANSI A118.4 and A118.11.
      a. BOSTIC Glass-Mate Glass Tile Mortar with Admixture Product 425TM Multi-Purpose Acrylic Latex Admixture.
      b. CUSTOM BUILDING PRODUCTS, VersaBond Professional Thin Set Mortar
      c. MAPEI: Adisilex P10 Mosaic & Glass Tile mixed with Keraply Latex additive
      d. Equal by LATICRETE

D. Dry-Set Mortar - Thin Set: Mixture of Portland cement with sand and latex, water imparting additive. Conform to ANSI A118.1, Standard Dry-Set Cement Mortar.
   1. May be used in lieu of Modified Dry Set Cement Mortar for ceramic floor and wall tile.

E. Portland Cement Setting Mortar - Thick Set (ANSI A108.20): Provide waterproof membrane beneath floor setting beds. Provide cleavage membrane at floors without waterproofing membrane. Reinforce floor setting beds. Provide bed of a thickness as required to bring the tile to the required finish elevation as shown on the drawings. Provide materials as follows:
   1. Underbed: Mix 1 part Portland cement to 5 parts loose, damp sand by volume.
      a. Portland Cement: ASTM C150 Type 1.
      b. Sand: ASTM C144.
      c. Water: Clean, potable and free of deleterious substances.
   2. Membrane Waterproofing: See Membrane Waterproofing herein
   3. Cleavage Membrane: ASTM D226; 15 pound non-perforated asphalt felt.
   4. Underbed Reinforcement: ASTM A185, 2" x 2" x 16 gage, galvanized welded wire fabric.
   5. Bond Coat: Portland cement paste on a plastic bed.

F. Grout - Ceramic Tile (ANSI A118.7): Integrally colored, sanded (unless otherwise indicated), polymer modified cement type, factory prepared (premixed) grout. Color as selected by Architect.
   1. Provide one of the following:
      a. BOSTIC, Ceramic Tile Grout with BOSTIK 425 Acrylic-Latex Admixture.
      b. TEC (H.B. FULLER), TEC Power Grout.
      c. MAPEI, Ultracolor Plus FA.
      d. LATICRETE, Permacolor Grout.
      e. CUSTOM BUILDING PRODUCTS, Prism
   2. Colors: As selected by Architect.

3. Provide unsanded grout for glass tile and tile joints less than 1/8” wide.

G. Membrane Waterproofing: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
   1. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.
      a. Products: Provide one of the following:
         1) BONSAL AMERICAN; B 6000 Waterproof Membrane with Glass Fabric
         2) BOSTIK, INC.; Hydroment Blacktop 90210.
         3) LATICRETE INTERNATIONAL, INC.; Hydro Ban Waterproof Membrane.
         4) MAPEI CORPORATION; Reinforcing Fabric with Aquadefense
         5) CUSTOM BUILDING PRODUCTS, Custom 9240 Waterproofing and Anti-Fracture Membrane
   2. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer
      a. Products: Provide one of the following:
         1) BONSAL AMERICAN; B 6000 Waterproof Membrane.
         2) BOSTIK, INC.; Hydroment Gold.
         3) LATICRETE INTERNATIONAL, INC.; Latapoxy 24hr HydroProofing.
         4) MAPEI CORPORATION; Aquadefense.
         5) TEC (H. B. FULLER COMPANY); HydraFlex - Waterproofing Crack Isolation Membrane
         6) CUSTOM BUILDING PRODUCTS RedGard Waterproofing ABD Crack Prevention Membrane.

H. Crack Isolation (Anti-Fracture) Membrane: Fabric-Reinforced, Modified-Bituminous Sheet: Self-adhering, modified-bituminous sheet with fabric reinforcement facing; 0.040-inch nominal thickness. ANSI A118.12.
   1. Products: Provide one of the following:
      a. MAPEI CORPORATION; Mapeguard CI with Primer HM.
      b. NATIONAL APPLIED CONSTRUCTION PRODUCTS, INC.; Strataflex.
      c. POLYGUARD; Tileguard.
      d. CUSTOM BUILDING PRODUCTS, Crack Buster Pro.

I. Metal Edge Trim: L-shape, height to match tile and setting-bed thickness; stainless steel, ASTM A666, 300 Series. SCHLUTER, CERAMIC TOOL COMPANY, BLANKE

J. Grout Sealer: Low VOC, penetrating type as recommended by grout manufacturer that does not change color or appearance of grout.

2.03 TILE BACKER BOARD

A. Provide one of the following types in maximum lengths available to minimize end-to-end butt joints.
   1. Nominal 1/2" thick acrylic coated glass mat gypsum backer board: ASTM C1178/C1178M.
   2. Nominal 1/2" thick Fiber-Cement Backer Board: ASTM C1288.
   3. Nominal 1/2" thick cementitious board with fiberglass mesh reinforcements conforming to the requirements of ANSI A118.9 or ASTM C1325.

B. Manufacturers: U.S. GYPSUM; GEORGIA PACIFIC, CUSTOM BUILDING PRODUCTS, NATIONAL GYPSUM COMPANY; JAMES HARDIE; CERTAINTEED.
   1. Provide coated screws, type as recommended by board manufacturer.
   2. Joint Treatment Tape: Type as recommended by board manufacturer.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine surfaces to receive tile, setting beds and accessories before tile installation for the following:

1. Defects or conditions adversely affecting quality and execution of the installation.
2. Deviations beyond allowable tolerances of surfaces to receive tile.
3. Do not proceed with installation work until unsatisfactory conditions are corrected.

B. Conditions of surfaces to receive tile.
1. Surfaces to be firm, dry, clean, and free of oily or waxy films or curing compounds.
2. Grounds, anchors, plugs, hangers, bucks, electrical, plumbing and HVAC work in or behind tile to be installed prior to proceeding with tile work.

3.02 PREPARATION

A. Prepare surfaces to receive tile as required to achieve proper bond and as recommended by the Tile Council of America.
1. See Section 01 73 00 for additional floor preparation requirements.

B. Fill cracks, low areas and pits in concrete with self-leveling fill of type recommended by tile manufacturer for substrate conditions encountered.

C. Lightly grind concrete subfloors with a terrazzo grinder to remove trowel marks, slab curl at saw cut joints or other surface irregularities or high spots which will telegraph to the flooring surface.

D. Sawcut or grind transition areas to install tile flush with adjacent finished floor materials.

E. Clean surfaces in a manner suitable for proper installation. Verify that slabs are free of curing membranes, oil, grease, wax, dust and other materials deleterious to tile installation.

F. Primers or other preparations required or recommended in accordance with manufacturer's instructions.

3.03 TILE BACKERBOARD

A. Location: Provide tile backerboard on metal stud walls as a substrate for ceramic tile products specified herein which are located where indicated.

B. Install in strict accordance with manufacturer's recommendations and ANSI A108.11, Interior Installation of Cementitious Backer Units.
1. Butt ends and edges of adjacent panels.
2. Attach with screws spaced at 6 inch centers on perimeter and field.
a. Maintain minimum 1/2 inch from screws to panel edge.
b. At wainscot or similar location where tile terminates in same plane of wall, shim tile backerboard flush with adjacent wall board. Provide shims continuous along face of studs.
3. Locate control and expansion joints in same locations as substrate and where required by wall tile.
4. Apply glass mesh tape, or type recommended by board manufacturer, over joints. Embed tape in setting material indicated for specified tile finish.

3.04 INTERIOR WALL TILE INSTALLATION - SYSTEMS

A. Prepare surfaces, fit, set or bond, grout, and clean in accordance with Tile Council of America, "Handbook for Ceramic Tile Installation", 2019 Edition; and as follows:

B. Thin Set - Stud Walls - Over Tile Backerboard: TCA W244, dry-set mortar bond coat or latex Portland cement bond coat and grout.
1. Tile: ANSI A108.5.
2. Grout: ANSI A108.10.
3. Backerboard
a. Joint Preparation: Fill joints completely with setting mortar and embed 2 inch wide coated fiberglass tape into skim coat of same mortar.
b. Apply setting mortar in one layer, troweling skim coat with trowel's flat edge and then texturing with appropriate notched trowel. Troweling equipment must be appropriate for type of tile work and in good condition.

C. Thin Set - Stud Walls - Over Gypsum Board: TCA W243, dry-set mortar bond coat or latex Portland cement bond coat and grout.
   1. Tile: ANSI A108.5.
   2. Grout: ANSI A108.10.

D. Thick Set - Solid Back-Up Walls (concrete, CMU, etc.) - Dry and Wet Areas: TCA W221, Portland cement mortar bed, metal lath, [waterproof membrane], dry-set mortar bond coat or latex Portland cement bond coat and grout.
   1. Tile: ANSI A108.1a.
   2. Grout: ANSI A108.10.
   3. Install mortar bed to thickness indicated on drawings.

3.05 INTERIOR FLOOR TILE INSTALLATION - SYSTEMS

A. Prepare surfaces, fit, set or bond, grout, and clean in accordance with Tile Council of America, "Handbook for Ceramic Tile Installation", 2019 Edition; and as follows:

B. Thick Set with Waterproof Membrane: TCA design F121; waterproof membrane, Portland cement mortar bed, reinforcing, bond coat and grout.
   1. Tile: ANSI A108.1a.
   2. Grout: ANSI A108.10.
   3. Mortar Bed Thickness: As indicated (min. 1-1/4”; max. 2”).
   4. Wet areas; shower areas; drying areas; pool decks; other areas indicated

C. Thick Set with Cleavage Membrane: TCA design F111, Portland cement mortar bed, dry-set mortar bond coat or latex Portland cement bond coat, cleavage membrane, reinforcing and grout.
   1. Tile: ANSI A108.1a.
   2. Grout: ANSI A108.10.
   3. Mortar Bed Thickness: As indicated (min. 1-1/4”; max. 2”).
   4. Pool decks; other areas indicated.

D. Thick Set - Bonded: TCA Design F112, Portland cement slurry bond coat, Portland cement mortar bed, dry-set mortar bond coat or latex Portland cement bond coat and grout.
   1. Tile: ANSI A108.1a.
   2. Grout: ANSI A108.10.

E. Thin Set with Waterproof Membrane: TCA Design F122, waterproofing, latex Portland cement bond coat and grout.
   1. Install in strict conformance with waterproofing membrane manufacturer's written instructions and recommendations.
   2. Tile: ANSI A108.5.
   3. Grout: ANSI A108.10.
   4. Wet areas; shower areas; drying areas; other areas indicated

F. Thin Set: TCA design F113, latex Portland cement mortar and grout or dry-set mortar and grout.
   1. Tile: ANSI A108.5.
   2. Grout: ANSI A108.10.

G. Epoxy Mortar and Grout: TCA design F131; epoxy mortar and grout. ANSI A108.6.
   1. Quarry tile; kitchen areas; other areas indicated.

H. Thin Set, Adhesive: TCA F116; organic adhesive and grout.
   1. Tile: ANSI A108.4.
   2. Grout: ANSI A108.10.

3.06 TILE INSTALLATION - PROCEDURES

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series

"Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following in]stallations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
    a. Floors in wet areas
    b. Swimming pool decks
    c. Kitchen areas
    d. Floor tiles 8” x 8” and larger
    e. Rib-backed floor tiles

B. All tiles are to be subjected to thermal cycling prior too installation.

C. Extend tile work into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown. 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. Carefully grind cut edges of tile abutting trim, finish or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures and other penetrations so that plates, collars or covers overlap tile.

E. Placement Methods: Install tile using the hereinbefore specified setting beds and grouts.

F. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting.

1. Avoid tile layout with less than half width tiles at room/area perimeters, unless otherwise indicated on the floor layout drawings. Notify Construction Manager if layout not achievable per layout indicated on the drawings. Do not continue in room/area in question until approved by the Associate.
2. Provide uniform joint widths, unless otherwise shown.
    a. Ceramic Mosaic Tile: 1/16 inch.
    b. Quarry Tile: 1/4 inch
    c. Large format Floor Tile: 1/8 inch.
    d. Glazed Wall Tile: 1/16 inch.
3. Multiple Tile Face Size: Where indicated tile pattern contains multiple tile face sizes, coordinate with Architect to provide uniform joint with size.

G. Anti-Fracture Membrane: Install over floor cracks, cold-joints and sawed joints. Discontinue at expansion joints. Install in compliance with ANSI 108.17 and manufacturer’s instructions and recommendations. Seam joints as recommended by manufacturer. Conform to TCA F125. Coordinate with flexible joints specified in Article 3.07, Flexible Joints.

H. Gauged Porcelain/"Thin Tile: Comply with ANSI A108.19, Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method bonded with modified dry-set cement mortar or improved modified dry-set cement mortar.

3.07 FLEXIBLE JOINTS

A. Locate flexible joints (expansion, control and isolation joints) prior to tile installation. See Quality Assurance in Part 1 herein.

B. Provide flexible joints as specified herein, unless more stringent requirements are indicated on drawings. Provide as specified, regardless if not indicated on drawings.

C. Joint to be continuous from face of tile to bottom of setting bed or leveling bed. Reinforcing to be discontinued at joint. Install continuous joint filler material in joint from setting or leveling bed to a point below face of tile adequate for proper placement of backing rod and sealant.

D. Joint Design: TCA design EJ171 as applicable. See Section 07 92 00 for sealant. Provide at the following locations:

1. Horizontal Surfaces

a. Directly over expansion joints.
b. Over anti-fracture membrane which is applied over structural slab cold joints, construction joints and control joints.
c. Where tile work abuts restraining surfaces such as perimeter walls, curbs, columns, pipes, etc.
d. Floor areas exceeding 12 feet in any direction for exterior work and 24 feet in any direction for interior work.
e. Other locations where indicated.

2. Vertical Surfaces
a. Directly over joints in wall substrate including cold joints, construction joints, control joints and expansion joints.
b. At changes in substrate material.
c. Where tile work abuts restraining surfaces such as perimeter walls, curbs, columns, pipes, etc.
d. Where indicated.

E. Curing: Cure tile floor, base, and wall installations in accordance with manufacturer's recommendations, TCA recommendations, and in accordance with ANSI requirements.

F. Metal Edge Strips: Provide metal edge strips at openings without thresholds, and where exposed edges of tile floors meet other materials.
1. Except as otherwise indicated, where trim is located across door openings, locate trim on the door side in line with the edge of the door stop, terminating at the rabbet.

G. Marble Thresholds: Provide at openings where exposed edges of tile floors meet other materials.

3.08 REPAIR, CLEAN AND PROTECT

A. Repair, or remove and replace chipped, damaged or otherwise defective work to the satisfaction of the Architect.

B. Cleaning: Upon completion of placement and grouting, clean all tile surfaces so that they are free of foreign matter.
1. Use methods and materials as recommended by tile manufacturer.
2. Replace tiles that cannot be satisfactorily cleaned.

C. Grout Sealer: Apply silicone grout sealer to grout joints according to grout sealer manufacturer’s written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer from joints and from tile faces by wiping with soft cloth.

D. Protection: When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent damage and wear.
1. Prohibit foot and wheel traffic from using tiled floors for at least 3 days after grouting is completed.

E. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 09 30 00

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide resilient flooring as shown and specified. Work includes:
   1. Base.
   2. Luxury vinyl tile
   3. Adhesives and accessories to complete the work.

1.02 RELATED SECTIONS

A. VOC Limits: Section 01 81 16.

1.03 REFERENCE STANDARDS

A. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine; 2017.

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2023.

C. ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials; 2021a, with Editorial Revision.

D. ASTM F150 - Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring; 2006 (Reapproved 2018).

E. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

F. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading; 2022.

G. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2023.

H. ASTM F1344 - Standard Specification for Rubber Floor Tile; 2021a.

I. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2020.

J. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

K. ASTM F2034 - Standard Specification for Sheet Linoleum Floor Covering; 2018.

L. ASTM F2169 - Standard Specification for Resilient Stair Treads; 2015 (Reapproved 2020).

M. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

N. Wherever the following abbreviations are used herein, they shall refer to the corresponding standard.
   1. ASTM: American Society for Testing and Materials.
   2. FS: Federal Specifications as established by the U.S. Government, General Services Administration.
   3. U.L.: Underwriter's Laboratories.
   4. ADA: Americans with Disabilities Act Accessibility Guidelines.

1.04 QUALITY ASSURANCE

A. Provide each type of resilient flooring and base material produced by one manufacturer, including recommended adhesives and leveling compounds.

B. Provide each type resilient flooring and base material from same production run. Colors shall be uniform throughout.

C. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

D. Slip Retardant Performance: Unless a greater performance is specified under a specific product, all floor materials must have a minimum static coefficient of friction of 0.6.

1.05 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of resilient flooring, base and accessory required.

B. Samples
   1. Tiles: Submit full sized samples of each type, color and pattern required to illustrate the full range of color variations.
   2. Base: Provide 6" lengths of each type and color.
   3. Sheet Flooring: Manufacturer’s standard sample size, but not less than 6” x 9” of each type, color and pattern required to illustrate the full range of color variations.
      a. Heat Welding Bead: Manufacturer’s standard sample size, but not less than 9” long of each color.
   4. Stair Treads: 6" lengths of each type and color.

C. Shop Drawings: Show locations of each type and color of tile and tile pattern.

D. Submit manufacturer's certification that resilient flooring furnished complies with required fire test performance and has been tested and meets indicated requirements.

E. Submit manufacturer's written instructions for recommended maintenance practices for each type of resilient flooring, base and accessory material required.

F. Extra Stock: Furnish extra materials in the following quantities:
   1. Tiles and Base: Furnish 2% of the total quantity (but not less than 2 full sealed cartons) of each type, pattern and color. Provide 5% of colors with less than 5000 square feet. Properly package and identify each material.
   2. Sheet Goods: Furnish 10 linear feet in roll form for each 500 linear feet or fraction thereof, of each product, color and pattern. Package each roll with protective covering and identification labels describing contents.
   3. Stair Accessories: Furnish 5% of the total quantity of each type, pattern and color. Properly package and identify each material.

G. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened labeled containers.

B. Store, protect, and handle resilient flooring materials in accordance with manufacturer's recommendations to prevent damage, soiling and deterioration.

C. Store materials in areas to receive resilient flooring for a minimum of 48 hours before installation.

1.07 PROJECT CONDITIONS

A. Maintain uniform room temperature range not less than 70 degrees F., in areas to receive resilient flooring for minimum 48 hours before installation and 48 hours after installation.

B. Provide adequate lighting and ventilation during installation and clean-up.

C. Protect adjoining surfaces from damage and soiling.

PART 2 PRODUCTS

2.01 RESILIENT FLOORING MATERIALS

A. Luxury Vinyl Strip and Tile Flooring
   1. Type: Meets Reference Specification ASTM F1700, Type B, Class III
   2. Thickness: 2.5 mm total with 28 mil urethane wearlayer.

3. Sizes: As indicated.
4. Properties:
    a. Static Load: ASTM F970 Meets Requirements
    b. Indentation – Residual (75 Lbs): Meets Requirements
    c. Coefficient Of Friction: ASTM D2047 0.65 (Dry)
    d. Fire Rating: ASTM E648 Class I
    e. Smoke Density ASTM E662: Meets Requirements
5. Colors, Patterns and Manufacturers
    a. Basis of Design: As indicated on the drawings.
    b. Other Acceptable Manufacturers: Luxury vinyl flooring manufactured by other manufacturers will be considered if materials meet the requirements of the Basis of Design and the sizes and colors are an acceptable match as approved by the Architect.
6. Wood Floor Deck Assemblies: Provide plywood underlayment when directed, and as approved by flooring manufacturer. APA Underlayment EXP 1, with sanded-face or equal. Conform to Specification 06 10 50.

2.02 BASE

A. Rubber Base: Complying with ASTM F1861, Type TP, Group 1, 4" high, 1/8" gage. Provide long length rolls and job formed corners. Standard top set cove (Style B) at resilient and other hard surface flooring and straight toeless (Style A) at all carpeted floors.
    1. Colors and Manufacturers
        a. Basis of Design: As indicated on the drawings.
        b. Other Acceptable Manufacturers: base manufactured by other manufacturers will be considered if materials meet the requirements of the Basis of Design and the colors are an acceptable match as approved by the Architect.

2.03 ACCESSORIES

A. Leveling Compound: Non-staining latex modified, Portland cement based type, compatible with flooring, as provided or recommended by the flooring manufacturer.

B. Adhesives: Water resistant, stabilized type as recommended by the resilient flooring and base manufacturer to suit material and substrate conditions.
    1. General: Provide materials that comply with Project Sustainable Design Requirements and Low Emitting Material goals.

C. Resilient Edge/Transition Strips: Provide rubber or stainless steel transition strips by the following manufacturers.
    1. Resilient-to-Carpet: Rubber. Colors as selected by Architect.
        a. ROPPE, #56
        b. JOHNSONITE/TARKETT, CTA-XX-H
        c. VPI FLOORING, ACC12
    2. Resilient-to-Concrete: Stainless steel
        a. SCHLUTER Reno U; stainless steel
        b. GREAT LAKES TILE PRODUCTS; Reducer.
        c. BLANKE CORP.; Reducer Trim.
    3. Where transition types are required for conditions other than those listed above, provide rubber type from the manufacturers listed to create a smooth transition or termination.

D. Cleaning and Polishing Materials: Polish and neutral cleaner as recommended by the floor material manufacturer.

E. Existing Adhesive Remover: Non-toxic type; similar to De-Sol-It by ORANGE-SOL or equal by NAPIER ENVIRONMENTAL TECHNOLOGIES, INC., or CITRUS KING.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates and installation condition. Do not proceed with resilient flooring work until unsatisfactory conditions have been corrected.

B. Subfloor surfaces shall be smooth, level, at the required finish elevation, and within the tolerances specified in Section 03 30 00.

C. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Prepare substrates according to floor manufacturer's written instructions to ensure adhesion of resilient products.
   1. Concrete Substrates: Prepare according to ASTM F710.
   2. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   3. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.

B. Perform tests recommended by flooring manufacturer. Proceed with installation only after satisfying manufacturer’s recommendations for test results.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install flooring until it is the same temperature as the space where it is to be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by flooring.

3.03 INSTALLATION

A. Install resilient flooring and accessories with adhesive in strict compliance with the manufacturer's recommendations. Butt tightly to vertical surfaces, thresholds, nosings and edgings. Scribe around obstructions and to produce neat joints, laid tight, even and straight. Extend flooring into toe spaces, door reveals and into closets and similar openings.

B. Tile Flooring
   1. Lay tile flooring with joints tight, in true alignment and parallel to walls of rooms and corridors.
   2. Lay tile symmetrically about centerlines of space, without pattern or borders. Adjust layout to avoid use of cut widths less than one-half tile at room perimeter.
   3. Match tile for color by using manufactured and packaged sequence.
   4. Broken, cracked, or deformed tiles are not acceptable.
   5. Immediately after installation, thoroughly roll tile with a 150 lb. sectional roller until a firm, uniform bond has been obtained.

C. Base
   1. Install at walls, column, casework and other permanent fixtures as scheduled. Install in as long of lengths as practicable. Tightly bond base to backing throughout length of each piece, with continuous contact at horizontal and vertical surfaces.
   2. Provide terminal base ends beveled and toes rounded.
   3. On masonry surfaces or other similar irregular surface, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.

D. Sheet Flooring
   1. Install sheet flooring in accordance with latest edition of manufacturers' instructions.
   2. Spread only enough adhesive to permit installation of sheet flooring before initial set.
   3. Install flooring wall to wall before installation of floor-set cabinets, casework and similar moveable items.

4. Extend flooring into door recesses, closets, and similar openings as indicated on drawings.
5. Where adjacent floor finish is dissimilar, terminate sheet flooring at centerline of doors.
6. Scribe, cut, and fit to walls, columns, cabinets, pipes, built-in-furniture and cabinets to produce tight joints. Lay flooring to provide a minimum number of seams. Avoid cross seams, filler pieces, and strips.
7. Sheet flooring shall be installed over covers for telephone conduits, electrical conduits and other similar items which occur within the finished floor areas.
8. Sheet flooring MUST be cut sharp and clean around these covers so that the covers can be removed when required.
9. Sheet flooring must be applied to covers in a solid application of adhesive.

3.04 CLEANING AND PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. After flooring has set, clean thoroughly. Remove excess adhesive or other surface blemishes from flooring, using neutral type cleaners as recommended by the flooring manufacturer.

C. Perform initial maintenance according to latest edition of manufacturer's maintenance manual and the following:
   1. Vinyl composition Tile: Clean, apply polish, and buff with type of polish, number of coats and buffing procedures in accordance with manufacturer's instructions.

D. Protect installed flooring from damage and staining with heavy duty non-staining Kraft paper or other covering at all traffic lanes. Protect completed work from traffic and damage until final acceptance.

END OF SECTION 09 65 00

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SECTION 09 68 00
CARPETING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Carpet, installation and all adhesive, edge guards, pad and accessories necessary for the installation of:
   1. Carpet tile
   2. Carpet sheet – Broadloom

B. Work includes preparation of subsurfaces, cleaning, and protection of finished carpet.

1.02 QUALITY ASSURANCE

A. Installer: Firm with not less than 5 years of carpeting experience similar to work of this Section.
   1. Work not in compliance with the manufacturer's recommended standards and procedures shall be promptly corrected at the Contractor's expense.

B. Manufacturer: Firm (carpet mill) with not less than 5 years of production experience with similar types specified in this section; and whose published product data clearly indicates compliance of product with requirements of this Section.

C. General Standard: "Carpet Specifiers Handbook" by The Carpet and Rug Institute; for definitions of terminology not otherwise defined herein, and for general recommendations and information.

D. Fire Performance Characteristics: Provide carpet that is identical to that tested for the following fire performance requirements, according to test method indicated, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Flammability - ASTM D2859: Passing Methanine Pill Test.
   2. Critical Radiant Flux - ASTM E648: Not less than 0.45 watts per square centimeter.
   3. Smoke Density - ASTM E662: 450 or less.
   4. Pile Height: Provide carpet that is ½” maximum as required by ADAAG 4.5.3 ADA Standards.

E. Carpet: Comply with the local building authority for flame spread and smoke contribution requirements and tested in accordance with ASTM E84.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).

C. ASTM D3574 - Standard Test Methods for Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams; 2017.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

E. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2023.

F. ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials; 2021a, with Editorial Revision.

G. CRI 104 - Standard for Installation of Commercial Carpet; 2015.

1.04 SUBMITTALS

A. Samples
   1. Tiles: Submit full size tiles (samples) of each color and pattern selected.
   2. Broadloom: Submit 12" x 12" samples of each color and pattern selected.
   3. Accessories: 12" long sample of each type exposed edge stripping and accessory item.

B. Product Data: Provide for all items. Include, product data covering carpet construction, physical characteristics, durability, resistance to fading, and flame resistance characteristics.

C. Shop Drawings
   1. Broadloom: Submit seam diagram drawings and edge treatments.
   2. Tiles: Submit drawings showing layout. Indicate pile or pattern direction and locations and types of edge strips.

D. Certifications: Contractor shall provide the following:
   1. Manufacturer: Before carpet materials are ordered, submit 4 copies of test results from a recognized laboratory and 4 copies of a notarized statement, signed by an officer of the manufacturer, confirming that the carpet products proposed for use are those which have passed the required tests indicated under "Performance Standards" for the carpet and comply with the requirements of State and local fire authorities.
   2. Installer: Submit 4 copies attesting that materials actually installed were the same as those certified as meeting specified requirements.

E. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.05 PRODUCT DELIVERY AND STORAGE

A. Deliver carpeting materials in original mill protective wrapping, and store inside protected from weather, moisture and soiling.

B. Investigate and resolve access restrictions, including elevator capacity, entrances and accessibility, to assure proper delivery and installation of materials.

C. Protect materials against damage of any kind. Damaged products, including soiled fabrics, will be rejected.

1.06 MAINTENANCE

A. Manufacturers: Provide three (3) copies of maintenance schedules, describing programmed maintenance procedures, including general maintenance, preventative maintenance, spot removal, traffic lane maintenance and overall cleaning.

B. Operational Service: Provide manufacturer’s take-back program service for carpet installed in project. Service shall reclaim materials for recycling and/or reuse. Service shall not landfill or burn reclaimed materials.

1.07 WARRANTY

A. Special Project Warranty: Submit a written warranty, executed by the Contractor, Installer and the Manufacturer, agreeing to repair or replace carpeting which fails in materials or workmanship within the specified `warranty period. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.
   1. Warranty period is two years after date of substantial completion.

B. Carpet manufacturer’s material wear warranty: Ten years.

1.08 EXTRA MATERIALS

A. Tiles: Provide quantity of full tiles for each type of material equal to 5 percent of amount installed.

B. Broadloom: Provide quantity of full-width carpet equal to 5 percent of amount installed. In addition, turn over to Owner all usable scraps of carpet. Usable scraps are defined to include roll ends of less than 9 ft. length, and pieces of more than 3 sq. ft. area and more than 8 inches wide.

C. Deliver extra carpet materials to Owner’s designated storage space, properly packaged with protective covering and identified with labels describing contents.

PART 2 PRODUCTS

2.01 CARPET

A. Manufacturers, Styles and Colors
   1. Basis of Design: Manufacturers, styles and colors as indicated on the drawings.
   2. Other Acceptable Manufacturers: Carpet manufactured by other manufacturers will be considered if materials meet the requirements of the Basis of Design performance and physical characteristics including but not limited to:
      a. Color, pattern, style
      b. Size, weight and gage
      c. Fiber characteristics, type and content.
      d. Density, yarn count, twist, stitches, pile weight and characteristics
      e. Primary and secondary backing
      f. Treatments
   3. If the, color and style are acceptable matches as approved by the Architect. these additionally approved manufacturers and carpets will be included by Addendum.
   4. Types, Patterns and Colors: As indicated on Drawings.

2.02 CARPET PADDING STRETCH-IN

A. Description: Grafted or densified primed bonded polyurethane-foam cushion.

B. Compression Force Deflection at 65 Percent per ASTM D3574: 0.7 to 1.4 and as recommended by carpet manufacturer

C. Physical Characteristics: HUD/FHA UM72a Class: 1
   1. Density: 6 lbs.
   2. Polymer density lbs./cu. Ft. ±5% 2.2 to 2.7
   3. Thickness: .375".
   4. Profile: Flat.
   5. Tensile Strength psi min: 10
   6. Elongation %: 100
   7. Comp. Set Max. % At 50% Deflection: 15.0

D. Emissions: Provide carpet cushion that complies with testing and product requirements of CRI's "Green Label" program.

2.03 ACCESSORIES

A. Carpet Edge Guard: Non-metallic type. Extruded or molded vinyl or rubber of size and profile indicated. Color as selected by Architect.

B. Adhesive: Non-toxic, water resistant, white latex base cement formulated for the installation of the manufactured materials. Type as recommended by carpet manufacturer.
   1. Toxicity/IEQ: Adhesive must not have a VOC content greater than 50 g/L less water and exempted solids, as prescribed by South Coast Air Quality Management District Rule 1168.

C. Seaming Cement: Hot-melt seaming adhesive or similar product recommended by carpet manufacturer, for taping seams and buttering cut edges at backing to form secure seams and prevent pile loss at seams.

D. Miscellaneous Materials: As recommended by manufacturer of carpet and other carpeting accessory products; selected by installer to meet project circumstances and requirements.

E. Leveling Materials and Crack Fill: Non-staining latex cementitious type, compatible with carpet adhesive, as recommended by the flooring manufacturer.

F. Carpet Stripping: Water-resistant plywood, in strips as required to match cushion thickness and that comply with CRI 104, Section 12.2.

G. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running

joints.

PART 3 EXECUTION

3.01 PREPARATION

A. Installer must examine substrates for moisture content and other conditions under which carpeting is to be installed, and notify Contractor in writing of conditions detrimental to proper completion of the work.
   1. Do not proceed until unsatisfactory conditions have been corrected.

B. Comply with CRI 2011 and with carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.

C. Concrete Substrates
   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 flooring manufacturer. Do not use solvents.
   3. Perform tests recommended by flooring manufacturer. Proceed with installation only after satisfying manufacturer’s recommendations for test results.

D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

E. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

F. Sequence carpeting with other work so as to minimize possibility of damage and soiling of carpet during remainder of construction period.

3.02 INSTALLATION

A. Install in accordance with recommendations of the manufacturers of materials and Carpet and Rug Institute's methods specified in CRI 2011. Carpet manufacturer's current installation instructions shall be kept at job site and be followed explicitly.
   1. Comply with manufacturer's recommendations for installation of carpet; maintain uniformity of carpet direction and lay of pile, unless otherwise indicated.
   2. Stretch-in Installation: Comply with CRI 104, Section 12, "Stretch-in Installations."

B. Use modular carpet from the same dye lot in each room.

C. Lay carpet in accordance with the final shop drawings. No reversing of carpet direction shall be permitted.

D. Install modular carpet by trimming, cutting and prefitting units. Then apply adhesive in strict accordance with manufacturer's instructions, and place the carpet modules with the pile inclination in the direction as recommended by the manufacturer, or as otherwise indicated on the final layout drawings.
   1. Application shall be full spread. Sprayed on adhesive is not permitted.
   2. Install using a notched trowel.

E. Trim protruding ends of open loops so slightly below surrounding pile height.

F. Use edge molding where carpet terminates under doors and along edge of carpet where it abuts another floor material. Fasten edge moldings securely to the floor with glue manufactured for this specific purpose.

G. Roll entire area lightly to eliminate air pockets and ensure uniform bond.

H. Double Glue-Down Installation
   1. Layout cushion using the longest lengths possible.
   2. Locate seams of carpet so they are not directly over cushion seams.
   3. Butt cushion edges.

4. Place cushion in full bed of adhesive conforming to application and curing rates of adhesive.
5. Fit sections of carpet into each space prior to application of adhesive. Trim edges and butter cuts with seaming cement.
6. Apply adhesive uniformly to cushion in accordance with manufacturer's instructions. Butt carpet edges tightly together to form seams without gaps. Roll lightly to eliminate air pockets and ensure uniform bond. Remove adhesive promptly from face of carpet.

3.03 CLEANING AND PROTECTION

A. Protect installed carpet to comply with CRI 2011 and carpet manufacturer recommendations.

B. Remove debris, sorting pieces to be saved from scraps to be disposed. Keep premises free and clear of waste material in connection with carpet work.

C. Vacuum carpet using commercial machine with face-beater element. Remove spots and replace carpet where spots cannot be removed.

D. Advise Contractor of protection methods and materials needed to ensure that carpeting will be without deterioration or damage at time of substantial completion.

E. Provide adequate protection for adjacent equipment, furnishings and materials.

F. When entering, passing through, or working in any space in the building that contains finished materials, maintain proper protection for floors, walls, ceilings, fixtures, etc. Repair or replace damaged adjoining work as directed by the Architect at no additional cost to the Owner.

END OF SECTION 09 68 00

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SECTION 09 91 00
PAINTING

PART 1 GENERAL

1.01 SCOPE

A. Work Included
   1. Section includes paint systems and high-performance coating systems.
   2. Surface preparation and painting or finishing of all interior and exterior exposed items and surfaces except as otherwise indicated. Work includes, but is not necessarily limited to, the following:
      a. Walls, ceilings and soffits.
         1) Gypsum board
         2) Plaster
      b. Concrete masonry walls.
      c. Hollow metal doors and frames.
      d. Wood trim, casework and millwork as required.
      e. Exposed structure including deck and all framing.
      f. Exposed ferrous metal of any type, interior and exterior, including galvanized items.
      g. Exposed sheet metal, ductwork, conduit and piping in finished spaces; not mechanical equipment or electrical equipment rooms.
      h. Exposed prime coated or unfinished mechanical or electrical items outside of mechanical equipment rooms. Repaint factory finished mechanical or electrical items where specified.
      i. Stenciling of fire walls above ceilings.
      j. Paint existing surfaces and items where indicated on the drawings and where these surfaces and items are located within areas where new work is being performed.
      k. Exposed cementitious fireproofing.
      l. Other items noted or specified.
   3. Surface preparation, priming and coats of paint specified are in addition to shop priming and surface treatment specified under other sections of the work.

B. Mechanical Equipment Rooms: Painting subject to the following requirements:
   1. Paint finish on walls and ceiling, when scheduled on drawings, to be applied prior to installation of mechanical/electrical work as much as possible.
   2. Spray painting not permitted after electric motors have been installed.

C. Work Excluded: Do not paint the following items unless specifically called for on the drawings or specified herein:
   1. Concrete floors.
   2. Shop or prime coats on items to which shop or prime coats have been applied by the fabricator, unless noted otherwise.
   3. Exterior concrete.
   4. Items with factory finish or natural finish (brick, stone, stainless steel, aluminum, and others) unless noted or indicated elsewhere.
   5. Colored concrete masonry units.
   6. Wall areas permanently concealed by fixed equipment or accessories.
   7. Sprayed fireproofing and items receiving sprayed fireproofing.
   8. Equipment, sheet metal, ductwork and equipment in mechanical and electrical rooms; painting of these items, if required, provided under Divisions 23 and 26 as applicable.
   9. Piping in mechanical rooms, except exposed gas and fire protection piping.
   10. Concealed, miscellaneous metal, except for shop prime coat touch-up.
   11. Factory finished equipment, except for touch-up, unless otherwise specified herein.
   12. Concealed piping.
   13. Communication and data wiring in cable trays

14. Items permanently concealed above ceilings.

D. Surface Preparation
   1. It is the intention of this specification that new substrates will be ready for decoration as specified herein except for normal construction dust and soiling.
   2. Surfaces and materials installed by other trades are required to be acceptable for work specified under Part 3, Surface Preparation. Specifically, new surfaces to be clean, sound, free from loose particles, dirt, loose mortar and grease.
   3. Existing Surfaces: Unless otherwise specified, provide all surface preparation required for decoration.

1.02 RELATED SECTIONS

A. Waste Materials Management and Recycling: Section 01 74 19.

1.03 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.04 REFERENCE STANDARDS

A. ASTM D2805 - Standard Test Method for Hiding Power of Paints by Reflectometry; 2011 (Reapproved 2018).

B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2018).

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

1.05 QUALITY ASSURANCE

A. Application: Performed only by skilled, experienced painters.

B. Provide lead free prime and finish coatings. All top coatings shall be mold and mildew resistant.

C. Coordination: Provide finish coats compatible with prime paints used. Review other specification sections to ensure compatibility of total coating system with prime paints provided for the various substrates. Provide barrier coats over non-compatible primers or remove primer and reprime as required. Notify the Architect of anticipated problems using coating systems specified on substrates primed in accordance with other section requirements.

D. Reference Specifications
   1. The following Society for Protective Coatings (SSPC) specifications are referenced by code number within this Section.

Code	Method
SP-1	Solvent Cleaning
SP-2	Hand Tool Cleaning
SP-3	Power Tool Cleaning
SP-6	Commercial Blast Cleaning

SP-11	Power Tool Cleaning to Bare Metal
SP-16	Brush-off Blast Cleaning of Non-Ferrous Metals

E. Job Mock-Ups: Mock-ups will serve as standard for acceptance of work. Leave approved mock-ups in place as part of completed project. Manufacturers' representatives shall be available to advise applicator on proper application techniques and procedures. Locate mock-up areas as directed by Architect. Provide the following mock-ups of spaces or areas indicated:
   1. Concrete Masonry, Epoxy Coating: 50 square feet.
   2. Concrete Masonry, Painted Finish: 50 square feet.
   3. Gypsum Board, Epoxy Finish: 50 square feet.
   4. Ornamental Handrail: 6 linear feet of each exposure (interior and exterior).
   5. Gypsum Board, Painted Finish: Mock-up room walls complete as specified in Section 09 21 16.
   6. Ductwork: 6 linear feet of each paint type and ductwork material.

F. Paint walls prior to installing wall mounted signage.

G. Prepainting Walk-Through: In areas where ceilings and walls are scheduled or indicated to be field painted, and equipment, ductwork, piping, conduit and other wall/ceiling mounted or suspended items are exposed, the areas are to be reviewed to determine colors of the various items.
   1. Attendance: Contractor, painter and Architect.
   2. Items to be painted colors other than the background wall or ceiling will be identified.

1.06 SUBMITTALS

A. Submit a complete selection of manufacturer's color chips indicating color, texture and sheen for approval for each finish specified herein.

B. Submit a complete schedule for identifying manufacturer and specific brand name or number of products proposed for finishing specified surfaces.
   1. Provide percent of solids by volume content data for each paint material.
   2. Provide paint label analysis and application instructions for each type paint.

C. Provide the following quantities of paint of each type and color required for maintenance purposes. Provide original, unopened, labeled containers with color samples and a list of project use. Extra materials are not to be used for touch-up by Contractor.
   1. Metals and Wood: 2 gallons.
   2. Gypsum Board: 5 gallons.
   3. Concrete Masonry – Painted: 5 gallons

D. Provide one (1) unopened gallon of each type and color of paint and stain required for maintenance purposes. Provide original, unopened, labeled containers with color samples and a list of project use. Extra materials are not to be used for touch-up by Contractor.

E. Color/Finish Samples
   1. After receiving color chips from the Contractor, the Architect will provide a complete schedule of colors and sheens desired.
   2. Obtain schedule well in advance of commencing work and submit samples of specified finishes for approval.
   3. Submit duplicate samples on the same kind of materials to which finishes will be applied. One half of the sample shall show the completed treatment and the other half shall show the successive steps, taken in producing the finish. When approved, samples will be so marked; one set will be retained by the Architect and one set will be returned for the painter's use.
   4. No finishes shall be applied on the work until samples are approved. Approved samples shall be strictly duplicated in the work. Additional coatings, if required to reproduce approved samples, shall be applied without additional cost to the Owner.
   5. Use representative colors when preparing samples for Architect's review.

F. Statement From Manufacturer
   1. Contractor, in submitting the list of proposed subcontractors, shall include for approval, along with the name of the painting subcontractor, the names of the manufacturers whose materials the subcontractor proposes to use in the work.
   2. Following tentative approval of the subcontractor and the materials manufacturers, notify the manufacturers, in writing, that the specifications require the manufacturers to submit to the Architect, a statement by a corporate officer of the manufacturer that coatings scheduled by the Architect are proper for the intended use and that the manufacturer's representative will be available to advise the Architect and the Contractor regarding applications of all coatings.

G. Close-Out Material List: Provide a list of all paint and coating materials used on the project. Include manufacturer, product number, color and room/location where used.

H. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials on the job site in original, new, unopened packages and containers bearing the manufacturer's name and label, and the following information:
   1. Name or title of material.
   2. Manufacturer's stock number and date of manufacture.
   3. Manufacturer's name.
   4. Contents by volume, for major pigment and vehicle constituents.
   5. Thinning instructions.
   6. Application instructions.
   7. Color name and number.

B. Store, protect and handle materials in accordance with manufacturer's recommendations to prevent damage and deterioration. Store paint materials at minimum of 50o F.

C. Maintain paint material storage space as clean, non-hazardous and orderly. Place waste and soiled paint rags in tightly covered metal containers; safely dispose of at end of each working day. Take every precaution to avoid fire hazards and spontaneous combustion. Provide acceptable type of fire extinguisher immediately adjacent to paint storage area.

1.08 PROJECT CONDITIONS

A. Coordinate painting and finishing work with other trades to ensure adequate illumination, ventilation and dust-free environment during application and drying of paint and finish treatments.

B. Maintain uniform interior building temperature of minimum 50^{o} F for 24 hours before, during and continuously for 48 hours after painting.

C. Do not apply coatings when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Provide adequate ventilation as required for specified paint and finish treatment materials in spaces scheduled. Maintain for time periods recommended by material manufacturer to provide proper drying.

E. Provide adequate illumination on surfaces to be finished. Maintain a minimum 80 foot candle lighting level measured mid-height at substrate surface.

F. Protect adjoining surfaces against damage or soiling.

G. Maintain work in neat and orderly condition, promptly removing empty containers, wrappings, soiled rags, waste and rubbish from site.

H. Material Safety Data Sheets (MSDS): Provide documents available to Owner's Representative and construction personnel at the job site. Comply with MSDS requirements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Paint: Brands of paint and stain are specified in "Paint and Material Finish Schedule," only to establish a standard of quality. Other paint brands and manufacturers such as BENJAMIN MOORE; BEHR/KILZ; MARTIN SENOUR; PPG PAINTS; PRATT AND LAMBERT; CORONADO PAINT COMPANY, SHERWIN WILLIAMS are acceptable with proof of comparable products and satisfactory experience records for the intended use. Comply with VOC content of materials specified.
   1. Colors: As indicated on drawing; colors not indicated to be as selected by Architect. [As selected by Architect.

B. Special Coatings: TNEMEC brand of coatings are specified in "Coatings and Material Finish Schedule," to establish a standard of quality. Coatings manufactured by SHERWIN WILLIAMS, DuPONT, PPG PROTECTIVE MARINE COATINGS, INTERNATIONAL PROTECTIVE COATINGS or CARBOLINE are acceptable with proof of comparable products and satisfactory experience records for the intended use. Comply with VOC content of materials specified.
   1. Colors: As indicated on drawing.

2.02 MATERIAL GENERAL

A. General: Provide materials that comply with Project Sustainable Design Requirements and Low Emitting Material goals.

B. Material Compatibility
   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. Stains: Factory-mixed, penetrating, transparent oil-base type. Applicator shall be allowed to add approved colorants on the job to match approved samples. No other ingredients shall be added to stains.

2.03 ACCESSORY MATERIAL

A. Application Equipment: Not required to be new, but shall be adequate for the work and workmanship required herein.

B. Accessories: Provide all required ladders, scaffolding, drop cloths, masking, scrapers, tools, dusters and cleaning solvents as required to perform the work and achieve the results specified herein.

C. Secondary products not specified by name (i.e. turpentine, thinners, mineral spirits, fillers, linseed oils, etc.) shall be "best grade" or "first line" products.
   1. Filler material shall be woodworker's option of material that can be tinted and worked so as to match adjacent wood surfaces.

2.04 EXTERIOR PAINT AND FINISH MATERIAL SCHEDULE

A. Apply paint and finish materials to substrate surfaces indicated. Apply touch-up prime coats in addition to shop-applied prime coats. Provide additional job site prime coats when indicated.

B. Metals - Ferrous: Galvanized and Shop Primed (Semi-Gloss).
   1. SW
      a. Primer: SW ProCryl Universal Metal Primer BB-310 Series One (1) Coat
      b. Finish: S-W Pro industrial Acrylic Semi-Gloss Coating B66-650 Series. Two (2) coats.
   2. PPG
      a. Primer: Pitt-Tech Plus Acrylic Interior/Exterior Primer/Finish DTM Industrial Primer 90-1912 PF Series. One (1) coat.

b. Finish: Pitt-Tech Plus HP Acrylic Interior/Exterior Semi-Gloss DTM Industrial Enamel 4216 Series. Two (2) coats.

C. Metal – Ferrous: Unprimed (Semi-Gloss).
1. SW
   a. Primer: SW ProCryl Universal Metal Primer BB-310 Series One (1) Coat
   b. Finish: S-W Pro industrial Acrylic Semi-Gloss Coating, B66-650 Series . Two (2) coats.
2. PPG
   a. Primer: 90-1912 Acrylic Interior/Exterior Primer/Finish DTM Industrial Primer. One (1) coat.
   b. Finish: 4216 HP Acrylic Interior/Exterior Semi-Gloss DTM Industrial Enamel 4216 Series. Two (2) coats.

D. Aluminum Shapes and Railings
1. SW
   a. Prime Coat: Macropoxy 646-100 Epoxy B58-620 Series
   b. Finish Coat (All steel exposed to view): Waterbased Acrolon 100 B65W721. Two coats.
2. PPG
   a. Prime Coat: PPG 95-3300 Durethane DTM Urethane Mastic Series
   b. Finish Coat (All steel exposed to view): PPG 95-3300 Durethane DTM Urethane Mastic Series

E. Mineral Fiber Cement Siding:
1. SW
   a. Primer: Preprimed.
   b. Finish: SW A-100 Exterior Latex Flat. Two coats.
2. PPG
   a. Primer: Preprimed.
   b. Finish: Speedhide Exterior 100% Acrylic Latex Flat 6-610XI Series. Two (2) coats.

2.05 INTERIOR PAINT AND FINISH MATERIALS SCHEDULE

A. Apply paint and finish materials to substrate surfaces indicated. Apply touch-up prime coats in addition to shop-applied prime coats. Provide additional job site prime coats when indicated.

B. Gypsum Board and Plaster – Walls.
1. SW
   a. Primer: ProMar 200 Zero VOC Interior Latex Primer B28W2600 Series.
   b. Finish:. ProMar 200 Zero VOC Interior Latex Eg-shel B20 Series Two (2) coats.
2. PPG
   a. Primer: SpeedHide zero Interior Zero VOC Latex Sealer 6-4900XI Series. One (1) coat.
   b. Finish: Speedhide zero Interior Zero VOC Latex Eggshell 6-4310XI Series. Two (2) coats.
3. Surfaces: Gypsum board wall surfaces.

C. Gypsum Board and Plaster – Ceilings/Soffits.
1. SW
   a. Primer: ProMar 200 Zero VOC Interior Latex Primer B28W2600 Series.
   b. Finish: ProMar 200 Zero VOC Interior Latex Flat B30 Series . Two (2) coats.
2. PPG
   a. Primer: Speedhide zero Interior Zero VOC Latex Sealer 6-4900XI Series. One (1) coat.
   b. Finish: Speedhide zero Interior Zero VOC Latex Flat 6-70ZV Series. Two (2) coats.
3. Surfaces: Ceilings, soffits, bulkheads

D. Concrete Masonry Surfaces (Semi-Gloss): Epoxy

1. SW
    a. Filler: Loxon Block Surfacer A24W200. 8 mil dft to pin hole free..
    b. Finish: Pro Industrial Pre-Catalyzed Water Based Epoxy K46 Series. Two coats.
2. PPG
    a. Filler: Perma-Crete Interior/Exterior Block Filler Surface 4-100. 6-15 XI Series. Minimum 8 mils dft to pin hole free.
    b. Finish: Pitt Glaze WB1 Semi-Gloss Water Based Pre-Catalyzed Acrylic Epoxy 16-510 Series. Two (2) coats.
3. Surfaces: Where indicated.

E. Metals - Ferrous: Shop Primed and Unprimed.
1. SW
    a. Primer: S-W Pro Industrial Pro-Cryl Primer, B66-310 Series
    b. Finish: S-W Pro industrial Acrylic Semi-Gloss Coating, B66-650 Series. Two (2) coats.
2. PPG
    a. Primer: Pitt-Tech Plus 90-1912 Acrylic Interior/Exterior Primer/Finish DTM Industrial Primer. One (1) coat.
    b. Finish: Pitt-Tech Plus 4216 HP Acrylic Interior/Exterior Semi-Gloss DTM Industrial Enamel 4216 Series. Two (2) coats.
3. Surfaces: Hollow metal doors, frames, door mullions, ferrous metal surfaces.

F. Metals - Ferrous: Galvanized. Similar to MPI INT 5.3A.
1. SW
    a. Primer: ProCryl Universal Metal Primer B66-310 Series
    b. Finish: S-W Pro industrial Acrylic Semi-Gloss Coating, B66-650 Series. Two (2) coats. Two (2) coats.
2. PPG
    a. Primer: Pitt-Tech Plus 90-1912 Acrylic Interior/Exterior Primer/Finish DTM Industrial Primer. Changed from 90-712 Series on 1-10-14
    b. Finish: Pitt-Tech Plus 4216 HP Acrylic Interior/Exterior Semi-Gloss DTM Industrial Enamel 4216 Series. Two (2) coats.
3. Surfaces: Hollow metal doors, frames, door mullions, railings, galvanized metal surfaces.

G. Wood - Painted.
1. SW
    a. Primer: Premium Wall & Wood Primer B28W8111. One (1).
    b. Finish: ProMar 200 Zero VOC Interior Latex Semi Gloss B31 Series Two (2) coats.
2. PPG
    a. Primer: Seal Grip Interior/Exterior 100% Acrylic Universal Primer/Sealer 17-921XI Series. One (1) coat.
    b. Finish: Speedhide zero Interior Zero VOC Latex Semi-Gloss Enamel 6-500ZV Series. Two (2) coats.

H. Wood – Satin Stained Finish: Alkyd based stain with alkyd or Water (to meet GS-11) based polyurethane satin varnish finish.
1. Wood Filler: Paste wood filler (open grains only).
2. Stain: Interior alkyd wiping stain; colors as indicated on the drawings. Final stain approval by Architect from approved samples.
    a. PPG: Varathane Woodcare Interior Oil Based Stain DFT400 Series. One (1) coat.
3. Sanding Sealer: Satin urethane varnish thinned per manufacturer’s recommendations.
    a. PPG: Proluxe Interior Oil Based Polyurethane Satin Finish DFT129
4. Finish Coats: Two (2) coats satin polyurethane varnish at approximately 1.4 mils dft per coat.
    a. PPG: Prolux Interior Oil Based Polyurethane Satin Finish DFT129

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrate surfaces and installation condition. Report condition(s) that might affect proper application.

B. Do not proceed with painting work until unsatisfactory conditions have been corrected.

C. Initial application of paint to a surface constitutes acceptance of existing conditions and responsibility for satisfactory performance.

D. Examine specification sections of other trades and their provisions regarding painting. Surfaces left unfinished shall be painted or finished as part of the work of this Section unless specifically noted otherwise.

3.02 SURFACE PREPARATION

A. General
   1. Broom clean and remove excess dust before painting is started in any area.
   2. Broom cleaning is not permitted after operations have begun in a specific area.
   3. Surfaces shall be clean, dry and adequately protected from dampness.
   4. Surfaces shall be free of any foreign materials that will adversely affect adhesion or appearance of applied coating.
   5. Remove any mildew and neutralize the surface prior to applying coating.

B. Existing Surfaces Scheduled for Painting or Finishing
   1. Condition, clean, sand, prime, seal and prepare existing surfaces for application of finish materials specified. Provide only finish coats over existing surfaces except where condition of existing surfaces or type of existing surface requires priming and sealing.
   2. Remove loose, blistered, scaled, or crazed finish to bare base material.
   3. At conditions where new work adjoins existing work, prepare existing surface extending to the nearest break in the plane of the surface.

C. Concrete Masonry and Concrete
   1. Remove splatters, dust and dirt by brushing or water washing with clear water.
   2. Remove misplaced mortar.
   3. Cracks, abrasions and other defects shall be cut out, patched flush, and sanded smooth and sealed before applying prime coat.
   4. Existing Surfaces
      a. Surfaces with minor loose or blistered paint: Remove loose, flaking, and blistered paint; clean as specified. Fill surface cracks with approved latex base filler. Apply primer-sealer over bare substrate and filled cracks.
      b. Multi-coated surfaces with major loose or blistered paint requiring complete paint removal: Remove paint down to bare substrate using chemicals, pressure methods, or other acceptable methods. Fill contraction and structural cracks with self-bonding filler or elastomeric sealant worked well into the cracks to prevent leaks, then wipe excess materials from the surface. Apply a latex base or other acceptable prime and fill material to fill all defects and holes, wipe excess material off surface; let filler material dry for 24 hours minimum before applying primer.
   5. All Surfaces
      a. Clean all cementitious substrates pursuant to the requirements of SSPC-SP 13.

D. Wood - Painted
   1. Prime and backprime interior finish wood products, before their installation, with interior wood prime paint.
   2. Sandpaper to smooth and even surface, dust off.
   3. Countersink nails.
   4. Remove resin with scrapers, sandpaper, mineral spirits or turpentine.

5. Apply shellac or knot sealer to all knots, pitch and resinous sapwood, allow to dry thoroughly prior to priming.
6. After priming, putty all nail holes, cracks, open joints and other defects, sand smooth and dust off. Color putty to match primer; if putty is not compatible with finish, spot prime puttied areas.

E. Wood - Stained
1. Prime and backprime faces, edges and end with first coat before installation.
2. Sandpaper to smooth and even surface, dust off.
3. Countersink nails.
4. Putty all nail holes, cracks, open joints and other defects with mixture of stain and putty so that appearance of completed work is uniform. Sand smooth and dust off.

F. Structural Steel and Miscellaneous Ferrous Metal
1. Bare Metal Surfaces
   a. Remove grease, oil, dirt and other foreign material prior to prime coat application where necessary according to SP-1, SP-2 and/or SP-3.
   b. Power tool clean remove rust prior to prime coat application according to SP-11.
   c. Include all hangers and miscellaneous fabricated items.
2. Shop Primed Surfaces
   a. Fill open joints or abrasions in shop prime coat with filler; feather edges, sand smooth, and touch-up with primer compatible with shop primer. Extend primer beyond treated area.
   b. Remove grease, oil, dirt and other foreign material prior to prime coat touch-up where necessary according to SP-1, SP-2 and/or SP-3.
   c. Include all hangers and miscellaneous fabricated items.

G. Galvanized or Zinc-Coated Items
1. Pretreat surfaces prior to application of prime coat with phosphate pretreatment, similar to Great Lakes Labs, “Clean and Etch”, Dupont’s Metal Conditioner #5717 or PPG DX 579, unless prime coat material to be used is recommended by its manufacturer for direct application over zinc treated surfaces of the type at hand. Follow manufacturer's directions.
2. Remove dirt or grease on surfaces scheduled for paint finish according to SP-1. Wipe dry with clean cloths.
3. Roughen surface with steel wool as necessary to remove gloss.

H. Gypsum Board
1. Fill minor irregularities with spackling paste.
2. Sand to smooth level surface and dust off.
3. Avoid raising nap of paper.
4. Pearlescent Finish: Level 5 finish in accordance with Section 09 21 16.

I. Plaster: Allow to cure a minimum of 2 weeks before finishing. Provide sonic moisture meter test results to confirm that plaster is dry and ready for paint.

J. Factory Primed Items: Verify compatibility between factory applied primer and finish painting system. If compatibility cannot be guaranteed, then provide barrier coat compatible with both finishes.

K. Aluminum and aluminum-alloy, lead, copper, and other nonferrous metal surfaces: Solvent clean in accordance with SSPC SP 1 and wash with mild non-alkaline detergent to remove dirt and water soluble contaminants. If aluminum does not come from the manufacturer with an approved paint grip finish, consult the coating manufacturer for the appropriate surface preparation requirements. Minimum requirement to meet SSPC SP 16.

3.03 APPLICATION

A. General
1. Only skilled mechanics shall be used.

2. Apply all paint in strict accordance with the manufacturer's instructions. Data sheets take precedence over these specifications if more restrictive.
3. Do not apply until preceding coat is dry to manufacturer's recommendations.
4. Do not apply to any surface unless it is thoroughly dry.
5. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes if moisture content of surface is greater than recommended by manufacturer.
6. Do not use material that has exceeded the pot life stated by the manufacturer.
7. Apply to the following workmanship requirements:
    a. Neat appearance of finished surfaces.
    b. Absence of ridges, sags, runs, drops, laps, unnecessary brush marks, holidays, air bubbles and excessive roller stipple.
    c. Thorough mixing of paint and limited use of thinners.
    d. Uniformity of film thickness.
    e. Proper drying time between coats.
    f. Protection of unpainted and finished surfaces.
8. Coverage and hide shall be complete. When color or undercoats show through final coat, recoat until the paint film is of uniform finish, color, appearance, and coverage, at no additional cost to Owner.
9. Edges of paint or finish adjoining other materials or colors shall be sharp and clean without overlapping.
10. Natatorium Trusses: Coat top of truss with specified paint system prior to installing roof deck.

B. Methods
1. Application may be by roller, brush, spray or other approved means.
2. When utilizing spraying, be careful not to use methods which will affect other trades work in adjacent areas.

C. Mixing
1. Mechanically mix before use.
2. Agitate during application as required.
3. Do not tint or shade in field unless permitted by Architect.

D. Thinning
1. Dilute only as required to achieve suitable application viscosity.
2. Use only type and amount recommended by manufacturer.

E. Approvals: Do not apply succeeding coat of paint until previous coat has been inspected and written approval is given.

F. Electrical Conduits
1. Do not paint any electrical conduit or boxes unless they are exposed and abutting a surface that is to be painted or stained.
2. Conduits and boxes to be painted shall be given a coat of galvanizing pretreatment followed by the paint system for the adjoining surface.

G. Protection of Surfaces
1. Provide covers, drop cloths and masking to protect unpainted surfaces previously finish painted. Use special care in protecting electrical and mechanical items which may be damaged by the painting operations (i.e., overspray and solvents that might damage the internals of the item).
2. If possible, remove items not to be painted such as hardware, accessories, electrical plates, lighting fixtures and/or trim, mechanical grilles and louvers and similar items in contact with painted surfaces.
3. Use caution when painting exterior work to avoid wind carrying overspray, drippings, etc., onto adjacent structures, facilities and vehicles.
4. Following completion of painting, reinstall removed items by workmen skilled in the trade involved and remove all covers, masking and drop cloths.

H. Fire and Smoke Partitions: Conform to OBC 703.7.
   1. Identify partitions above ceilings on both sides of partitions except within shafts in letters not less than 3 inches high with a minimum 3/8 inch stroke in contrasting color.
   2. Stenciled message: "SMOKE PARTITION or X HOUR FIRE PARTITION – PROTECT ALL OPENINGS" as applicable.
   3. Locate within 15 feet of the end of each wall and at intervals not exceeding 30 feet measured horizontally along the wall or partition
   4. Use semi-gloss paint of color that contrasts with color of substrate.
   5. Locate approximately 12” above ceiling tile.

END OF SECTION 09 91 00

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SECTION 10 14 11
RESTROOM SIGNAGE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Restroom signs
   1. Wheel Chair Accessible
   2. Non-Accessible

B. Emergency escape directories.

C. All signs which identify restrooms shall be tactile and braille.

1.02 SUBMITTALS

A. Shop Drawings: Submit to Architect manufacturer's product data, where applicable, and complete drawings showing all identifying devices and installation details in accordance with the requirements of the General Conditions.

B. Samples: Submit samples for materials, finishes, colors, letter styles, etc., as required for selection and approval by Architect prior to fabrication of identifying devices.

C. Final signage schedule must be approved by Architect prior to fabrication.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.04 QUALITY ASSURANCE

A. Signage Standards: Conform to the Americans with Disabilities Act (ADA Standards) Standards and ICC A117.1 where applicable and to the extent as indicated.

B. Acceptable Manufacturers: All units are to be custom fabricated; manufacturer's products meeting the specifications will be acceptable. Manufacturers must be regularly engaged in fabrication and installation of signage units and related identifying devices.
   1. Fabricator must review all dimensional changes with Architect.

C. Approvals: All identifying devices shall be approved at the fabricator's shop by the Architect prior to shipment and installation.

D. Spelling and Braille Accuracy: Responsibility of sign manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original shipping cartons with seals unbroken.

B. Protect materials from physical damage.

C. Store materials in clean, dry area.

D. Inspect all materials prior to installation to assure proper function and condition of all items.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Locations, Quantities, Graphics and Copy: As specified (scheduled) herein.

2.02 MATERIALS

A. Plates: High pressure phenolic "ES" plastic; scratch resistant, non-static, thermoset, rated self-extinguishing.
   1. Colors: As selected by Architect.
   2. Thickness: 3/32" for ADA plates; 1/16" for non-raised copy (flat) plates.

B. Provide an integral method to create tactile and Braille signs; producing a unitary component. Glued on or laminated letters or Braille cells are not acceptable.

2.03 DESIGN GUIDELINES

A. Plate Shape: Square cornered; do not bevel edges.

B. Letter Style
   1. ADA Signs: Helvetica medium, all capital letters.
   2. All Other Signs: Helvetica medium, mixed upper and lower case.

C. Tactile Letters and Braille: Grade II braille; raised 1/32" above background surface. Provide Braille dome topped same color as background. Sign manufacturer shall be responsible for verifying accuracy of spelling, both tactile and Braille.

D. Letter Size
   1. Tactile Signs: Minimum letter size is 5/8" for capital letters.
   2. Non-tactile Signs: Between 3/8" and 1" capital letter height.
   3. Overhead Signs: Minimum 3" copy. Mixed upper and lower case is permissible. Non-tactile is permissible.

E. Color: As selected by Architect.

2.04 METHOD OF MANUFACTURING

A. Tactile Signs: Relief engraved plates.

B. Non-Tactile Signs: Routed engraved.

2.05 SIGNS REQUIRED FOR TACTILE/BRAILLE

A. Restrooms - Wheel Chair Accessible: Approximately 6” wide x 8” high plate with 1" capital letters (MEN or WOMEN), centered on the plate with Braille centered directly below the word. Provide a routed engraved wheel chair access symbol and a universal man or woman symbol located above the word. No border.

B. Restrooms - Non-Accessible: Two plates required.
   1. 6-3/4" wide by 2-3/4" high plate with 1" capital letters (MEN or WOMEN), centered horizontally on the plate with Braille centered directly below the word.
   2. 6-3/4" x 6-3/4" plate with 5/8" raised caps informing location of nearest accessible restroom. Same message in Braille centered below copy.

2.06 EMERGENCY ESCAPE DIRECTORY

A. Description: 18" x 12". Extruded aluminum "F" frame with anodized medium bronze finish and non-glare acrylic face. Provide with rigid masonite backing.

B. Copy: Color screen printed removable graphic of floor plan showing escape route from installed location. Locate at building entrances.

2.07 COPY POSITION

A. Lines of copy laid out flush left with a margin of 3/4" along the left edge of plate. Exceptions are restrooms and stairways, which shall be centered on the plate.

B. Left hand, right hand and bottom margins are 3/4". Vertical spacing measured between lower case letters is 3/4". Overall width and height of a plate is achieved with multiples of 3/4".

PART 3 EXECUTION

3.01 INSTALLATION

A. Mount signs plumb and level.

B. Mount all identification devices with 3/4" foam tape on all four edges.

3.02 SIGNAGE SCHEDULE

A. Provide the following Sign Plates
   1. Women, combined with room number and handicap symbol and international symbol, as applicable, at each restroom.

2. Men, combined with room number and handicap symbol and international symbol, as applicable, at each restroom.

B. Emergency Escape Directory: As specified hereinbefore.

C. Sign Locations
1. Single Doors: Locate signs on the wall next to the latch side of the door, 1" from the outside edge of the door frame and with the top edge of the uppermost sign 61-1/2" A.F.F.
2. Pairs of Doors: Locate signs as specified above for single doors, except Architect will direct in field if sign occurs on right or left jamb of opening.

3.03 CLEAN UP

A. After completion of work remove all debris and tools from the premises, clean all adhesive spatter and run-over from finished surfaces and wash all plated clean of fingermarks and soil. Polish sign surfaces with a soft cotton rag.

END OF SECTION 10 14 11

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SECTION 10 14 19
DIMENSIONAL LETTER SIGNAGE

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide wall mounted building identification letters.

1.02 SUBMITTALS

A. Layout Drawings: Provide full size layout drawing indicating letter style, size and spacing.

B. Product Data: Submit for each cast dimensional character specified, including details of construction relative to materials, dimensions, gages, profiles, method of mounting, specified options, and finishes.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver in manufacturer's original unopened protective covering.

B. Store in original packing.

C. Handle so as to prevent damage.

PART 2 PRODUCTS

2.01 MATERIALS

A. Material: Cast aluminum; alloy and temper as recommended by sign manufacturer for the casting process used and for the use and finish indicated.

B. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.

C. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Furnish inserts, as required, to be set into masonry work.

2.02 DIMENSIONAL LETTERS

A. Cast Letters: Form individual letters by casting. Produce characters with smooth, flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, or other defects. Cast lugs into the back of characters and tap to receive threaded mounting studs. Comply with requirements specified for finish, style and size.

B. Text: As indicated.

C. Letter Style: Helvetica: All Upper Case

D. Size: 12"

E. Thickness: 1"

2.03 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. 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

C. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.04 FINISH

A. General: Comply with NAAMA "Metal Finishes Manual" for finish designations and applications recommendations.

B. All exposed aluminum surfaces: Architectural Class II, clear anodized fine satin finish.

2.05 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, letters manufactured by A.R.K. RAMOS, ANDCO INDUSTRIES CORP., ASI SIGN SYSTEMS or VOMAR PRODUCTS, INC. are acceptable

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

3.02 INSTALLATION

A. Securely install in location indicated on the drawings in accordance with manufacturer's written instructions and recommendations.
   1. Install letters level, plumb, true to line and at heights and locations indicated, with surfaces free from distortion or other defects in appearance.
   2. Mount letters with 1" projection from wall surface.

3.03 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 14 19

SECTION 10 26 00
WALL PROTECTION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work under this section includes the following:
   1. Resilient laminated wall panels.
   2. Resilient corner guards

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents; 2021.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

D. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies; 2014.

1.03 QUALITY ASSURANCE

A. Manufacturer: Firm with minimum five years experience in successfully producing wall guards and wall panels similar to that indicated for this project.

B. Installer qualifications: Engage an installer who has no less than 3 years experience in installation of systems similar in complexity to those required for this project.

C. Fire performance characteristics: Provide engineered PETG wall protection system components with UL label indicating that they are identical to those tested in accordance with ASTM E84 for Class 1 characteristics listed below:
   1. Flame spread: 25 or less
   2. Smoke developed: 450 or less

D. Impact Strength: Provide assembled wall protection units that have been tested in accordance with the applicable provisions of ASTM F476.

E. Chemical and stain resistance: Provide wall protection system components with chemical and stain resistance in accordance with ASTM D543.

F. Single source responsibility: Provide all components of the wall protection system manufactured by the same company to ensure compatibility of color, texture and physical properties.

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 23.

B. Shop Drawings: Clearly indicate the following for each type of wall protector:
   1. Type of wall protector identified by manufacturer's model numbers including profiles, sizes, accessories and finish.
   2. Types and sizes of wall anchors for each type of wall construction.

C. Samples: 6" long full size samples representative of each type of wall protector specified.

D. Manufacturer's certification indicating compliance with ADA Standards Accessibility Guidelines for Protruding Objects.

1.05 DELIVERY, HANDLING AND STORAGE

A. Products shall be delivered to job-site in original unopened packages bearing manufacturer's labels.

B. Store and protect products in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 RESILIENT WALL PANEL

A. Description: Vinyl/acrylic sheet (.040")
   1. Color: As selected by Architect.
   2. Trim and Joint Moldings: Extruded rigid plastic that matches wall-covering color.
   3. Mounting: Adhesive.

B. Manufacturer: As indicated. Equal by DECOGARD PRODUCTS or equal by BALCO METALINES, KOROSEAL, PAWLING or IPC CONSTRUCTION SPECIALTIES, INC

2.02 RESILIENT LAMINATED WALL PANELS

A. Description: Vinyl/acrylic sheet (.022") factory bonded to 3/8" thick fiber board core. Factory bond moisture resistant balance sheet to backside of panel.
   1. Edges: Beveled; vinyl/acrylic sheet extending to all edge surfaces.
   2. Color: As selected by Architect.
   3. Joint: Vee joint reveal.
   4. Joint Filler: Color match sealant strip.

B. Manufacturers: CONSTRUCTION SPECIALTIES (C/S), KOROSEAL, PAWLING or IPC.

2.03 RESILIENT CORNER GUARDS

A. Description: Assembly consists of extruded aluminum retainer (0.063") and textured high impact snap-in acrylic cover (0.11").

B. Vinyl/Acrylic Cover: U.L. classified. Tested in accordance with ASTM E84 meeting both flame spread and smoke development requirements for Class 1 rating.
   1. Flame Spread: 20.
   2. Smoke Developed: 250 - 450.

C. Wing Width: 2” (3” available; 135o is 2-1/2” wide).

D. Angle: 90 degrees (135 degrees is available).

E. LENGTH: 6'-0".

F. Manufacturer: FS-20 by CONSTRUCTION SPECIALTIES, INC.

G. Color: As selected by Architect.

2.04 MATERIALS

A. Plastic Materials: Chemical- and stain-resistant, high-impact-resistant plastic with integral color throughout; extruded and sheet material as required, thickness as indicated.

B. Adhesives: As recommended by protection product manufacturer. Provide and comply with project VOC and sustainability requirements.

2.05 FABRICATION

A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.

B. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

C. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
   1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface preparation: Prior to installation, clean substrate to remove dirt, debris and loose particles. Perform additional preparation procedures as required by manufacturer’s instructions.

B. Protection: Take all necessary steps to prevent damage to material during installation as required in manufacturer’s installation instructions.

3.03 INSTALLATION

A. Install items in accordance with manufacturer's instructions and directions.

B. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

1. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
2. Where splices occur in horizontal runs of more than 20 feet (609.6 cm), splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches (304.8 mm).
3. Adjust termination caps as required to ensure tight seams.

C. Impact-Resistant Wall Covering: Install top and edge moldings, corners, and divider bars as required for a complete installation.

3.04 CLEANING

A. Remove protective material from all wall protectors and clean in accordance with manufacturer's recommendations.

B. Remove surplus materials, rubbish and debris resulting from installation as work progresses and upon completion of work.

3.05 PROTECTION

A. Protect installed materials to prevent damage by other trades. Use materials that may be easily removed without leaving residue or permanent stains.

END OF SECTION 10 26 00

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SECTION 10 28 13
TOILET ACCESSORIES

PART 1 GENERAL

1.01 SCOPE

A. This section covers all toilet accessories. Extent of each type of accessory is indicated on the drawing and specified herein.

B. Included are accessories for:
   1. Toilet rooms.

1.02 WORK SPECIFIED IN OTHER SECTION

A. Unframed Mirrors: Section 08 81 00.

1.03 REFERENCED STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM F446 - Standard Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area; 2019.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.04 QUALITY ASSURANCE

A. Provide each type of products of one manufacturer. Provide locks with same keying for all accessory units in the project.

B. Stamped names or labels on exposed faces of units not permitted.

C. Follow ADA Standards and ICC A117.1 as required by code, and as indicated in drawings.

1.05 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of toilet accessory required.

1.06 DELIVERY, STORAGE AND HANDLING

A. Delivery accessory items in manufacturer's original, unopened packaging.

B. Store and handle materials in accordance with manufacturer's recommendations. Protect against soiling, damage and wetting.

1.07 PROJECT CONDITIONS

A. Furnish anchoring devices and inserts for installation of toilet accessories. Coordinate delivery of items which must be set or built into other work.

B. Provide setting drawings, templates and instructions for installation of anchorage devices.

1.08 WARRANTY

A. Submit mirror manufacturer's written ten year warranty against silver spoilage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Where a manufacturer's product is specified as a Basis of Design, equal products as manufactured by BOBRICK, BRADLEY, AJW, AMERICAN SPECIALTIES, may be used provided the product meets the requirements of the specifications, unless otherwise indicated.

2.02 ITEMS

A. Toilet Paper Holder: ADA compliant, open non-controlled.
   1. Double Roll: ASI Model 74022 SSM.
      a. Type: Surface Mount.
      b. Finish: Satin stainless steel.

B. Soap Dispenser - ADA compliant Horizontal Tank Type: BRADLEY Model 6542-73

1. Type: Surface mounted, liquid dispenser.
2. Material: Stainless Steel, 20 ga., type 304.
3. Finish: Satin.
4. Capacity: 40 oz.

C. Handicap Bars: BRADLEY Series 812
1. Diameter: 1-1/2 inch.
2. Material: Stainless steel, standard satin finish.
3. Fasteners: Concealed.
4. Style and Length
   a. As indicated; where not indicated provide 42” long horizontal and 18” vertical bars.
   b. Provide both horizontal and vertical bars in conformance with ICC A117.1, 604, 608 and 609.
   c. Provide grab bars in conformance with ICC A117.1, 607 for bathtubs.

D. Paper Towel Dispenser: BRADLEY Model 250-15
1. Type: Surface mount with lockable hinged front cover.
2. Capacity: 500 multi or 300 C-fold towels.
3. Material: Stainless steel, 22 ga., type 304.
4. Finish: Satin.

E. Sanitary Napkin Disposal: BRADLEY Model 4781-15.
1. Type: Surface mounted on toilet partition. Hinged bottom for disposable liner removal.
2. Material: Stainless steel, satin finish.

F. Robe/Towel Hook: BRADLEY Model 9119-81
1. Type: Wall mounted, concealed fastener.
2. Material: Chrome plated brass. Satin chrome finish.

G. Mirrors
1. Standard Framed Type: BRADLEY Model 780.
   a. Frame: Stainless steel angle, theft resistant concealed fasteners.
   b. Glass: Tempered 1/4" thick with full silver coating, copper coating and organic coating. Warranted by manufacturer 10 years against silver spoilage.
   c. Size: 18" wide x 36" high, unless otherwise indicated or scheduled on the drawings.
2. Unframed Type: Section 08 81 00.

H. Infant Changing Table
1. Description: Surface mount, fold down type. Concave molded polyethylene changing surface with safety strap. Folds up flat against wall when not in use. Provide with integral sanitary liner holder.
   a. Sanitary Liners: Provide 2 cases (approximately 2,800) disposable liners.
2. Manufacturer Koala Bear Kare Horizontal Baby Changing Station by KOALA CORPORATION or equal by BROCAR PRODUCTS, FOUR D, INC. or other manufacturers listed in Article 2.01.

2.03 FABRICATION

A. Edges: All throat openings and similar type exposed edges of towel dispensers, seat cover dispensers, waste receptacles and similar type accessories to be hemmed or sufficiently rounded to preclude accidental cuts to users.

B. Miters: Provide one-piece seamless beveled or return flange; open miters, if not welded, must be worked to eliminate sharp edges; edges which may cut or snag are not acceptable.

2.04 SCHEDULE OF ACCESSORIES

A. Location, quantity and mounting height of accessories as indicated on drawings.

B. Keyed Units: Key all similar types of units alike. Provide two keys per unit.

PART 3 EXECUTION

3.01 INSPECTION

A. Installer: Examine substrates, previously installed inserts anchorages necessary for mounting of accessories and other conditions under which installation is to occur.
   1. Notify Contractor in writing of conditions detrimental to proper and time completion of the work.
   2. Do not proceed with work until satisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions using fasteners which are appropriate for substrate and recommended by manufacturer of unit. Install units and plumb and level, firmly anchored in positions indicated.

B. Provide concealed fasteners wherever possible of types required for substrate conditions encountered.
   1. Metal Stud and Gypsum Board: Screws or bolts anchored to 16 gage (minimum) metal plate blocking or wood blocking located within stud space. See Section 06 10 00 Rough Carpentry.
   2. Concrete Masonry Units: Integral fasteners (i.e. expansion anchors, etc.).
   3. Metal Lath and Plaster and Studs: Toggle bolts.

C. Lead, plastic or fiber plugs are not acceptable.

D. Grab Bars: Coordinate grab bar locations as to right hand or left hand installations with field conditions.
   1. Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F446.

E. Upon completion of installation, adjust each accessory unit for proper operation and clean exposed surfaces. Turn over keys to designated Owner's personnel.

END OF SECTION 10 28 13

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SECTION 10 31 00
FIREPLACE COMPONENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Section includes fireplace components. Fireplace descriptions are as follows:
   1. Vent free gas.

1.02 RELATED SECTIONS

A. Plumbing: Division 22.

1.03 REFERENCE STANDARDS

A. ANSI Z21.88/CSA 2.33 - Vented Gas Fireplace Heaters; 2019.

B. UL 127 - Standard for Factory-Built Fireplaces; Current Edition, Including All Revisions.

C. Additional References
   1. ANSI Z21.88/CSA 2.33 ANSI Z21.88 – 2005 CSA 2.33-2005
   2. ICBO ER-2031 Evaluation Report.
   3. ICBO ER-5159 Evaluation Report.
   4. UL-29-915173A
   5. UL 127/UL-CS610 Standards - Factory-Built Fireplaces.
   6. UL-MH8988
   7. UL-MH8988-127

1.04 QUALITY ASSURANCE

A. Variations from the manufacturer's installation instructions are subject to approval by the manufacturer's technical support department in writing and submitted to the Associate prior to submitting a bid.

B. Fireplace Products: Comply with all local building codes and regulations; in addition, products shall have approvals and meet the specifications noted.

1.05 SUBMITTALS

A. Shop Drawings and Product Data: Submit for all items in accordance with the requirements of the General Conditions.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect all materials from damage by other trades as well as damage from inclement weather and other unforeseen job site hazards.

PART 2 PRODUCTS

2.01 VENT FREE GAS FIREPLACES

A. Manufacturers
   1. Basis of Design: Drawings and Specifications are based on MONESSEN Artisian AVFL42.
   2. Other Manufacturers: Fireplaces manufactured by others are acceptable providing they meet the requirements and design intent indicated or specified herein and conform to the dimensional layout indicated on the drawings. Minor dimensional changes are acceptable. However, the resulting finish modifications are the responsibility of the Contractor.

B. Description: Single sided vent free.
   1. Rating: 37,000 Btu/hr input; natural gas maximum.
   2. Gas type: Natural Gas
   3. Size: 37 ½” x 13 ½”
   4. Efficiency: 99.9%
   5. Face: Stainless steel
   6. Fireglass: Diamond

PART 3 EXECUTION

3.01 COORDINATION

A. Coordinate installation of concealed utilities with construction of fireplace.

3.02 INSTALLATION

A. Install manufactured fireplaces in accordance with manufacturer's recommendations and approved Shop Drawings, and with requirements of authorities having jurisdiction.

B. Upon completion of installation, visually inspect all exposed surfaces. Touch up scratches and abrasions with touch up paint recommended by the manufacturer; make imperfections invisible to the unaided eye from a distance of one feet.

3.03 ADJUSTING AND CLEANING

A. Adjust and clean for proper operation.

END OF SECTION 10 31 00

SECTION 10 44 00
FIRE EXTINGUISHERS AND CABINETS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide fire extinguishers and cabinets as shown and specified.
   1. Provide fire extinguishers with wall brackets in non-finished areas (i.e. mechanical rooms, electrical rooms, etc.).

1.02 RELATED SECTIONS

A. Masonry (coordination for recessed cabinets): Section 04 00 00

1.03 REFERENCED STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

1.04 QUALITY ASSURANCE

A. Provide fire extinguishers complying with Fire Protection Association (NFPA) Pamphlet No. 10.

1.05 PROVIDE ONLY NEW PORTABLE FIRE EXTINGUISHERS FULLY LOADED, TESTED AND APPROVED BY UNDERWRITER'S LABORATORIES (UL), AND READY FOR USE.

A. Fire-Rated, Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

1.06 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.
   1. Cabinets: 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. Samples: Submit 6” x 6” sample for each type of exposed finish required.

1.07 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 recessed fire protection cabinets with wall depths.
   1. Coordinate location of fire extinguisher cabinets prior to construction of concrete masonry walls. Verify recessed type installations and coordinate these locations with the masonry construction.
      a. Provide mason with rough opening size of cabinets.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Portable Fire Extinguishers
   1. J. L. INDUSTRIES
   2. LARSEN’S MANUFACTURING COMPANY
   3. POTTER-ROEMER
   4. WATROUS

B. Fire Extinguisher Cabinets
   1. J.L. INDUSTRIES
   2. LARSEN’S MANUFACTURING COMPANY
   3. POTTER-ROEMER
   4. WATROUS

C. Where a specific manufacturer's product is specified herein it is to establish a level of quality. Products by the other manufacturers listed are acceptable providing they meet these specifications.

2.02 FIRE EXTINGUISHERS

A. Multipurpose Dry-Chemical Type: Fabricate in accordance with NFPA 10, 10A, and 10L and UL Standards, except hose, gauge face cover, and horn cone parts shall be metal. No plastic or nylon valves, trigger/handle, casing, or gauge will be acceptable. Fire extinguishers, unless indicated otherwise, shall be 10 lb. multi-purpose dry chemical type for use on A, B, and C fires (4A-60BC), with hose and horn.
   1. Provide this type throughout facility, unless noted otherwise.

B. Wet Chemical Type: Fabricate in accordance with NFPA 10, 10A, and 10L, UL Standards, and State Codes, except hose, gauge face cover, and horn cone parts shall be metal. No plastic or nylon valves, trigger/handle, casing, or gauge will be acceptable. Fire extinguishers shall be 6 liter potassium acetate wet chemical type for use on Class K fires.
   1. Provide wet chemical extinguishers in kitchen area and where noted.

C. Size: 21-1/2” high x 8-1/2” wide x 5” deep.

2.03 FIRE EXTINGUISHER CABINETS

A. Provide steel construction, except units in Natatorium and locker rooms which are stainless steel.

B. Basis of Design: Drawings and specifications are based on LARSEN Architectural Line with full glass door. LARSEN catalog numbers are listed to establish a standard of quality and mounting type. Equal products may be provided from the listed acceptable manufacturers. Provide the following wall mounting types where a specific type of cabinet is indicated on the drawings. Where no type is indicated, provide recessed units.
   1. Recessed - Steel: 2409-R, Flat Trim.
   2. Surface Mount - Steel: 2409-SM.
   3. Semi-Recessed - Steel: 2409-6R.
   4. Recessed - Stainless Steel: SS-2409-R, Flat Trim.
   5. Surface Mount - Stainless Steel: SS-2409-SM.
   6. Doors
      a. Gymnasium: Solid
   7. All Other Areas: Full glass

C. Coordinate final model size with fire extinguisher.

D. Finish
   1. Steel: Baked enamel or powder-coat.
      a. Color: As selected by Architect.
   2. Stainless Steel: No. 4.

E. Mounting Brackets: Provide manufacturer's standard plated finish, heavy duty mounting brackets for surface mounted fire extinguishers. Provide proper size and type for capacity of extinguishers indicated.

F. Fire Rated Cabinets: Listed and labeled to meet requirements of ASTM E814 for fire resistance rating of wall where it is installed.
   1. Construct fire rated cabinets with double walls fabricated from 0.0478 inch thick, cold rolled steel sheet lined with minimum 5/8 inch thick, fire barrier material.

G. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate the words "FIRE EXTINGUISHER" vertically on cabinet door.
   1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

2.04 CABINET FABRICATION

A. Provide standard steel box with trim, frame, door and hardware to suit cabinet type, trim style and door indicated. Weld all joints and grind smooth; miter and weld door frames. Fabricate trim in one piece with corners mitered, welded and ground smooth. Open miters are not acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare recesses for recessed and semirecessed fire protection cabinets as required by type and size of cabinet and trim style.

3.03 INSTALLATION

A. Install fire extinguishers and fire extinguisher cabinets where indicated or as directed by Architect in accordance with manufacturer's instructions and recommendations. Mount at heights indicated, when not indicated as directed by Architect.

B. Securely anchor [brackets and]cabinets to substrate construction with toggle bolts or expansion anchors. Lead, wood or plastic plugs and fasteners are not acceptable.

C. Fire extinguishers are to be fully charged and ready for use when building is turned over to the Owner. Extinguishers shall be certified as fully charged by an approved fire extinguisher service company and shall be tagged or labeled as such.

3.04 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust cabinet doors that do not swing or operate freely.

B. On completion of installation, clean interior and exterior surfaces as recommended by manufacturer.

C. 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.

D. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

E. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10 44 00

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SECTION 10 55 23
MAILBOXES

PART 1 GENERAL

1.01 SCOPE

A. Provide front loading, lockable mailboxes. Provide arrangements, layouts, box sizes and quantities as indicated on drawings.

B. Provide rear loading, lockable mailboxes. Provide arrangements, layouts, box sizes and quantities as indicated on drawings.

C. Cluster Box Units (CBUs). Provide arrangements, layouts, box sizes and quantities as indicated on drawings.

1.02 SUBMITTALS

A. Submit manufacturer's product data, layout drawings and installation instructions in accordance with the General Conditions.

B. Product Certificates: For each type of postal specialty required to comply with USPS regulations, signed by product manufacturer. Include written approval by Postmaster General.

PART 2 PRODUCTS

2.01 MAILBOXES

A. Cluster Box Units (CBUs): Consisting of multiple compartments enclosed within a freestanding, pedestal-mounted enclosure. Provide access to compartments for distributing incoming mail from front of unit by unlocking master lock and swinging pair of side-hinged master doors to provide accessibility to entire group of compartments. Provide access to each compartment for removing mail by swinging compartment door. Comply with USPS-B-1118G.
   1. Compartment Enclosure: Fabricated from aluminum sheet with aluminum mounting pedestal and weather-protection hood, with the following number and size of compartments:
   2. Size: As indicated

B. Fabrication: Provide units completely factory assembled, requiring no field assembly.

C. Basis of Design: FLORENCE MANUFACTURING VersatileTM, 4C mailboxes & parcel lockers
   1. Other Manufacturer: Equal products by SALSBURY INDUSTRIES; CUTLER MANUFACTURING CORPORATION; BOMMER INDUSTRIES; AMERICAN DEVICE.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install mailbox assembly in accordance with the manufacturer's recommendations. Anchor units securely to wall structure. Trim opening with flanged trim provided by mailbox manufacturer, finished to match mailboxes.

END OF SECTION 10 55 23

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SECTION 11 31 00
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide appliances where indicated on drawings consisting of:
   1. Refrigerator/freezer
   2. Range/oven
   3. Washer
   4. Dryer
   5. Range hood
   6. Microwave

1.02 RELATED SECTIONS

A. Electrical Rough-In: Included under Electrical Contract, Division 26.

1.03 SUBMITTALS

A. Manufacturer's Product Data: Submit for all items in accordance with the General Conditions and Section 01 33 23.

B. Energy Star Compliant Certificates.

PART 2 PRODUCTS

2.01 ITEMS

A. Finishes: All residential appliances and other appliances to be stainless steel.

B. Refrigerators in ANSI Type A and UFAS units must be vertical side-by-side type; or of the over under type and meet the following requirements: Have at least 50 percent of the freezer space below 54 inches (1371.6 mm) AFF; and, have 100 percent of the freezer controls below 54 inches AFF. Freezers with less than 100 percent of the storage within an accessible reach range must be self-defrosting.

C. Manufacturers listed are to establish a standard of acceptable quality and basis of design. Dimensions of basis of design products are critical for compliance with ADA/ANSI requirements and casework layouts as indicated in drawings. Except where no substitution is indicated, similar products by other manufacturers listed below are acceptable provided they are an acceptable match in performance, characteristics and exact dimensions. All proposed substitutions to be approved by Architect.
   1. KENMORE
   2. KITCHEN AID
   3. AMANA
   4. GENERAL ELECTRIC
   5. MAYTAG
   6. FRIGIDAIRE

D. Refrigerator/Freezer:
   1. Provide as indicated in drawings / schedules.

E. Range/Oven
   1. Provide as indicated in drawings / schedules.

F. Range Hoods
   1. Provide as indicated in drawings / schedules.

G. Disposal:
   1. Provide as indicated in drawings / schedules.

H. Washer:
   1. Provide as indicated in drawings / schedules.

I. Dryer:
   1. Provide as indicated in drawings / schedules.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install all items in accordance with manufacturer's instructions.

B. Provide all required accessories and fasteners to ensure a complete installation.

END OF SECTION 11 31 00

SECTION 11 52 23
TELEVISION MOUNTING BRACKETS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide flat screen television wall mount and ceiling mount type brackets complete with all accessories for mounting at locations indicated on the drawings or specified.

B. Coordinate mounting heights, electrical and AV feeds, cable management and television equipment with Owner and Architect.

1.02 RELATED SECTIONS

A. Use with LEED Wood Blocking: Section 06 10 50.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's product data for all items.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver items in manufacturer's original protective packaging.

B. Store items in original packaging to prevent physical damage.

C. Handle so as to prevent damage to finished surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Specifications are based on mounting brackets manufactured by PEERLESS INDUSTRIES, INC. Catalog numbers are listed to establish a level of quality and performance.

B. Other Manufacturers: Similar models manufactured by BRETFORD MANUFACTURING, DA-LITE or. are acceptable provided the units meet the requirements specified herein.

2.02 MOUNTING BRACKETS

A. Wall Mount Type: SmartMount Universal Tilt Wall Mount. Fixed height, tilting.
   1. Television Size Range: 39 to 75”.
   2. Double bracket style with universal mounting arms.
   3. Maximum Load Capacity: 175 pounds.
   4. Finish: Matt black, powder coat.
   5. Tilt Adjustment Capability: 15º forward.
   6. Horizontal Adjustment: Up to 8.00" for centering display on wall.
   7. Vertical Adjustment: Up to 0.25" of vertical adjustment on each universal display adaptor bracket for post-installation leveling and height adjustment fine-tuning.

B. Ceiling Mount Type: SmartMount Universal Tilt Ceiling Mount. Unit consists of support column anchored to ceiling and adjustable, tilting, rotating mechanism with display attachment bracket.
   1. Television Size Range: 32” to 90”.
   2. Drop 36”.
   3. Tilt: 20º.
   4. Rotation: 360º.
   5. Maximum Load Capacity: 200 pounds.

C. Provide all hardware, mounting adapters, templates and fasteners for assembly and attachment of the bracket to substrates indicated.

D. Coordinate mounting of ceiling units with required overhead mounting steel and brackets.

PART 3 EXECUTION

3.01 INSTALLATION

A. In accordance with manufacturer's instructions.

B. Verify that wood blocking has been provided in stud/gypsum board walls. Blocking to be located at mounting hardware.

C. Coordinate placement of miscellaneous steel above ceiling for connection to building framing members.

D. Clean-up: Remove all cartons, debris, scraps, etc. and leave spaces clean and have brackets ready to use.

END OF SECTION 11 52 23

SECTION 11 66 00
EXERCISE EQUIPMENT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work includes all exercise equipment and appurtenances specified and all labor and materials required to install (place) and make fully operational the equipment as specified herein and as indicated on drawings. The scope of exercise equipment is listed in Part 2 of this specification.

1.02 RELATED SECTIONS

A. Electrical: Division 26.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum five (5) years experience in the manufacture of exercise equipment items similar to those specified for this project.

B. Maintenance Service: Manufacturer or supplier to have maintenance office or technician within a 100 mile (160.93 kilometer) radius of the site.

1.04 SUBMITTALS

A. Submit the following in accordance with the General Conditions:
   1. Manufacturer's product data.
   2. Assembly/installation instructions.
   3. Operating and maintenance data.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Prevent damage to exercise equipment handling and storage.

B. Ship, handle and store items as recommended by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Where manufacturers and models are listed herein for specific products they are so named to establish a level of quality.

B. Products by other listed manufacturers or by other manufacturers are acceptable provided they meet the requirements of the Basis of Design manufacturers and their specified products and are approved by the Architect. These products must be submitted to the Architect a minimum of 10 days prior to the Bid Date. Approved manufacturers and products will be issued by Addendum.

2.02 EQUIPMENT ITEMS

A. See equipment specification sheets, immediately following this section.

B. Reference equipment list in Appendix A.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install all components in accordance with manufacturer's instructions and approved Shop Drawings.

B. Leave each system in operating condition. Instruct Owner's personnel on operation, programming and maintenance of all components individually and the system complete.

3.02 CLEANING

A. When all the work covered by this Contract has been completed, Contractor shall clean each and every item of equipment so that all traces of grease, stains, protective coatings, abrasive dust, markings, scratches and other foreign matter are completely removed. The cleaning process shall be one which shall eliminate any further cleaning on the part of the Owner with the exception of that which would ordinarily be undertaken daily to maintain accepted standards of sanitation and appearance.

END OF SECTION 11 66 00

COLUMBUS METROPOLITAN HOUSING AUTHORITY
COMMUNITY. COMMITMENT. COLLABORATION

Moody Nolan

PRODUCT SPECIFICATION

Project Name / Number:	**The Falls on Refugee Road**	June 2, 2025

Plan Tag:	**AB1**	Manufacturer:	True Fitness
Item Name:	Incline Bench	Rep:	Bryan Knapp / G&G Fitness
		Tel:	614.557.7965
Style/Series:	True Flat Incline Bench	E:	bknapp@livefit.com
Model #	SF1000-35		
Dimensions:	55" L x 30" W x 19"		
Finishes:	N/A		
Upholstery Mfg.:	N/A		
Pattern:			
Color:			
COM Yardage/Sq. Ft.:			

Description:
True Fitness Flat Incline Bench
Adjustable
9-position back pad adjust from 0-75 degrees
4-position seat pad adjusts from 0-18 degrees
Integrated wheels and handle for easy moving

PRODUCT IMAGE MAY NOT REFLECT EXACT SPECIFICATIONS

Room/Quantity: FITNESS D109 (1)

Total Quantity: **2**

COLUMBUS METROPOLITAN HOUSING AUTHORITY
COMMUNITY. COMMITMENT. COLLABORATION

Moody Nolan

PRODUCT SPECIFICATION

Project Name / Number:	**The Falls on Refugee Road**	June 2, 2025

Plan Tag:	**AT1**	Manufacturer:	Prism Fitness
Item Name:	Self-Guided Com. Package	Rep:	Bryan Knapp / G&G Fitness
		Tel:	614.557.7965
Style/Series:	Self-Guided Com. Package	E:	bknapp@livefit.com
Model #	400-155-131		
Dimensions:	70" W x 30" D x 90" H		
Finishes:	N/A		
Upholstery Mfg.:	N/A		
Pattern:			
Color:			
COM Yardage/Sq. Ft.:			

Description:

Prism Fitness Smart Deluxe Self-Guided Commercial Pkg.
Tower for well-rounded functional training workout
Includes:
(2) Smart Mats, 16mm with Grommets (blue)
(2) Smart Recovery Foam Rollers
(1) Smart Medicine Ball, 4lb (yellow)
(2) Smart Medicine Balls, 6lb (orange)
(2) Smart Medicine Balls, 8lb (green)
(1) Smart Medicine Ball, 10lb (blue)
(1) Smart Stability Ball, 55cm (yellow)
(1) Smart Stability Ball, 65cm (green)
(1) Smart Stability Ball, 75cm (blue)
(1) Fitness Cable, 20lb (purple)
(1) Fitness Cable, 30lb (pink)
(1) Fitness Cable, 50lb (orange)
(1) Fitness Cable, 70lb (yellow)
(1) Fitness Cable, 90lb (blue)
(5) Smart Quick Flip Single Pocket Handles (pair)
(1) Smart Deluxe Storage Tower

PRODUCT IMAGE MAY NOT REFLECT EXACT SPECIFICATIONS

Room/Quantity: FITNESS D109 (1)

Total Quantity: **1**

COLUMBUS METROPOLITAN HOUSING AUTHORITY
COMMUNITY. COMMITMENT. COLLABORATION

Moody Nolan

PRODUCT SPECIFICATION

Project Name / Number:	**The Falls on Refugee Road**		June 2, 2025

Plan Tag:	**BT1**	Manufacturer:	Gronk Fitness
Item Name:	Balance Trainer	Rep:	Bryan Knapp / G&G Fitness
		Tel:	614.557.7965
Style/Series:	Gronk	E:	bknapp@livefit.com
Model #	3401-G1		
Finishes:	N/A		
Upholstery Mfg.:	N/A		
Pattern:			
Color:			
COM Yardage/Sq. Ft.:			

Description:

Gronk Fitness Balance Trainer
64CM
Adjustable 32" bands
Crafted to push your stability and coordination to new heights, this premium-quality fitness tool is a must-have for athletes, fitness enthusiasts, and anyone seeking to improve their functional strength
Enhanced Stability: engages core muscles
Durable Construction: engineered with top-grade materials
Versatile Training: enables a wide range of exercises
Portable Design: compact and lightweight
Included: convenient pump and two handles

PRODUCT IMAGE MAY NOT REFLECT EXACT SPECIFICATIONS

Room/Quantity: FITNESS D109 (1)

Total Quantity: **1**

COLUMBUS METROPOLITAN HOUSING AUTHORITY
COMMUNITY. COMMITMENT. COLLABORATION

Moody Nolan

PRODUCT SPECIFICATION

Project Name / Number:	**The Falls on Refugee Road**	June 2, 2025

Plan Tag:	**DB1-10**	Manufacturer:	SDR
Item Name:	Dumbbell	Rep:	Bryan Knapp / G&G Fitness
		Tel:	614.557.7965
Style/Series:	SDR Hex	E:	bknapp@livefit.com
Model #	See below		
Finishes:	N/A		
Upholstery Mfg.:	N/A		
Pattern:			
Color:			
COM Yardage/Sq. Ft.:			

Description:

SDR, Dumbbell, Hex w/ contoured handle

(2) SDR-005	5lb.
(2) SDR-010	10lb.
(2) SDR-015	15lb.
(2) SDR-020	20lb.
(2) SDR-025	25lb.
(2) SDR-030	30lb.
(2) SDR-035	35lb.
(2) SDR-040	40lb.
(2) SDR-045	45lb.
(2) SDR-050	50lb.

Made from solid cast iron with a 6-sided anti-roll design and encased in rubber

PRODUCT IMAGE MAY NOT REFLECT EXACT SPECIFICATIONS

Room/Quantity: FITNESS D109

Total Quantity: **1 Lot (20 items)**

COLUMBUS METROPOLITAN HOUSING AUTHORITY
COMMUNITY. COMMITMENT. COLLABORATION

Moody Nolan

PRODUCT SPECIFICATION

Project Name / Number:	**The Falls on Refugee Road**	June 2, 2025

Plan Tag:	**DR1**	Manufacturer:	True Fitness
Item Name:	Dumbbell Rack	Rep:	Bryan Knapp / G&G Fitness
		Tel:	614.557.7965
Style/Series:	True 3 Tier Flat Tray	E:	bknapp@livefit.com
Model #	SF1050-35		
Dimensions:	32" L x 48" W x 37" H		
Finishes:	N/A		
Upholstery Mfg.:	N/A		
Pattern:			
Color:			
COM Yardage/Sq. Ft.:			

Description:
True Fitness 3 Tier Tray Dumbbell Rack
Oversized flat trays accommodate any style dumbbell
Angle of top tray allows kettlebell storage

PRODUCT IMAGE MAY NOT REFLECT EXACT SPECIFICATIONS

Room/Quantity: FITNESS D109

Total Quantity: **1**

COLUMBUS METROPOLITAN HOUSING AUTHORITY
COMMUNITY. COMMITMENT. COLLABORATION

Moody Nolan

PRODUCT SPECIFICATION

Project Name / Number:	**The Falls on Refugee Road**		June 2, 2025
Plan Tag:	**EL1**	Manufacturer:	True Fitness
Item Name:	Elliptical	Rep:	Bryan Knapp / G&G Fitness
		Tel:	614.557.7965
Style/Series:	True Fitness w/ True Unite	E:	bknapp@livefit.com
Model #:	XC3-0A-35 / CC6-LX0A		
Dimensions:	48.6" L x 30" W x 64" H		
Finishes:	N/A		
Upholstery Mfg.:	N/A		
Pattern:			
Color:			
COM Yardage/Sq. Ft.:			

Description:

True Launch Treadmill w/ True Unite LED Elliptical Console
Self-Generating
Robotically Welded Heavy-Gauge Steel
Hybrid Self-Generating Brake
21" Stride Length, 30 Resistance Levels
Molded Anti-Slip / Textured Pattern Footpad
2 Front Transport Wheels
Active Footprint: 70" L x 30" W x 64" H
Large LED Display w/ intuitive navigation
Self-generated
8 data points for detailed workout feedback
Dedicated message center
10-key pin pad for easy set-up and data entry
Quick-access workout program keys
Reading rack
Seamless connectivity to Apple Watch & Samsung Galaxy Watch wearables
Wide selection of streaming and entertainment apps
Bluetooth connection to heart rate straps, headphones, and mobile devices
Wi-Fi, ANT+, and NFC compatibility

PRODUCT IMAGE MAY NOT REFLECT EXACT SPECIFICATIONS

Room/Quantity:	FITNESS D109 (2)
Total Quantity:	**2**

COLUMBUS METROPOLITAN HOUSING AUTHORITY
COMMUNITY. COMMITMENT. COLLABORATION

Moody Nolan

PRODUCT SPECIFICATION

Project Name / Number:	**The Falls on Refugee Road**	June 2, 2025

Plan Tag:	**FT1**	Manufacturer:	True Fitness
Item Name:	Functional Trainer	Rep:	Bryan Knapp / G&G Fitness
		Tel:	614.557.7965
Style/Series:	True Functional Trainer	E:	bknapp@livefit.com
Model #:	SM1000-35		
Dimensions:	44" L x 66" W x 85" H		
Finishes:	N/A		
Upholstery Mfg.:	N/A		
Pattern:			
Color:			
COM Yardage/Sq. Ft.:			

Description:

True Fitness SM1000-35 Functional Trainer
Dual weight stack design allows users to train or rehabilitate each arm using different levels or allows for two simultaneous users
Unique and roll pulley handles allow for effortless one-handed adjustments through 31 heights clearly marked 1-31
Multi-grip pull-up bar enhances versatility
Integrated accessory tray w/ water bottle
Weight stacks per side: 215 lb.
Resistance profile: 21
Cable Travel: 8'

PRODUCT IMAGE MAY NOT REFLECT EXACT SPECIFICATIONS

Room/Quantity: FITNESS D109 (1)

Total Quantity: **1**

COLUMBUS METROPOLITAN HOUSING AUTHORITY
COMMUNITY. COMMITMENT. COLLABORATION

Moody Nolan

PRODUCT SPECIFICATION

Project Name / Number:	**The Falls on Refugee Road**		June 2, 2025

Plan Tag:	**LE1**	Manufacturer:	True Fitness
Item Name:	Leg Extension	Rep:	Bryan Knapp / G&G Fitness
		Tel:	614.557.7965
Style/Series:	Leg Extension/Leg Curl	E:	bknapp@livefit.com
Model #:	SD1000H-35		
Dimensions:	58" L x 48" W x 57" H		
Finishes:	N/A		
Upholstery Mfg.:	N/A		
Pattern:			
Color:			
COM Yardage/Sq. Ft.:			

Description:

True Fitness Leg Extenson/Leg Curl
Multi-position contoured back pad with lumbar support wings and integrated head pad
3 starting positions for both leg extension and leg curl exercises
4-position ankle pad adjusts easily
Fixed shin pad provides stability during leg curl exercise
Weight Stack Options: 175 lbs. or 255 lbs.

PRODUCT IMAGE MAY NOT REFLECT EXACT SPECIFICATIONS

Room/Quantity: FITNESS D109 (1)

Total Quantity: **1**

COLUMBUS METROPOLITAN HOUSING AUTHORITY
COMMUNITY. COMMITMENT. COLLABORATION

Moody Nolan

PRODUCT SPECIFICATION

Project Name / Number:	**The Falls on Refugee Road**	June 2, 2025

Plan Tag:	**LP1**	Manufacturer:	True Fitness
Item Name:	Leg Press	Rep:	Bryan Knapp / G&G Fitness
		Tel:	614.557.7965
Style/Series:	Leg Press/Calf Stack	E:	bknapp@livefit.com
Model #:	SD1003H-35		
Dimensions:	90" L x 46" W x 57" H		
Finishes:	N/A		
Upholstery Mfg.:	N/A		
Pattern:			
Color:			
COM Yardage/Sq. Ft.:			

Description:

True Fitness Leg/Calf Press
Low-profile walk-through design for easy entry and exit
12 position contoured back pad with lumbar support wings and integrated head pad
Oversized rubber-coated foot platform accommodates a wide range of users
Weight Stack Options: 255 lbs.

PRODUCT IMAGE MAY NOT REFLECT EXACT SPECIFICATIONS

Room/Quantity: FITNESS D109 (1)

Total Quantity: **1**

COLUMBUS METROPOLITAN HOUSING AUTHORITY
COMMUNITY. COMMITMENT. COLLABORATION

Moody Nolan

PRODUCT SPECIFICATION

Project Name / Number:	**The Falls on Refugee Road**	June 2, 2025

Plan Tag:	**LR1**	Manufacturer:	True Fitness
Item Name:	Lat/Row Machine	Rep:	Bryan Knapp / G&G Fitness
		Tel:	614.557.7965
Style/Series:	Lat/Row Machine	E:	bknapp@livefit.com
Model #:	SD1002H-35		
Dimensions:	78" L x 48" W x 87" H		
Finishes:	N/A		
Upholstery Mfg.:	N/A		
Pattern:			
Color:			
COM Yardage/Sq. Ft.:			

Description:

True Fitness Lat/Row Machine
10-position thigh pad easily adjusts to accommodate a wide range of users
Angled seat encourages proper anatomical alignment during both pulldown and row exercises and creates an unobstructed path for the rown handle
Weight Stack Options: 175 lbs.
or 255 lbs.

PRODUCT IMAGE MAY NOT REFLECT EXACT SPECIFICATIONS

Room/Quantity: FITNESS D109 (1)

Total Quantity: **1**

COLUMBUS METROPOLITAN HOUSING AUTHORITY
COMMUNITY. COMMITMENT. COLLABORATION

Moody Nolan

PRODUCT SPECIFICATION

Project Name / Number:	**The Falls on Refugee Road**		June 2, 2025

Plan Tag:	**MP1**	Manufacturer:	True Fitness
Item Name:	Multi-Press	Rep:	Bryan Knapp / G&G Fitness
		Tel:	614.557.7965
Style/Series:	Multi-Press Heavy Stack	E:	bknapp@livefit.com
Model #:	SD1005H-35		
Dimensions:	61" L x 60" W x 60" H		
Finishes:	N/A		
Upholstery Mfg.:	N/A		
Pattern:			
Color:			
COM Yardage/Sq. Ft.:			

Description:

True Fitness Multi-Press Heavy Stack
3-position back pad with lumbar support wings and integrated head pad uses gas cylinder assist to easily adjust for Chest, Incline Chest, and Shoulder Press exercises
6-position press arm and 8-position seat accommodate wide range of users
Multi-position hand grips for exercise variation
Clearly labeled and color-coded adjustment knobs
Weight Stack Options: 175 lbs. or 255 lbs.

PRODUCT IMAGE MAY NOT REFLECT EXACT SPECIFICATIONS

Room/Quantity: FITNESS D109 (1)

Total Quantity: **1**

COLUMBUS METROPOLITAN HOUSING AUTHORITY
COMMUNITY. COMMITMENT. COLLABORATION

Moody Nolan

PRODUCT SPECIFICATION

Project Name / Number:	**The Falls on Refugee Road**	June 2, 2025

Plan Tag:	**RB1**	Manufacturer:	True Launch
Item Name:	Recumbent Bike	Rep:	Bryan Knapp / G&G Fitness
		Tel:	614.557.7965
Style/Series:	True Launch w/ True Unite	E:	bknapp@livefit.com
Model #:	RC3-0A-35 / CC6-LBKA		
Dimensions:	66.5" L x 25.5" W x 52" W		
Finishes:	N/A		
Upholstery Mfg.:	N/A		
Pattern:			
Color:			
COM Yardage/Sq. Ft.:			

Description:

True Launch Recumbent Bike w/ True Unit LED Bike Console
Self-generating capability
Ergonomic bask seat with 25 position settings
30 resistance levels
40-450 Watts workload range
2 Front Transport Wheels
Large LED Display w/ intuitive navigation
Self-generated
8 data points for detailed workout feedback
Dedicated message center
10-key pin pad for easy set-up and data entry
Quick-access workout program keys
Reading rack
Seamless connectivity to Apple Watch &
Samsung Galaxy Watch wearables
Wide selection of streaming and entertainment apps
Bluetooth connection to heart rate straps, headphones, and mobile devices
Wi-Fi, ANT+, and NFC compatibility

PRODUCT IMAGE MAY NOT REFLECT EXACT SPECIFICATIONS

Room/Quantity: FITNESS D109 (1)

Total Quantity: **1**

COLUMBUS METROPOLITAN HOUSING AUTHORITY
COMMUNITY. COMMITMENT. COLLABORATION

Moody Nolan

PRODUCT SPECIFICATION

Project Name / Number:	**The Falls on Refugee Road**	June 2, 2025

Plan Tag:	**SP1**	Manufacturer:	Spirit
Item Name:	Spin Bike	Rep:	Bryan Knapp / G&G Fitness
		Tel:	614.557.7965
Style/Series:	Spirit CIC850 Indoor Cycle	E:	bknapp@livefit.com
Model #	850390		
Dimensions:	58.5" L x 22" W x 53.5" H		
Finishes:	N/A		
Upholstery Mfg.:	N/A		
Pattern:			
Color:			
COM Yardage/Sq. Ft.:			

Description:

Spirit CIC850 Indoor Cycle
Wireless LCD console and adjustable steel tablet holder
Smooth magnetic resistance and maintenance-free operation
Reliable commercial-grade Hutchinson Poly V-belt
Adjustable steel tablet holder is PVC coated for durability
Dual pedal design with SPD clip and toe-cage convenience
Stride Length: 13.4"
Seat: High Density Foam
Seat Adjustments: Up/Down/Fore/Aft
Dual water bottle holders
Transportation wheels

PRODUCT IMAGE MAY NOT REFLECT EXACT SPECIFICATIONS

Room/Quantity: FITNESS D109 (1)

Total Quantity: **1**

COLUMBUS METROPOLITAN HOUSING AUTHORITY
COMMUNITY. COMMITMENT. COLLABORATION

Moody Nolan

PRODUCT SPECIFICATION

Project Name / Number:	**The Falls on Refugee Road**		June 2, 2025

Plan Tag:	**TR1**	Manufacturer:	True Fitness
Item Name:	Treadmill	Rep:	Bryan Knapp / G&G Fitness
		Tel:	614.557.7965
Style/Series:	True Launch w/ True Unite	E:	bknapp@livefit.com
Model #:	TC3-DA-35 / CC6-LT0A		
Dimensions:	79" L x 32" W x 60" H		
Finishes:	N/A		
Upholstery Mfg.:	N/A		
Pattern:			
Color:			
COM Yardage/Sq. Ft.:			

Description:

True Launch Treadmill w/ True Unite LED Treadmill Console
Running Surface: 60" L x 22" W
0.5 to 12.5 MPH
15% Maximun Incline
Large LED Display w/ intuitive navigation
Self-generated
8 data points for detailed workout feedback
Dedicated message center
10-key pin pad for easy set-up and data entry
Quick-access workout program keys
Reading rack
Seamless connectivity to Apple Watch &
Samsung Galaxy Watch wearables
Wide selection of streaming and entertainment apps
Bluetooth connection to heart rate straps, headphones, and mobile devices
Wi-Fi, ANT+, and NFC compatibility

PRODUCT IMAGE MAY NOT REFLECT EXACT SPECIFICATIONS

Room/Quantity: FITNESS D109 (3)

Total Quantity: **3**

SECTION 12 21 23
HORIZONTAL LOUVER BLINDS - CORDLESS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide and install materials, and all related accessories required for complete blind installation on all windows indicated on drawings to receive blinds.

1.02 WORK SPECIFIED IN OTHER SECTIONS

A. Wood Blocking: Section 06 10 50

1.03 REFERENCE STANDARDS

A. WCMA A100.1 - Standard for Safety of Window Covering Products; 2022.

1.04 SUBMITTALS

A. Submit manufacturer's product data and full range of color samples.

1.05 QUALITY ASSURANCE

A. Safety Certification: WCMA A100.1 - Safety of Window Covering Products; Window Covering Manufacturers Association.

1.06 EXTRA MATERIAL

A. Provide (3) full-size units for each blind type, size and color installed.

PART 2 PRODUCTS

2.01 MINI BLINDS

A. Materials
   1. Extruded PVC 2" wide with faux wood coating.
      a. Provide slat-to-slat seal coverage with closure with no visible route holes when closed.
   2. Provide engineered bottom rail with cordless push up system.
   3. Matching headrail.

B. Basis of Design: NORMAN Faux Wood Blinds
   1. Other Manufacturers.: Products manufactured by BALI, SPRINGS WINDOW FASHIONS, KIRSCH or HUNTER DOUGLAS, INC. are acceptable upon Architects review and acceptance.

C. Lift Cord: Cordless.

D. Control Wand: Extruded solid plastic; hexagonal shape.
   1. Non-removable type.
   2. Length of window opening height less 3 inches (76.2 mm).
   3. Color: clear.

E. Type A - Accessible Units: Provide battery powered and independent remote-controlled blind tilting devices at each blind.
   1. Manufacturer: SWICHBOT or approved equal.

F. Provide hold-down clips for blinds installed on half and full-lite doors

PART 3 EXECUTION

3.01 INSTALLATION

A. Field measure each window for correct dimensions.

B. Blinds to be installed between window jambs, set ½” off face of window frame.

C. Provide a single blind for each window unit. For double and triple windows, provide multiple blinds on a single head rail.

D. Following installation, shorten lift cord to proper length

E. Replace any bent or damaged slats or other defective items prior to installation.
F. Install level and of proper length and width to fit all windows designated to be treated.
G. Adjust for smooth operation.

END OF SECTION 12 21 23

SECTION 12 33 55
MANUFACTURED PLASTIC LAMINATE CLAD CASEWORK

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide plastic laminate casework as indicated on drawings. Countertops and custom pieces are specified under Section 06 40 00.

B. Accessories common to casework are included as work of this section.

1.02 RELATED SECTIONS

A. Rough carpentry and wood blocking: Section 06 10 00.

B. Wood Blocking: Section 06 10 50.

C. Countertops: Section 06 40 00.

D. Custom Casework: Section 06 40 00.

E. Vinyl Base: Section 09 65 13.

F. Sustainable Design Requirements: Section 01 81 13.

G. VOC Limits: Section 01 81 16

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).

B. ANSI A208.1 - American National Standard for Particleboard; 2022.

C. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

D. ANSI/AWI 0641 - Architectural Wood Casework; 2019.

E. ASTM D1037 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials; 2012 (Reapproved 2020).

F. AWI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).

G. AWI (QCP) - Quality Certification Program; Current Edition.

H. AWI 200 - Care & Storage; 2018.

I. CS 253 - U.S. Commercial Standard CS 253-63 for Structural Glued Laminated Timber; 1963.

J. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 QUALITY ASSURANCE

A. Fabricator qualifications: A firm specializing in the fabrication of millwork with a satisfactory record of performance on projects of comparable size and quality. Fabricator manufacturing, materials and installations shall adhere to applicable AWI Quality Standards Illustrated and be acceptable to the Architect.

B. Installation: Performed only by experienced skilled finish carpenters.

C. Catalog Standards
   1. Manufacturer's catalog numbers, where shown, are for convenience in identifying cabinet work.
   2. Use of a specific manufacturer's catalog numbers is not to preclude the use of any other acceptable manufacturer's product or procedures that may be equivalent.

D. Quality Grade: Materials and fabrication shall be "custom grade" in accordance with "Quality Standard Illustrated," of the AWI conforming to the following sections:
   1. Section 200: Plywood and particleboard.
   2. Section 400: Casework.
   3. Section 1700: Installation

1.05 DEFINITIONS

A. Exposed Portions of Casework: Include surfaces visible when doors and drawers are closed. Bottoms of casework more than 4 feet (121.92 cm) above floor and tops less than 6 feet (182.88 cm) 6 inches (152.4 mm) above floor shall be considered as exposed. Visible members in open cases or behind glass doors also shall be considered as exposed portions.

B. Semi-Exposed Portions of Casework: Includes those members behind opaque doors, such as shelves, divisions, interior faces of ends, case back, drawer sides, backs and bottoms, and back face of doors. Tops of casework 6 feet (182.88 cm) 6 inches (152.4 mm) or more above floor shall be considered semi-exposed.

C. Concealed Portions of Casework: Include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

1.06 SUBMITTALS

A. Product Data: Submit manufacturer's/fabricator's data and installation instructions for each type of casework unit.

B. Samples: Submit samples of specified finishes.

C. Shop Drawings
   1. Submit shop drawings for casework showing plans, elevations, ends and cross sections.
   2. Show details and location of anchorages and fitting to floors, walls and base.
   3. Include layout of units with relation to surrounding walls, doors, windows and other building components.

D. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.
   1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.07 DELIVERY, STORAGE AND HANDLING

A. Protect casework during delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver casework until concrete, masonry and other similar wet work has been completed and is thoroughly dry, outside door openings are permanently watertight, exterior windows are glazed and, in case of temperature dropping below 60o F., until temporary heating and ventilating systems are in operation.

C. Store casework in dry, well-ventilated spaces with constant minimum temperature of 60o F., and maximum relative humidity of 55%.

1.08 PROJECT CONDITIONS

A. Do not deliver or install plastic laminate product until the following conditions are met:
   1. Windows and doors are installed and the building is secure and weather tight.
   2. Ceiling, overhead ductwork and lighting are installed.
   3. All painting is completed and floor tile is installed.
   4. Interior building temperature to be between 60o and 80o F, and ambient relative humidity maintained between 25% and 55% prior to delivery, and during and after installation.

B. Obtain measurements and verify dimensions and details before proceeding with finish carpentry.

1.09 WARRANTY

A. Plastic laminate faced casework to be guaranteed by manufacturer, and Contractor jointly and severally to the Owner for five years, to be free of defects due to faulty materials, workmanship, or performance.

B. Warranty not to include damage sustained as a result of abuse, negligence, use beyond that of it's intended function by the Owner, acts of God, or unnatural events or causes beyond the control of the manufacturer.

C. Include repair and replacement of defective materials and components at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Particle Board (Substrate for Laminate Surfaces): High density industrial grade with a minimum density of 45 pounds per cubic foot and a moisture content between 9% maximum and 6% minimum, meeting or exceeding ANSI A208.1 Grade M-3 or ASTM D1037.

B. Fiberboard: Uniform, medium density conforming to ANSI A208.2. Maximum moisture content of 8%. Meet the following minimum standards:
   1. Internal Bond: 125 psi (861.84 kPa).
   2. Modulus of Rupture: 4,000 psi (27579.04 kPa).
   3. Modulus of Elasticity: 400,000 psi (2757904.00 kPa).
   4. Screw Holding Power: 325 pounds.
   5. Density: Minimum 50 pounds per cubic foot.

C. Hardboard: Tempered, smooth both sides; conforming to ANSI A135.4 Class 1.

D. Lumber: Optional framing material for concealed framing. Conform to AWI (AWS) requirements premium grade; provide in suitable species of manufacturer's option.

E. Plastic Laminate: Conform to the requirements of the NEMA LD 3. Colors, patterns and finishes as indicated.
   1. General Purpose Horizontal Grade: 0.05 inches (1.27 mm) thick.
   2. General Purpose Vertical Grade: 0.028 inches (0.71 mm) thick.
   3. Backing Sheet Grade: 0.02 inches (0.51 mm) thick.
   4. Post-Forming Grade: 0.042 inches (1.07 mm) thick.
   5. Cabinet Liner: 0.02 inches (0.51 mm) thick.
   6. Fill and seal plastic laminate joints with Seamfil by KAMPEL ENTERPRISES, INC. or FormFill by FORMFILL PRODUCTS (UNIKA USA). Colors specifically mixed by manufacturer to match plastic laminate.
   7. Manufacturer and Color: As indicated
   8. Other Acceptable Manufacturers: Solid surface manufactured by the following companies are acceptable providing they meet the requirements specified herein and the colors and pattern are an acceptable match as determined by the Architect.
      a. FORMICA
      b. PIONITE
      c. NEVAMAR

F. Edging Materials
   1. 1mm PVC banding, machine applied.
   2. 3mm PVC banding, machine applied and machine profiled to 0.12 inch (3 mm) radius.
   3. Colors: As selected by Architect.

G. Pressure Fused Laminate/Interior Surfacing
   1. Melamine resin impregnated, 100 gram PSM minimum, surface laminated to core under pressure.
   2. Meet NEMA LD 3 GP28 and CL20 standards.
   3. White pressure fused laminate for cabinet interiors behind door and drawers, interiors of all open cabinets unless otherwise specified, and underside of wall cabinet unless otherwise specified.
   4. Shall be balanced at all concealed surfaces with phenolic backer. Unsurfaced coreboard not allowed.

H. Hardware Items: All exposed hardware to be (polished brass) (satin stainless steel) (polished stainless steel) finish.

1. Drawer Slides: Self-closing, side mounting type with nylon tire, steel ball-bearing rollers. Manufactured by BLUM, GRASS, AMEROCK, KNAPE & VOGT; ACCURIDE. Load capacity as follows:
    a. 75 pounds: Drawers up to 3-1/2 inches (89 mm) deep: Similar to ACCURIDE Series 2132.
2. 100 pounds: Drawers up to 8 inches (203.2 mm) deep: Similar to ACCURIDE Series 2832.
    a. 150 pounds: Drawers over 8 inches (203.2 mm) deep, all file drawers: Similar to ACCURIDE Series 4034.
3. Drawer and Door locks: 5-pin tumbler removable core, dead bolt. BEST; COMPX NATIONAL; CORBIN. Key and masterkey locks as directed by Associate Architect. Provide 2 keys per cylinder and 5 masterkeys per master set.
4. Concealed Hinges: European style, self-closing, type as required for construction. Metallamet by HAFELE; similar by GRASS; PRAMETE; BLUM.
5. Continuous Hinge: 780 HD Roton Hinge by HAGER. Aluminum with finish as selected by Architect.
6. Hinges: 5-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide 2 for doors 48 inches (1219.2 mm) high or less and 3 for doors more than 48 inches high
7. Drawer and Door Pulls: Wire pull, 5/16" diameter x 3-1/3" long x 1-5/16" extension. STANLEY, GRASS; BLUM, HAFELE.
8. Drawer and Door Pulls: Indicated on the drawings. Catalog numbers based on EPCO; equals by GRASS, BLUM, HAFELE
9. Adjustable Cabinet Shelf Supports: Provide metal pilaster type or hardwood drilled type, manufacturer's standard.
    a. Metal Type: KNAPE & VOGT (KV) steel nickel plated.
        1) Standards: KV #255 NP for dado installation.
        2) Clips: KV #256 NP.
    b. Wood Type: Provide hardwood verticals with adjustment holes located 1/2" on center. Provide shelf clips of type that locks shelf in place.
10. Adjustable Cabinet Shelf Supports: 5mm spoon type; nickel plated.
11. Catches: Magnetic, STANLEY #45 or equal by NATIONAL LOCK or EPCO.

I. Glue: Waterproof adhesive (phenol, resorcinol or melamine) base meeting requirements of CS 253 for "Wet Use" unless otherwise specified in specific sections.

J. Plywood: Birch hardwood plywood conforming to AWI 200 for veneer core material, AWI "custom" grade, provide with waterproof glue.

2.02 FABRICATION - CASEWORK

A. General: Except as specified hereinafter, fabricate all work in accordance with AWI (QCP)quality standards as specified. Work not specified with a level of quality shall be not less than "Custom" quality per AWI (AWS).
    1. "Flush Overlay" design as shown in ANSI/AWI 0641 Architectural Casework Details.
    2. Provide complete factory-fabricated and finished components which, when assembled on site, will provide an integral system of storage and work surfaces.
    3. Provide locks where indicated.
    4. Make cut-outs and other provisions for the work of other trades and as indicated or required for installation.
    5. Assemble cabinets with accurate router grooves 1/8" deep with glue and nails and screws.
    6. Apply plastic laminate to exposed ends after assembly to conceal screws in end cabinet.
    7. All particle board panels to be balanced construction.

B. Subbases: Provide continuous plywood closed bases capable of being leveled to meet site conditions; subbase to be unfinished to receive resilient base. See Section 09 65 00.

C. Base Cabinets

1. Sides and Bottoms: Construct of 3/4" thick particle board with interior of cabinet finished with cabinet liner or polyester laminate. Provide balanced constructed panels with neutral colored backer sheet at concealed conditions and finish laminate at exposed conditions.
2. Backs: Standard 1/4" prefinished hardboard. Install in housed joints in surrounding panels. All backs exposed to view to be neutral colored except where indicated to match vertical color surfaces.
3. Rear, unexposed side of backs to receive continuous hot melt glue at joint between back and sides/top/bottom for sealing against moisture and vermin, and to further contribute to cabinet stability.
4. Frame: Provide frame construction of 3/4" thick particle board or lumber dadoed into sides at the following:
    a. As sub-top.
    b. At all locked drawers and doors.
5. Runners: Provide runners or frame construction between all drawers.
6. Shelves: Provide fixed and adjustable shelves with particle board core where indicated on drawings. Provide shelves adjustable on 1/2" centers. Except for exposed shelving conditions, finish shelves with neutral colored polyester laminate or liner grade laminate
    a. Shelves under 36" wide: 3/4" thick, except all open shelves to be 1" thick.
    b. Shelves 36" to 42" wide: 1" thick.
    c. Shelves over 42" wide: Construct in accordance with AWI Section 400 to support minimum 30 lbs./running foot of shelf with deflection limited to 1/4" or provide intermediate supports to limit the span to ranges specified above.
    d. Edges: Except where cabinet design requires matching laminate self edge, provide 3mm PVC on Front & Back Edges, 1mm PVC on Side Edges.
7. Finish
    a. Casework Edges: Except where cabinet design requires matching laminate edges, finish front edges of sides, frames, and bottom with 3mm PVC machine applied edge.
    b. Exposed Exterior of Casework: Finish exposed portion of cabinet with vertical grade plastic laminate in solid color finish as selected by Architect.
    c. Interior of Casework
        1) Semi-Concealed (behind doors): Neutral colored polyester or cabinet liner laminate.
        2) Exposed: Vertical grade laminate to match exposed casework.

D. Drawers
1. Body: Construct of fiberboard with polyester laminate finish on faces and PVC on exposed top edges. Subfronts, sides and back fabricated with shouldered lock joint or dado construction and routed to receive bottom.
2. Sides and Back: 1/2" thick.
    a. Subfront: 5/8" thick.
3. Bottom: 1/4" thick prefinished hardboard, housed and glued, into front, sides and back. Underside of drawer to receive continuous hot melt glue at joint between bottom and back/sides/front for sealing and rigidity. Reinforce drawer bottoms as required with intermediate spreaders.
4. Front: 3/4" thick particle board front finished with vertical grade plastic laminate on exposed face and cabinet liner laminate on interior side; total thickness 13/16" thick. Except where cabinet design requires self edge matching laminate edges (see cabinet design), edges to be finished with 1mm PVC.
    a. Where adjacent door sizes require core thickness in excess of 3/4", provide drawer fronts to match door thickness. Verify conditions with Architect.
5. Install on proper sized slides specified herein.

E. Doors: Construct and finish same as drawer fronts except core construction to vary as follows:
1. Doors over 30" x 48": Construct from 1" to 1-1/4" thick particle board core.

2. Doors over 36" x 60": Construct as 1-3/8" thick hollow core units in accordance with AWI Section 1300.

F. Wall Cabinets: Construct and finish same as base cabinets except provide suitable hang rail of 3/4" plywood secured to cabinet frame.
   1. Where wall cabinets close to soffit or ceiling, provide fascia scribed to conditions and leveled on bottom to permit level installation of cabinets. Finish of fascia to match cabinet.

G. Design
   1. Configuration of casework is indicated on drawings.
   2. The detailing and design required to provide rigid, solid and structurally adequate casework is the responsibility of the fabricator; within parameters of AWI specifications and as approved by Architect.
   3. The following conditions require special attention:
      a. Casework exceeding 42" in width between supports.
      b. Sink and/or equipment cutouts and supports.
      c. Countertops exceeding 24" unsupported.
      d. Wall and Ceiling Mounted Casework: Provide integral framing in casework of size, strength, and in locations which allow unit to be screw attached to proper substrate and remain rigidly in place.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of laboratory casework.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Condition casework to average prevailing humidity conditions in installation areas prior to installing.

3.03 CASEWORK INSTALLATION

A. General
   1. Install plumb, level, true and straight with no distortions so that doors and drawers will fit openings properly and be accurately aligned.
   2. Shim as required using concealed shims.
   3. Where casework abuts other finished work, scribe and apply filler strips for accurate fit with concealed fasteners.
   4. Where possible, assemble units into one integral unit with joints flush, tight and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16".
   5. Anchor cabinet units securely in place with concealed (when doors and drawers are closed) fasteners, anchored into structural support members of wall construction. Comply with manufacturer's instructions and recommendations for support of unit.
   6. Adjust casework and hardware so that doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

B. Base Cabinets
   1. Fasten each individual cabinet to floor at toe space, with fasteners spaced at 24" on center.
   2. Bolt continuous cabinets together.
   3. Secure individual cabinets with not less than 2 fasteners into floor, where they do not adjoin other cabinets.

C. Wall Cabinets
   1. Verify that wood blocking has been installed at required locations.

2. Bolt continuous cabinets together.
3. Secure individual cabinets with not less than 2 fasteners into wall (wood blocking), where they do not adjoin other cabinets.

3.04 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed upon completion of installation.
   1. Patch surfaces damaged by installation to prior condition as approved or replace damaged units as directed.

B. Clean shop-finished surfaces, touch-up as required, and remove or refinish damaged or soiled areas, as acceptable to Architect.
   1. Dust cabinet interiors. Clean exterior surfaces to original condition.

C. Advise Contractor of procedures and precautions for protection of materials and installed casework from damage by work of other trades.

END OF SECTION 12 33 55

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SECTION 12 36 40
STONE COUNTERTOPS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work includes limestone countertops as indicated on the drawings.

1.02 RELATED SECTIONS

A. Sealants: Section 07 92 00.

1.03 SUBMITTALS

A. Submit shop drawings for countertops.
   1. Provide large scale details.
   2. Indicate methods of fabrication, edging, location and construction of joints.

B. Submit samples of each type of stone.

1.04 QUALITY ASSURANCE

A. Fabricator qualifications: A firm specializing in the fabrication of stone countertops with a minimum of 5 years experience and a satisfactory record of performance on projects of comparable size and quality. Fabricator shall be acceptable to the Architect.

B. Installation: Performed only by skilled finish carpenters with a minimum of 3 years experience in installing stone countertops to that required for this project.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protect materials and items during delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver materials and items until concrete, masonry, painting, grinding and other similar wet work has been completed and is thoroughly dry.

C. Store materials in dry, well-ventilated spaces with constant minimum temperature of 60o F., and maximum relative humidity of 55%.

1.06 PROJECT CONDITIONS

A. Provide and maintain a constant temperature and humidity before, during and after installation as required to maintain optimum moisture content of installed materials.

B. Obtain measurements and verify dimensions and details before proceeding with fabrication.

PART 2 PRODUCTS

2.01 BASIC MATERIALS AND FABRICATION METHODS

A. Stone Types and Colors: As indicated on the drawings.
   1. Kitchen Countertops: 3cm Granite.

B. Fabrication
   1. Fabricate to dimensions, profiles and details indicated with openings and mortises precut, where possible to receive fixtures, accessories and other similar items of work.
   2. Ease edges as indicated on the drawings. Fabricate edges as detailed.
   3. Complete fabrication and other work before shipment to site to the greatest extent practicable. Dissamble components where necessary for fitting at site. Provide ample allowance for scribing, trimming and fitting.

C. Measurements: Prior to fabrication of items required to be fitted to other construction, obtain field measurements and verify dimensions and Shop Drawing details as required for accurate fit.

2.02 MISCELLANEOUS MATERIALS

1. Joint Adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, nonporous joints, with chemical bond.

PART 3 EXECUTION

3.01 PREPARATION

A. Condition materials, items and products to average prevailing humidity conditions in installation areas before installing.

B. Install blocking and anchoring devices built into substrates for anchorage of countertops.

3.02 INSTALLATION

A. General
   1. Install items plumb, level, true and straight with no distortion.
   2. Shim as required using concealed shims.
   3. Install to a tolerance of 1/8" in 8'-0" for plumb and level, with no offset in flushness of adjoining surfaces.

B. Scribe and cut work to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

C. Install countertops level, true to alignment, accurately fit to wall conditions and securely fastened to base units and other support systems as indicated.

3.03 CLEANING AND PROTECTION

A. Repair damaged and defective items to eliminate functional and visual defects. Where not possible to repair properly, replace items as directed by the Architect.

B. Protect installed work during remaining construction operations.

END OF SECTION 12 36 40

SECTION 12 36 61
SOLID SURFACE COUNTERTOPS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work includes solid surfacing countertops with integral sink bowls and splashes as indicated on the drawings.

1.02 RELATED SECTIONS

A. Rough Carpentry: Section 06 10 00.

B. Finish Carpentry: Section 06 20 00.

1.03 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2023, with Editorial Revision.

B. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2022.

C. ASTM D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C with a Vitreous Silica Dilatometer; 2016.

D. ASTM D785 - Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials; 2023.

E. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2017.

F. ASTM D972 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement; 2020.

G. AWI (QCP) - Quality Certification Program; Current Edition.

H. IAPMO Z124 - Plastic Plumbing Fixtures; 2022, with Editorial Revision.

1.04 SUBMITTALS

A. Submit shop drawings for countertops.
   1. Provide large scale details.
   2. Indicate methods of fabrication, edging, location and construction of joints.

B. AWI Quality Standards: A photo-copy of the applicable portions of the AWI (QCP) publication "Architectural Woodwork Quality Standards", latest edition, shall be submitted with each set of shop drawings.
   1. Each copy must be marked to clearly show all details, specifications and finishes proposed for this work.

C. Submit samples of the solid surface countertop.

D. Manufacturer's product data describing solid surface counter top material.

1.05 QUALITY ASSURANCE

A. Fabricator qualifications: A firm specializing in the fabrication of solid surface items with a minimum of 5 years experience and a satisfactory record of performance on projects of comparable size and quality. Fabricator shall be acceptable to the Architect.

B. Installation: Performed only by skilled finish carpenters with a minimum of 3 years experience in installing custom solid surface items similar to that required for this project.

1.06 DELIVERY, STORAGE AND HANDLING

A. Protect materials and items during delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver materials and items until concrete, masonry, painting, grinding and other similar wet work has been completed and is thoroughly dry.

C. Store materials in dry, well-ventilated spaces with constant minimum temperature of 60o F., and maximum relative humidity of 55%.

1.07 PROJECT CONDITIONS

A. Provide and maintain a constant temperature and humidity before, during and after installation as required to maintain optimum moisture content of installed materials.

B. Obtain measurements and verify dimensions and details before proceeding with architectural woodwork.

PART 2 PRODUCTS

2.01 BASIC MATERIALS AND FABRICATION METHODS

A. Solid Surface Material
   1. Material: Homogeneous filled acrylic meeting IAPMO Z124.3 and IAPMO Z124.6, Type Six, and Fed. Spec. WW-P-541E/GEN.
   2. Basic Minimum Material Properties
      a. Hardness: 52-60 Barcol; ASTM D785.
      b. Specific Gravity: 1.53-11.8 g/cc; ASTM D972
      c. Tensile Strength: 4000; ASTM D638.
      d. Flexural Strength: 7000; ASTM D790.
      e. Izod Impact: 24; ASTM D256.
      f. Thermal Expansion: 000018-.0000042 inch (0 mm)./in./oC; ASTM D696.
   3. Thickness: ¾".
   4. Colors: As selected by Architect.

B. Manufacturer
   1. Basis of Design: As indicated.
   2. Other Manufacturers: Products by other manufacturers will be considered during bidding. Products must meet the performance requirements specified, match colors selected as determined by the Architect, conform to details indicated on the drawings and be approved by Architect.

C. Fabrication
   1. Fabricate to dimensions, profiles and details indicated with openings and mortises precut, where possible to receive fixtures, accessories and other similar items of work.
   2. Ease edges as indicated on the drawings. Fabricate edges with solid surface material, except as otherwise indicated.
   3. Complete fabrication and other work before shipment to site to the greatest extent practicable. Dissamble components where necessary for fitting at site. Provide ample allowance for scribing, trimming and fitting.
   4. Secure bowls and splashes or similar items to countertop per manufacturer's installation method; seamed undermount "S".

D. Measurements: Prior to fabrication of items required to be fitted to other construction, obtain field measurements and verify dimensions and Shop Drawing details as required for accurate fit.

2.02 MISCELLANEOUS MATERIALS

A. Joint Adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, nonporous joints, with chemical bond.

B. Screws: Select material, type, size and finish required for each use. Comply with FS FF-S-111.

PART 3 EXECUTION

3.01 PREPARATION

A. Condition materials, items and products to average prevailing humidity conditions in installation areas before installing.

B. Install blocking and anchoring devices built into substrates for anchorage of solid surface fabrications.

C. Deliver inserts and anchoring devices to be built into substrates well in advance of time substrates are to be built.

3.02 INSTALLATION

A. General
   1. Install items plumb, level, true and straight with no distortion.
   2. Shim as required using concealed shims.
   3. Install to a tolerance of 1/8" in 8'-0" for plumb and level, with no offset in flushness of adjoining surfaces.

B. Scribe and cut work to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

C. Install countertops level, true to alignment, accurately fit to wall conditions and securely fastened to base units and other support systems as indicated.

3.03 CLEANING AND PROTECTION

A. Repair damaged and defective items to eliminate functional and visual defects. Where not possible to repair properly, replace items as directed by the Architect.

B. Protect installed work during remaining construction operations.

END OF SECTION 12 36 61

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SECTION 12 48 13
ENTRANCE MATS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide recessed entrance mat in vestibule as indicated.

1.02 SUBMITTALS

A. Submit shop drawings and product data in accordance with the requirements of the General Conditions and Section 01 33 23.

1.03 JOB CONDITIONS

A. Coordination: Coordinate size and shape of mat with floor tile installation.

PART 2 PRODUCTS

2.01 ENTRANCE MATS

A. Description: 3/8" thick, rubber mat with 1/16" high raised (grooved) surface. Square edge for recessed installation into tile flooring.

B. Size and Shape: As indicated on Drawings. Field verify exact size of tile floor opening.

C. Colors: As selected by Architect.

D. Manufacturer
   1. Basis of Design: LL-10 Pyramid Top Pebble Base Entrance Mat by R.C. MUSSON RUBBER CO.
   2. Subject to requirements, products by PAWLING CORPORATION, or DURABLE MAT CO. are acceptable.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Install in accordance with shop drawings and manufacturer's instructions.

3.02 MAT INSTALLATION

A. Trim mat to exact tile opening dimensions.

B. Lay mat without use of cement.

END OF SECTION 12 48 13

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SECTION 12 56 51
FURNITURE, FURNISHINGS AND ACCESSORIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all labor, materials and transportation necessary for the complete installation of all furniture, furnishings and accessories indicated on the drawings or specified herein or both.

1.02 SUBMITTALS

A. For each item, submit manufacturer's product data in accordance with the General Conditions.

B. Samples: Submit color chips and fabric samples for Architect's color verification or selection.

C. Maintenance Instructions: Submit three copies of manufacturer's recommended maintenance instructions, including information needed for removal of common stains.

1.03 DELIVERY AND INSTALLATION

A. Protect furniture and accessories during delivery, storage and handling to prevent damage, soiling and deterioration.

B. Shipment of furniture and accessory items may be made directly to building site in cases where prior approval of Architect has been obtained and the building is ready for furniture installation. Furniture Contractor is responsible for knowing when his merchandise is to arrive and must have available all labor and equipment for unloading and handling.

C. Delivery must be in accordance with the Progress Schedule developed by this Contractor in cooperation with the other Contractors and Owner as provided for under Article 4 of the General Conditions.

D. Contractor is responsible for temporary storage of all furniture and accessory items until time for delivery and installation.

E. Particular care must be taken by furniture Contractor when handling equipment and furniture during installation so as not to damage existing building, carpet and shelving.

1.04 DAMAGED ITEMS

A. Furniture Contractor is responsible for all damage to items provided under this contract up to the time of acceptance by the Owner, whether this damage results during shipment from manufacturer, delivery to site, placement, or through carelessness or malicious mischief or whatever reason, and final payment will be made only for undamaged items. Contractor shall replace all damaged items or parts of assembled or manufactured items as soon as discovered.

B. Nominal touch-up or repair of painted finishes will be permitted if done in accordance with the manufacturer's recommended procedures for such repair and the end results, in the opinion of the Architect, appears as good as new. Repairs must return item to original appearance and function.

PART 2 PRODUCTS

2.01 FURNITURE, FURNISHINGS AND ACCESSORIES

A. See VOLUME 3.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Placement shall be made in accordance with the locations indicated on the drawings. When conditions require adjustment of placement, the Architect will determine or approve alternate placement.

B. Placement and installations shall be performed by mechanics skilled in the requirements of that type of work.

C. Upon completion of the work, all furniture and accessories shall be fully assembled with moveable parts operating properly.

D. Installation shall be in accordance with the requirements, standards and procedures of the product manufacturer.

END OF SECTION 12 56 51

SECTION 12 93 00
SITE FURNISHINGS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide the following:
   1. Bicycle racks.
   2. Trash receptacles.

1.02 SUBMITTALS

A. Submit manufacturer's product data and installation details for all items.

PART 2 PRODUCTS

2.01 BICYCLE RACK

A. Manufacturer: Ribbon Rack Model RB-9 by BRANDIR or equal.

B. Description: Inground anchor mount type. ASTM A53 schedule 40 steel pipe, galvanized finish.

C. Length: Approximately 7'-2"; capacity for 9 bikes.

D. Quantity: 2 required.

2.02 BICYCLE RACK

A. Bicycle racks shall be "U-Type" bike rack manufactured by DuMOR, INC., Mifflintown, PA 17059, or approved equal.

B. Bike rack shall have galvanized finish.

2.03 TRASH RECEPTACLE

A. Trash receptacle shall be Concrete trash container TR-27RC with pleated bag rack and brown FRP lid, manufactured by ARCHITECTURAL PRECAST, INC., Columbus, OH 43223, or approved equal.

2.04 PLANTERS

A. Manufacturer: Round , Style "R" by SITECRAFT, or equal.

B. Description
   1. Staves: Tongued and grooved, nominal 2" thickness.
   2. Hoops: Galvanized steel.
   3. Rods: Internal steel rods each face with wood plugs.
   4. Bottoms: 5/8" exterior grade plywood with drainage holes.
   5. Size: As indicated on drawings.

C. BENCHES
   1. Manufacturer: Cresent, Style BKB by SITECRAFT, or equal.
   2. Description: Members nominal 2" x 4". Secure by tamper resistant fasteners.
   3. Length: As indicated on drawings.

2.05 BENCHES

A. Manufacturer: KINGS RIVER CASTING.

B. Model: Palisade Bench.

2.06 TRASH RECEPTACLES

A. Manufacturer: KINGS RIVER CASTING.

B. Model: Township Trash Receptacle Model TTR.

2.07 FASTENERS AND HARDWARE

A. Fasteners and metal components shall be cadmium-plated steel or steel hot-dipped galvanized in accordance with ASTM A153.

PART 3 EXECUTION

3.01 INSTALLATION

A. Site furnishings shall be erected as indicated on the Drawings, plumb, level, snug, and free from rocking. Make necessary shimming and final adjustments.
   1. Shims shall be stainless steel sized so that they do not protrude beyond the base of the item so as to be visible in completed installation.

3.02 TRASH RECEPTACLE

A. Units shall meet specifications. No structural deficiencies, cracks, loose inserts or anchors, exposed steel, steel with less than 1 in. minimum cover, or other defects shall be permitted.

B. Appearance Acceptance Criteria: When viewed at a distance of 10 ft. in natural daylight, exposed surfaces shall be uniform in color, texture, and finish shall be within the range of approved mock-up samples when compared side by side. Edges shall be well defined and true to line

C. Trash receptacle shall be located in the field as directed by the Architect. Each receptacle shall be fastened to the base with one bolt, or as indicated on the Drawings.

D. Trash receptacle shall be positioned in the required location and firmly secured to the base.

3.03 BICYCLE RACK

A. Work shall be executed only by workmen experienced in the trade.

B. Obtain exact dimensions, cut, fit, and drill as necessary for proper assembly and installation of all work and for attaching items of other trades as required.

C. The bending method for the bicycle racks pipe shall produce a smooth curved pipe without surface buckles and wrinkles.

D. All steel fabrication, including welding, shall be completed before galvanizing.

E. All units shall be fully welded and conform to the applicable requirements of AWS D1.1. All groove welds shall be ground flush and smooth.

F. Install bicycle racks level and plumb at the locations indicated on the Drawings and in accordance with approved shop drawings. Coordinate bicycle racks installation with installation of the surrounding surface at grade beneath the bicycle racks.

G. Protect bicycle racks from paint spatter, splashed concrete, and other construction damage by wrapping and taping in place plastic sheeting or heavy Kraft paper around the bicycle racks until adjacent work is completed. Repair any damage to the painted finish in a manner consistent with manufacturer's recommendations and with the original bicycle racks paint.

END OF SECTION 12 93 00

SECTION 13 15 00
POOL CONSTRUCTION

PART 1 GENERAL

1.01 SUMMARY

A. This section describes the work to be performed by a Pool Contractor experienced in the installation of commercial swimming pools, mechanical equipment and associated pool equipment.
   1. It is the basic intent of these specifications that the swimming pool structure complete with its mechanical system and related piping and all other work, both general and mechanical be included as hereinafter spelled out.
   2. The Contractor will be required by the Owner to present evidence of having sufficient experience to fulfill this contract in a satisfactory manner. All work called for in this section hall be subject to the project general and special conditions.
   3. Contractors doing work in this section shall refer thereto.

B. Work to be performed by pool contractor (base bid):
   1. Prepare working drawings for pool, filter room and pipe trenches. Layout of pools.
   2. Furnish and install complete pool structure including footings, reinforcing, poured concrete floors and sidewalls.
   3. Furnish and install pool recirculating system.
   4. Furnish and install all embedded anchors for deck equipment.
   5. Furnish and apply the specified protective pool coatings to the interior concret surfaces of pool.
   6. Furnish, assemble and install all deck equipment detailed on drawings and specifications. Refer to Section 1.12.
   7. Furnish, assemble and install safety and maintenance equipment specified.
   8. Furnish and install main drain box and drain line to filter room.
   9. Furnish and install skimmers and piping to filter room.
   10. Furnish and install supply piping to pool.
   11. Furnish and install pool filtration system housed in filter room.
   12. Furnish and install recirculating pump, face piping, control valves, gauges, and rate of flow indicators.
   13. Furnish and install pool heater and interconnecting water piping and valves. Mechanical contractor to furnish gas supply piping and venting of heater.
   14. Furnish and install chemical feed equipment, pH feed system, automatic chemical control system and chemical storage tank.
   15. Furnish and install auto fill system.
   16. Furnish only deck marking tiles as required by Ohio Department of Health. Installation of tiles by deck contractor.
   17. Start, test, calibrate and adjust all equipment. Instruct Owners personnel in proper operation and maintenance of all mechanical systems.
   18. Furnish start up chemicals and balance pool water.
   19. Provide three (3) bound copies of operations manual.
   20. Provide 18" x 24" filter schematic drawing mounted on filter room wall under plastic cover.
   21. Provide written warranty on all pool components per attached specifications.
   22. Ohio Department of Health permits to be furnished to Pool Contractor. Pool Contractor to obtain pool boiler permit.

C. Related work by others
   1. Coordination:
      a. Coordinate with other contractors or subcontractors all work relating to this section. The Contractor must establish with other contractors or subcontractors, having related work in this section, that all work necessary to complete the pool as shown on the drawings and in the specifications is included in the base bid and alternates to the

Owner.

b. If in doubt regarding the responsibility for work covered in this section and/or discovery of errors or omissions in the bidding documents, the Contractor shall notify the Pool Consultant through channels established by the specifications and request a clarification ten (10) days prior to the bid date.

2. General Contractor:
   a. Any required building permits excluding Ohio Department of Health permit and boiler permit.
   b. Site access.
   c. Concrete pit for pool installation.
   d. Temporary utilities.
   e. Filter room with backwash pit.
   f. Perimeter enclosure.
   g. All site utilities to include electric, gas, sanitary sewer, storm sewer and water.
   h. Perimeter concrete decks with drainage. Install depth marking tiles
3. Plumbing Contractor
   a. Bring fresh water supply to auto fill assembly.
   b. Bring gas service to pool heater and make final connections.
   c. Furnish and install heater venting and intake air.
4. Furnish any required utility meters.
   a. Bring sanitary sewer line into filter room backwash pit.
5. Electrical Contractor
   a. The Electrical Contractor shall furnish and install all electrical service to the pool and its mechanical system as shown on the plans and as specified herein including panels, conduits, wiring, switches, GFI'S, starters, controls, bonding and grounding, all in accordance with the latest requirements of the National Electric Code (NEC) 680.26 as specified elsewhere in the specifications.

1.02 RELATED SECTIONS

A. General Conditions and Division 01

B. Concrete flatwork and decks

C. Mechanical: Plumbing- Division 22 & HVAC- Division 23 & 26

D. Electrical: Division 26

E. Landscape Division 32

F. Vapor Barrier: Section 07 19 00.

1.03 REFERENCED STANDARDS

A. Applicable standards of the following specifications and codes apply to work of this section:
   1. Association of Pool & Spa Professionals (APSP)
   2. Ohio Department of Health (ODH) swimming pool rules
   3. All local building codes
   4. National Electric Code (NEC)
   5. National Sanitation Foundation (NSF)
   6. American Society for Testing and Materials (ASTM)

1.04 QUALITY ASSURANCE

A. The Pool Contractor must have had at least five (5) years experience in the construction of commercial swimming pools herein specified and must list at least five (5) pools of this type, each with a water surface area of not less than 800 square feet, which was constructed in the State of Ohio and which, upon investigation, would be found to be completed in a satisfactory manner and in operation at least three (3) years.

B. The Pool Contractor shall furnish complete evidence that they have the facilities, equipment, personnel, etc. to complete all phases of this trade division. Pool Contractor must furnish a full

time, on site superintendent for duration of pool construction. Prior approval must be obtained before entering into any subcontract for this work.

C. Pool Filter
   1. Due to the specialized nature of the specified work and products, all bidders shall be required to have a minimum of five (5) years of operating history. The equipment described herein shall be products of a manufacturer regularly engaged in the fabrication of filtration and recirculating systems for at least fifteen (15) years and shall be a Professional Engineering corporation.
   2. The Owner requires that filters bear the National Sanitation Foundation (NSF) seal for Standard 50. This NSF listing is required by the owner regardless of local health department regulations. The specified filter system shall have had an NSF listing for at least two (2) years prior to the project bid date.
   3. As assurance that each item of apparatus is properly sized to perform in conjunction with each other, the Owner requires bidders to use the filter manufacturer as a single source of supply for the items of equipment as listed and described herewith.

1.05 SUBMITTALS

A. See General Conditions for quantity of submittals required.

B. The Pool Contractor shall submit for approval, all pool construction items, components, finishes, mechanical systems, sanitation system, deck, safety, maintenance equipment, pipe, valves fittings and any other pool related items.

C. Shop drawings for equipment shall be submitted and approved prior to beginning fabrication. Shop drawings shall not be copies of bid documents.

D. All submittals and shop drawings shall be provided complete and bound.

E. Pool Filter Submittals
   1. Provide detailed shop drawings of the items of equipment being provided, indicating the dimensions, material of the filter tanks, exterior face piping, internal manifolds and laterals and filter media.
   2. Provide a complete set of operating instructions, embracing the operational functions and recurring maintenance processes involved in connection with the complete filtration system.

F. Pool Filter Alternates:
   1. Other treatment systems will be considered only if a complete set of drawings and specifications detailing such equipment as it pertains to this project are submitted for evaluation ten (10) days prior to the bid date. The submission should include a list of five (5) operating installations within a reasonable distance of the jobsite. List should include the names and telephone numbers of the operating personnel. The technical contents of the submittal shall include hydraulic calculations, equipment fabrication details, filter room layout in plan and elevation views, warranties, installation and operating instructions.
   2. NOTE: This information must be submitted by a bidding contractor. Submittals will not be considered if provided directly by the alternate equipment manufacturer.
   3. Alternates meeting the terms and conditions of the bidding documents will be acknowledged prior to bidding by addendum. No alternates will be considered after bid. For any and all alternates approved in accordance with the above conditions, state the amount to be deducted from the base bid if an alternate filtration system is being offered.

G. Substitutions
   1. Materials, products, and equipment described in these specifications establish a standard of function, dimension, appearance and quality. The Owner and the Pool Consultant have made a detailed investigation before selecting the specified swimming pool recirculation system, filtration system, and other special pool equipment. All base bids must include this equipment without substitution since the operation and maintenance of this swimming pool facility has been predicated upon the specified equipment.

2. If any Contractor wishes to submit an alternate swimming pool recirculation system, the following information must be provided: All proposed substitutions of specified construction methods and equipment shall include a complete submittal as required by these specifications and drawings of appropriate scale incorporating all required changes. The Contractor shall provide a list of at least four (4) satisfactory installations comparable to this project that have been manufactured and installed under the manufacturer's current legal name. Submit a list of such projects with the name, address and current telephone number of the Owner's Operator and Architect of Record to the pool consultant on the bid date.
3. Bidders utilizing the voluntary alternate must submit manufacturers cut sheets and supporting data for Owner's evaluation.

H. Pool Filter Substitutions
1. No substitutions will be considered unless the specified product becomes unavailable due to no fault of the Contractor.
2.

1.06 DELIVERY, HANDLING AND STORAGE

A. All materials required for the completion of this project shall be delivered to the project site in a manner designed to prevent damage. No hooks or forks shall be used for unloading. Unloading shall be performed by the contractor. Materials shall be stored in a flat, dry area in a manner that will not damage them. All materials provided are to be new and in unopened packaging.

1.07 WARRANTIES

A. The contractor warrants to the Owner and Architect that materials and equipment provided under the contract will be of good quality and new unless otherwise required or permitted by the contract documents, that the work will be free from defects not inherent in the quality required or permitted, and that the work will conform with the requirements of the contract documents. Work not conforming to these requirements, including substitutions not properly approved and authorized will be considered defective. The contractor's warranty will exclude remedies for damage or defect caused by abuse, improper or insufficient maintenance, improper operations, modifications not executed by the contractor or improper wear and tear under normal use. If required by the Architect, the contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. All warranties shall be for a period of one year from the date of substantial completion or the owner begins using the pool unless otherwise specified.

B. The contractor shall agree to repair or replace any defective or non-complying work at no cost to the Owner upon written notification from the Owner within the warranty period. Pro-rated warranties are not acceptable.

C. Submit all warranties covering, but not limited to the following:
1. All pool deck equipment and accessories against defects in material, manufacturer and installation for a period of one (1) year.
2. Defects in material, manufacture and installation of the filtration, backwash, chlorination, pH adjustments and cleaning systems, including controls for a period of one (1) year.
3. Defects in material or workmanship of the pool structure causing a loss of water for a period of two (2) years.
4. Defects in material, workmanship, and installation of the pool piping system for a period of two (2) years.
5. Defects in material, workmanship, and installation of the pool pumps for a period of one (1) year.
6. Manufacturer's minimum five (5) year warranty against defective materials, components and workmanship in the pool chemical controller. ORP and pH sensors shall be covered by a standard two (2) year warranty. All other sensors and flow cell components shall be covered by a standard one (1) year warranty.
7. Defects in material, workmanship, and installation of the pool finish against delamination for a period of one (1) year.

8. Manufacturer's minimum ten (10) year warranty on the filter tank against defective materials or workmanship of the tank and components. Prorated warranties are
9. Manufacturer's minimum one (1) year warranty against defective materials, components and workmanship in the sanitizing feed system. Manufacturer's minimum one (1) year warranty against defective materials, components and workmanship in the pH buffer feed system.

D. Pool Filter Guarantee
1. The equipment supplier shall guarantee that the equipment to be furnished is of the correct capacity, that the various parts are designed to operate correctly and in conjunction with each other, that if the installation is made in accordance with the project drawings and operated in accordance with the supplier's instructions, the system will perform the prescribed functions correctly, the water entering the pool will be clear, bright, free from suspended matter visible to the unaided eye, and will be sanitary to the satisfaction of all authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Substitutions
1. Materials, products, and equipment described in these specifications establish a standard of function, dimension, appearance and quality. The Owner and the Pool Consultant have made a detailed investigation before selecting the specified swimming pool recirculation system, filtration system, and other special pool equipment. All base bids must include this equipment without substitution since the operation and maintenance of this swimming pool facility has been predicated upon the specified equipment.
2. If any Contractor wishes to submit an alternate swimming pool recirculation system, the following information must be provided: All proposed substitutions of specified construction methods and equipment shall include a complete submittal as required by these specifications and drawings of appropriate scale incorporating all required changes. The Contractor shall provide a list of at least four (4) satisfactory installations comparable to this project that have been manufactured and installed under the manufacturer's current legal name. Submit a list of such projects with the name, address and current telephone number of the Owner's Operator and Architect of Record to the pool consultant on the bid date.
3. Bidders utilizing the voluntary alternate must submit manufacturers cut sheets and supporting data for Owner's evaluation.

2.02 MATERIALS

A. Swimming Pool Tank
1. Cast-in-place reinforced concrete shall be used for pool floor and wall construction. Shotcrete construction can be used as an alternate to cast-in-place concrete for pool wall construction if contractor's qualifications have been pre-approved by Architect/Engineer.
2. Concrete
   a. Pool walls and floor to be eight inches thick, 4000 psi concrete reinforced with a single mat of rebar spaced per drawings.
   b. Concrete shall be ready mix compliant with ASTM-C-4 and the attached specifications. Type I Portland cement shall be used. Concrete shall be placed within 1.5 hours after cement is placed in mix. All concrete shall have a cement content of not less than 6 sacks per cubic yard.
   c. All concrete that will be subjected to freezing and thawing shall have an air content of not less than 6% and slump shall not exceed 4". Air entraining admixture shall conform to ASTM C 260 with the exception of being non toxic after 30 days. Admixture shall not contain chlorides.
   d. Concrete shall contain water reducing admixture. Admixture shall conform to ASTM C 494, Type A or D with the exception of being non toxic after 30 days. Admixture shall not contain chlorides and shall be compatible with air entrained admixtures.

e. All aggregate shall conform to ASTM C 33. Fly ash shall conform to ASTM 618.
f. The compressive field strength shall be 4000 PSI at 28 days when cured and tested per ASTM C 31 and C 39.

3. Shotcrete
   a. Mix Design
      1) Wet-mix design only.
         (a) A proven mix design shall be used for all Shotcrete applications.
         (b) The shotcrete mix design shall be submitted 20 days prior to use.
         (c) The redi-mix supplier to be used shall submit an analysis of the aggregate and sand to be used.
         (d) The cement used shall conform to ASTM C 150 Type I.
         (e) Applicable to concrete exposed to freezing and thawing cycles: The total volumetric air content of shotcrete before placement shall be 7.5%, plus or minus 1.5%, as determined by ASTM C173 or ASTM C231. Air entraining agents shall meet requirements of ASTM C260, C231 and C457.
         (f) Shotcrete strengths at 28 days shall be no less than 5,000 psi.
   b. Rebound
      1) Rebound materials may not be reused in any form for shotcrete work and shall never be worked into the construction by the nozzleman.
4. Waterproofing additive: All concrete materials used for pool structure shall contain Xypex crystalline waterproofing additive. Dosage rates as recommended by manufacturer.
   a. Repair of Surface Defects: Proprietary compounds will be permitted for adhesion or as patching ingredients subject to the approval of the pool consultant.
   b. Finishing Formed Surfaces: Selection of finishes shall be in accordance with specifications unless otherwise specified herein, or as noted or scheduled on the drawings. All concrete surfaces exposed to public view shall have a smooth formed or broom finish. All concrete surfaces not exposed to public view may have a rough form finish.
5. Reinforcing Steel
   a. Pool reinforcing shall be #5 rebar conforming to ASTM A 615, grade 60.
   b. All splices shall include minimum overlap of 16”. Splices shall be tied with wire and shall be tightly secured for electrical bonding purposes as required by NEC section 680.
   c. All rebar to be supported by concrete brick. Rebar to be raised in middle of slab.
6. Expansion Joints
   a. Pool floors to have waterstop and expansion joints per details.
   b. Expansion joints shall be installed per drawings. All joints to receive gun grade sealant finish. All submerged joints shall receive Synthacalk GC2+ as manufactured by Pecora or Deck-O-Seal 785. All submerged joint to be primed prior to caulking.
   c. For good adhesion, the joint interface must be sound, clean, and dry. It is essential to remove all moisture, powder, dirt, grease, oil, and other foreign matter. Cleaning may be done by wire brushing, grinding, or sandblasting.
   d. Waterstop to be center bulb type PVC as manufactured by Greenstreak item # 732. Lapping of waterstop is not permitted. PVC waterstop may be butt spliced with splicing iron. Flame exposure is not permitted.

B. Pool Finishes
   1. Pool floor and walls to be coated with Diamond Brite exposed aggregate pool finish as manufactured by Southern Grouts & Mortars. Color selection by owner. All floors shall have non-slip finish.
   2. Materials
      a. Pool finish to Diamond Brite as manufactured by SGM. Color to be determined by Owner.
      b. Bond coat to be Bond Kote as manufactured by SGM.

3. Preparation
    a. Examine pool surface to identify conditions that might interfere with proper bonding and coating.
    b. Examine pool surfaces of all material that might interfere with proper bonding and coating.
    c. Stop any water penetration from outside of pool. Plug leaks and cracks using hydraulic cement.
    d. Cover any pool fittings prior to installation.
    e. Clean pool surface following manufacturers guidelines.
4. Installation
    a. Apply bond coat with stippled finish.
    b. Apply coating following manufacturer's instructions.
    c. Mix coating to produce best quality and consistent color throughout. If material from more than one batch number is used, mix all batches together for color consistency.
    d. Apply, trowel and expose aggregate using methods and sequence selected to produce the most uniform finish.
5. Start-Up
    a. Allow coating to dry before filling pool. Avoid filling to soon that could cause molting; avoid drying out causing shrinkage cracking.
    b. Fill pool and start circulation system when water level is above return inlets; circulate water continuously for the first three days. .
    c. Test water and adjust chemistry to best avoid discoloration and scale. Refer to manufacturers recommendations for start- up information.
    d. Brush entire coated surface twice a day for the first three days. Thereafter, brush entire surface once a day for two weeks.
    e. Do not use wheeled vacuums for at least 14 days and do not use automatic vacuums for at least 28 days.

C. Pool Tile
1. The pool finish shall have ceramic tile markings and trim at locations including the vertical tile band, depth markings and all other tile installations as shown and detailed on the drawings and in strict accordance with the specifications
2. Tile installers shall have two years experience in similar pool projects which the Owner may require written proof thereof and proper tools to install tile.
3. Tile to be Field Tile series by Inlays, Keystone Series by Dal Tile or equal by American Olean.
4. Unglazed Ceramic Mosaic Tile
    a. Slip-resistant porcelain unglazed ceramic mosaic tile. Minimum coefficient of friction shall be 0.6 for wet surfaces and 0.8 for ramped surfaces.
    b. Ceramic tile band above water level shall be 6" x 6" field tile.
    c. Surface preparation shall be in accordance with ACI 302. The surface shall be structurally sound and free of any foreign substances and debris that could reduce or impair adhesion. Sound and remove all loose concrete to firm substrate. Surfaces shall be roughened to a CSP of 3 to 5 (reference ICRI CSP Standards 7 to 9 for acceptable profile height). Thoroughly wash/rinse with clean potable water. Surface defects or holes in the substrate shall be patched per manufacturer's recommendations.
    d. Use either Laticrete 254 Platinum one-step, polymer fortified, thin-set mortar or Mapei Ultraflex 3 one-step, polymer modified, thin-set mortar, used in accordance with the manufacturer's requirements. As manufactured by Laticrete International, Mapei, Inc., or approved equal.
    e. Use either Laticrete PermaColor Grout or Mapei Ultracolor Plus Grout in accordance with the manufacturer's requirements. As manufactured by Laticrete International, Mapei, Inc., or approved equal.

f. Provide Owner with approximately 10% or 25 square feet (whichever is least) of each color and type tile used on the project for Owner's repair and replacement requirements
g. Tile Schedule:
    1) Waterline: 6" x 6" field tile
    2) Nosing: 2" x 6" Safety edge

D. Precast Coping:
1. Pool wall coping to be AQ series as manufactured by Federal Stone Industries. Color to be white.

2.03 POOL FILTER SYSTEM

A. Purpose of the bid is to purchase and have installed a complete filtration and recirculation system for the swimming pool. It is intended to limit the bidding to a style of product and company that has a proven history and record of performance.
1. Due to the specialized nature of certain components required for this project, these specifications, in some instances, refer to various components by trade or manufacturers name.
2. Whenever a proprietary (trade) name is used within this Specification Section, it is used for informational purposes to describe a standard of required function, dimension, appearance and quality. References to materials by trade name, make or model number shall not be construed as limiting competition. All bidders are required to bid on the named manufacturer in the base bid.

B. Filter System Requirements
1. The system shall be supplied complete by the manufacturer and shall include: internals, face piping and valves, gauge panel with tubing and petcocks, sight glass, air relief connection, bottom drain connection with internal strainer. System shall be fabricated and fully assembled at the manufacturer's plant for pressure testing and dimensional verification. Internal manifold and lateral piping shall be factory installed and shipped in place.
2. The filter system capacity, size, performance and model number shall be as shown on the drawings. Filtration rate not to exceed 15.0 gallons per minute per square foot of filter area.

C. Fiberglass Filter Tank
1. The equipment described herein shall be a product of a manufacturer regularly engaged in the fabrication of fiberglass pressure vessels for at least 10 years.
2. The filter tank(s) shall be no less than 30 "diameter with a 30" side shell, suitable for 50 psi working pressure and designed with a 4:1 safety factor. In connection with Section X of the ASME Code, the vessel test pressure should not exceed 150% of the design pressure by more than 10%.
3. The filter shall be an upright cylinder with semi-hemispherical ends and mounted onto a pedestal style base for support. 30", 38' and 42" diameter tanks shall have a 9" diameter polycarbonate threaded clear lid with o-ring seal. 48"diameter tanks shall have a 14" x 18" nominal manway (13" x 17' opening) with o-ring seal and secured with two (2) composite yokes. Manway shall be positioned so that internal pressure from the filter will augment the seal.
4. Drain out system shall consist of one (I) 1/2" male threaded fitting with cap, mounted near the tank bottom. 42" and 48" diameter tanks shall include a 1-1/2" media dump port. All models shall be provided with a 1/4" petcock for air relief and a 2" diameter 0-60 psi pressure gauge. Each filter tank shall be equipped with the necessary inlet/outlet bulkhead connections for the internal and external piping.
5. The resin shall be commercial grade I premium corrosion resistant polyester that has been evaluated in a. laminate test in accordance with ASTM C-581 in service comparable to the intended application. No Thixotropic agent shall be added. Resin pastes used to fill crevices may contain Thixotropic agents provided that all such areas are subsequently

covered with a full corrosion resistant barrier laminate. Exterior surface shall be an ultraviolet inhibiting premium grade gel-coat. The laminate for the entire tank shall be corrosion resistant with multiple structural reinforcing layers built up to the required design thickness.

6. Filter shall carry a ten (10) year limited non- prorated warranty and shall carry NSF Standard 50 listing:
7. Filters to be Triton 100-C, 30" diameter as manufactured by Pentair. Filter to be complete with multiport valve.

D. Media
   1. Gravel support media of a hard coarse aggregate with a subangular grain shape with a particle size of 1/8" x 1/4" shall be used on the inside of the bottom head to the elevation where the filter media commences. The specific gravity shall not be less than 2.5. Support media shall be placed by hand to avoid damage to the underdrain system and leveled before the addition of the upper layer of filter media. Support gravel shall be delivered and stored in 50 pound bags for ease of handling and elimination of possible contamination. Media shall be free from minerals which may precipitate onto pool surfaces.
   2. Sand shall be a carefully selected grade of hard, uniformly graded silica material. Media shall be naturally rounded particles of silica or milled angularly shaped particles of silica quartz. Sand shall have a particle size between .45mm and .55 mm. (#20). No more than 1.5% shall be allowed to pass through a #40 sieve (.0164”). Uniformity coefficient shall not exceed 1.53. Specific gravity to be not less than 2.5. Filter shall contain a minimum bed depth as shown on the drawings. Systems which do not provide a minimum bed depth, as shown on the drawings, will not be acceptable. Sand shall be delivered and stored in 50 pound bags for ease of handling and elimination of possible contamination. Media shall be free from minerals which may precipitate onto pool surfaces.

2.04 RECIRCULATING PUMP AND MOTOR

A. Furnish and install pumps with capacities as shown on plans. Pumps shall be self-priming, centrifugal design with hair and lint strainer, capable of being serviced without disturbing piping connections.

B. The filtration pump shall be Pentair Intelliflo3, 3hp, 1 phase, and 208-230 volt, capable of 80 gpm @ 60' TDH. Pump shall include integral hair and lint strainer with extra strainer basket.

2.05 PUMP STRAINERS & ACCESORIES

A. Furnish compound gauges on suction and discharge sides of pumps. Gauges to be 2.5” diameter face, stainless steel case, liquid filled, 30” to 60psi range. Manufactured by Weiss, Trerice or equal.

B. Concentric/eccentric reducers shall be constructed of PVC, sized per drawings. Reducer connections shall be ANSI standard dimension.

C. All pumps to be mounted to concrete floor as shown on drawings. Pumps and piping to be adequately supported to alleviate strain on components if pump is removed. Pump base to have mounting frame to allow for easy removal of pump for service.

D. Furnish Flo-Vis flow meter by H2Flow. Size per drawings.

2.06 PIPE, FITTINGS AND VALVES

A. Piping
   1. Pool pipe and fittings shall be fabricated from schedule 80 PVC, NSF approved and manufactured by Spears, Ipex, Westlake or Charlotte. Connections shall be with socket joint of 150 lbs. A.N.S.I. flanges as shown on drawing. All joints shall be made with craftsmanship according to manufacturer instructions.
   2. All piping shall drain completely by gravity. If gravity drainage cannot be provided, drain valves shall be provided to empty pipes. All exterior pipes shall be bedded with a minimum of six inches clear stone material and a minimum of 12” cover. All buried piping must be pressure tested per engineers recommendations prior to backfill.

3. No piping installation shall be made that allows for cross connection between pools and potable water supply that could allow a backflow of pool water into the potable water system.
4. Overhead piping in filter room shall be run so a minimum of 7’-0” clearance is maintained to bottom of all piping, fittings or supports.

B. Fittings
1. All pipe fittings to be Schedule 80 PVC, solvent weld. All fittings through 8” diameter to be injection molded.

C. Valves
1. All butterfly valves sizes 2”-12” shall be of a PVC body, PVC disc and EPDM construction suitable for chlorinated water applications. Stem shall be of 316 stainless steel and non-wetted. Valves shall be a self-gasketing design with a convex sealing arrangement. All 2”-10” valves shall be rated to 150 psi and size 12” 100 psi at 70 degrees F. Valves 3" through 8" shall be lever operated; 10" and above gear operated. Valves shall be Pool Pro type as manufactured by Asahi-America.
2. Ball valves shall be PVC-1 with E.P.D.M. liner, bubble-tight seat. Valves 1" through 3" shall be true union. Valves shall be manufactured by Asahi-America, Colonial or Hayward.
3. All valve hardware to be zinc plated steel. Washers to be used on all connections. Hardware in submerged locations to be stainless steel.
4. Hydrostatic relief valves located in drain boxes to be manufactured by Hayward SP-1056, 2” diameter. Furnish collector tube SP-1055 or equal.
5. Pool water level shall be maintained by an automatic water level controller Levelor Model K1100CKA manufactured by Jandy. Controller to include 1" slow closing solenoid valve.

D. Pool Fittings
1. Floor inlets to be ABS body with adjustable top, model 08417-000 as manufactured by Pentair.
2. Wall fittings for water sensor and fill line to be Hayward SP-1023S with SP-1026 cover.
3. Pool main drains to be 3.850" x 32" x with outlet per drawing, model 640-1320V as manufactured by Waterway. Drains to be complete with certified grate.
4. Skimmers to be Hayward model SP 1082 complete with equalizer fittings. Equalizer covers to be Waterway model 640-8200V with VGBA approved cover.
5. Underwater lights shall be Slimlite 5G as manufactured by Pentair Aquatics, 300 watt equivalent LED 110V. Light to have appropriate length cord, 16/3 wire with water resistant jacket. Light niche to be constructed of stainless steel complete with 1" threaded coupling for attachment of conduit. Electrical contractor responsible for installation of pool lights and conduit.

E. Pipe Hangers & Supports
1. All filter room piping must be adequately supported both laterally and vertically. All hangers, pipe supports, pipe connectors and material to be zinc plated or galvanized. All pipe connections and supports in surge tank to be stainless steel.
2. All strut material to be a minimum 1 5/8” x 1 5/8” x 12 gauge material. Finish to be galvanized steel or 304 stainless steel.

2.07 CHEMICAL FEED SYSTEM

A. Chemical Feeders
1. Sanitizer for main pool is calcium hypochlorite. Chemical feeder for chlorine to be manufactured by Axiall, model 1030 with a capacity of 26 lbs./day. One feeder is required.
   a. Chemical feeder for pH to be manufactured by Stenner, model 45M-1 with a capacity of 45 lbs./day per day. One feeder required.
2. Pool contractor to provide startup chemicals to balance water. Chlorine 2.0. pH 7.4, Total Alkalinity 80ppm, Calcium Hardness 200-300ppm.

B. Automatic Chemical Controller

1. An integrated electronic web-based system shall be furnished to continuously monitor and control the pH level and chlorine residual of the swimming pool water. This controller will be NSF/ANSI Standard 50 Certified.
2. Controller shall be a microprocessor-based proportional-dosing chemical treatment controller designed specifically for the regulation of pH and sanitizer levels of pool and spa water. Controller shall be capable of continuously data logging and uploading wirelessly to the PoolComm website and/or mobile app. WiFi model is included within this specification.

3. All instrumentation shall be housed in a nonmetallic enclosure featuring a clear polycarbonate hinged interface cover, separate gasket terminal access cover and protection to NEMA 12/13. The enclosure shall include accommodations for an optional key lock to prevent unauthorized access. Accommodations shall also be provided to accommodate modular installation through the use of optional external mounting brackets. Unit shall include mounting backboard and machined acrylic flow cell or molded flow cell.
4. Front panel (user interface) shall feature a sealed .08" ultraviolet-stabilized matte polyester membrane keypad, and all keys shall incorporate stainless steel tactile domes. With the exception of a hidden key (provided for dealer setup), all keys shall be fully embossed for ease of operation. All front panel graphics shall be printed on the reverse side of the user interface panel for durability, and front panel keys shall function using low voltage for safe operation.
5. The controller shall provide qualitative measure of sanitizer using Redox Potential (ORP). The system will use two probes, pH and ORP. Chemical feed event indicator lights, feed mode selection lights and all alarm lights shall be light emitting diodes. The controller shall continuously and simultaneously display the current pH and sanitizer activity (ORP) using bright seven-segment light emitting diodes.
6. The pH level shall be continuously monitored and displayed digitally on the unit front panel. The display range is 4.0 to 9.9 with a .1 unit resolution. The pH setpoint control shall be operator-adjustable from 7.0 to 8.0, with a factory and reset default setpoint of 7.5. The pH level must be controlled + / - 1% of setpoint. The controller shall incorporate a visual pH feed indicator light, which is activated when pH correction chemicals are being feed. Unit shall be provided with visual and audible high and low pH alarms which will prevent the feeding of pH chemicals when activated.
7. The ORP level shall be continuously monitored and displayed digitally on the unit front panel. The display range is 0 to 995 mV with a 5 mV display resolution. The ORP setpoint control shall be operator-adjustable from 200 to 995 mV, with a factory and reset default setpoint of 650 mV. The ORP level must be controlled + / - 5 mV of setpoint. The controller shall incorporate a visual ORP feed indicator light, which is activated when sanitizer is being feed. Unit shall be provided with visual and audible high and low ORP alarms which will prevent the feeding of sanitizer when activated.
8. Controller shall have the following inputs:
    a. Professional Series pH sensor
    b. Professional Series ORP sensor
    c. Magnetic flow sensor
    d. Rotary flow sensor
    e. Optical pH tank level sensor
    f. Optical ORP tank level sensor
    g. Optical water level sensor
    h. Digital flow meter
    i. Temperature
9. The controller shall incorporate internal, non-volatile memory in which all factory default settings as well as dealer or operator-modified setpoint and calibration modifications are stored. Such memory will not be affected by power interruption and shall require no battery. Factory default settings can be restored for either pH or ORP functionality by performing a channel reset. The controller shall also facilitate a full reset, which restores all factory default settings. Any unit that requires battery backup and/or cannot be

automatically reset to factory default settings shall not be considered equal.

10. The controller shall feature pH, sanitizer and one auxiliary output capable of handling standard line voltage of not more than 10 amps each, and shall use fused to protect the relay controlled outputs. Automatic outputs shall be capable of being manually overridden with front membrane panel push buttons – which feature automatic, off, and manual-on selections. Any unit incorporating solid-state relays shall not be considered equal. Controller outputs shall be:
    a. pH feed, 4 Amp, 115 VAC
    b. ORP feed, 4 Amp, 115 VAC
    c. AUX - 1 - dry contact, 1 Amp max
    d. AUX - 2 - dry contact, 1 Amp max
    e. Dechlorination control
    f. Water level control
    g. Level / flow sensor #1
    h. Level / flow sensor #2
    i. Level / flow sensor #3
    j. Chlorine generator interface with supplemental secondary disinfection control
    k. Time-based activation
    l. Temperature control
11. The controller shall be equipped with an internal microprocessor based alarm circuit that shall disable the appropriate chemical feeder(s) and energize an alarm circuit in the event of: pH low and high alarms, ORP low and high alarms, pH priority feed, supplemental feed modes, pH and ORP overfeed timeout and flow alarms. The flow alarm shall be disabled by correcting the condition or unplugging the flow sensor connector. The controller shall feature a flow sensor auto-detection process, which will recognize the presence of a flow sensor and activate alarm features should the sensor, connector, or cable become damaged or disengaged.
12. The controller shall provide a Configuration Menu – Setup features are accessible by a second menu level and include: pH control mode, pH priority, pH Interlock, pH feed, pH high and low alarm points, pH overfeed timeout, ORP feed, ORP high and low alarm points, ORP overfeed timeout, Display system information, System Reset, Restore factory defaults, Fixed or Proportional Feed Options, and serial interface programming. Audible, visual and email alarm notifications will be provided for all alarm conditions and will be enumerated on the controller display.
13. Controller shall be equipped with one ORP and one pH probe (sensors) that shall be manufactured incorporating patented porous Teflon junction technology to reduce maintenance, extend cleaning intervals and prolong electrode life. Each sensor shall be constructed incorporating a removable, spin-off bulb guard to facilitate easy cleaning and reduce the potential for damaging the electrode during cleaning. Each electrode shall include an integrated 10' specialty cable with covered BNC connector, and shall be packaged with a storage container with appropriate buffered storage solution.
14. The controller shall feature web-based communication allowing for remote alarm notification, real time ORP and pH readings and remote controller adjustment.
15. The controller unit shall carry a 5-year warranty against defects in material and workmanship, including relays. All ancillary components in the system, flow cell assembly shall carry a 12-month warranty. pH and ORP sensors shall carry a two-year warranty. Toll-free technical support covering installation, operation, troubleshooting, and equipment upgrades shall be provided free of charge for the duration of the warranty period.
16. Controller shall be Hayward CAT-4000-WIFI.

C. Storage Tanks
    1. Muriatic acid is to be supplied in 15 gallon carboys. Tanks to have sealed connection with vent line for tubing connections. See drawing for details.

2.08 POOL HEATING SYSTEMS

A. The heaters shall be a Lochinvar Energyrite Model ERN252A, size as indicated on drawings or approved equal. The heater shall be orificed for operation on Natural Gas.

B. The water containing section shall be of a "Fin Tube" design, with straight copper tubes having extruded integral fins spaced seven (7) fins per inch. The tubes shall terminate into a one piece rear header and a two piece front header with an integral by-pass assembly. The front header configuration shall allow access to the heat exchanger for the purposes of inspection, cleaning or repair. The heat exchanger shall have a drain for proper draining and winterization The front header shall provide a 3/4" NPT connection for a field installed relief valve when required. Connection may be made directly to the front header with PVC or CPVC pipe. The heat exchanger shall be mounted in a stress free jacket assembly in order to provide a "free floating design" able to withstand the effects of thermal shock. The polymer front header shall have water connections for 2" pipe. The heat exchanger assembly shall carry a three (3) year limited warranty against failure caused by defective workmanship or material.

C. The combustion chamber shall be sealed and completely enclosed with Loch Heat® ceramic fiberboard insulation. The Loch-Heat material shall provide a high efficiency insulation barrier while providing low weight. The burners shall be constructed of high temperature stainless steel and fire on a horizontal plane. The pool heater shall have an integral combustion air blower to precisely control the fuel/air mixture for maximum efficiency. Operation of the combustion air blower and venting system shall be monitored by an air proving switch.

D. The pool heater shall be constructed with a heavy gauge pre-painted galvanized steel exterior jacket assembly. All steel jacket components must be galvanized on both sides.

E. The pool heater shall be certified and listed by CSA International under the latest edition of the appropriate ANSI test standard. The **POOL HEATER** shall comply with the energy efficiency requirements of the latest edition of the ASHRAE 90.1 Standard. The **POOL HEATER** shall operate at a thermal efficiency of up to 87%.

F. The pool heater shall be furnished with an integral by pass assembly to ensure proper operation without condensation. The by pass assembly shall be internally mounted inside the polymer front header. The by pass assembly shall be constructed with all corrosion resistant materials for long life. The by-pass shall automatically control water flow rates through the heat exchanger to maximize efficiency and prevent sweat and condensate problems. No auxiliary by-pass shall be required unless water flow rates exceed 100 GPM.

G. Standard operating controls shall include a digital electronic thermostat with independent settings for either pool or spa temperature control. The electronic temperature control shall ensure accurate temperature control to 1°F. A pool water safety high limit control shall be provided. The temperature controls shall be factory installed and weather proof. Adjustment of the temperature control shall be made without tools or the removal of any jacket panels. The pool heater shall have a master on/off switch inside the jacket enclosure.

H. The pool heater shall be field convertible to operate on either 120 VAC or 240 VAC. The standard control system shall include a direct-spark ignition system. The ignition system shall provide flame supervision for 100% safety shutdown. The pool heater shall be equipped with a 2-line, 16-character digital display to provide the status of operation and trouble shooting assistance on a control sensed malfunction. The control shall consist of the ignition control and a main gas valve with redundant valve seats and a (low gas pressure regulator on 250,000 – 400,000 models). Additional standard controls shall include a combination low air and blocked flue pressure switch to monitor fan operation, low voltage transformer for the control circuit and a convenient 24 volt terminal strip for easy connection of remote controls. The pool heater shall be provided with a built-in low water pressure switch to monitor water flow.

I. The pool heater shall be provided with the following venting system: E-Rite Sidewall Direct Vent: Installed indoors with an optional venting kit to allow the pool heater’s internal combustion blower to exhaust flue products to the sidewall using a sealed Category IV vent pipe and an additional sealed air inlet pipe to draw combustion air from the sidewall. The flue pipe or air

inlet pipe each shall not to exceed 20 equivalent feet in length.

J. Pool Contractor to connect pool piping to heater and provide flow switch and pressure relief valve. Heater to be A.S.M.E. certified and installed per state boiler code. Pool contractor to obtain required heater permit. **Plumbing Contractor responsible for vent and gas to heater.**

K. Start up by factory authorized representative required for heater.

2.09 MECHANICAL EQUIPMENT SCHEDULE

POOL	QTY	DESCRIPTION
Surface Area		975 sq. ft.
Perimeter		128 lin. ft.
Volume		27,200 gal
Turnover Time		420 min
Turnover Flow		75 gpm
Filter Rate		10.76 gpm/sq.ft.
Filter Pump	1	Pentair Intelliflo3, 120 gpm @ 60' TDH, 3HP, 208-230 volt, 1 phase, 3450 RPM with integral strainer.
Filter	1	Pentair Triton TR-140C vertical high rate sand filter. 7.06 square feet filter area. Furnish with valve assembly # 261255
Heater	1	Lochinvar ERN 252A, 250,000 BTU/hour input. 3/4" gas connection, 6" vent, 5" air intake. Cupro nickel heat exchanger, ASME certified.
Pool Flowmeter	1	Flo-Vis FV-C, 10-110GPM range.
Chemical Controller	1	Chemical Automation Technologies model CAT 4000, with professional series sensors, molded flow cell and PVC backboard.
Sanitizer Feeder	1	Accutab 1030.
pH Feeder	1	G.H. Stenner model 45M-1
Fresh Water Auto-fill	1	Jandy Levelor K-1100CKA with 1" solenoid valve.
Main Drain	1	Sized per drawing.

2.10 DECK & SAFETY EQUIPMENT

A. Pool contractor to furnish following deck, safety and maintenance equipment:

Material	Make	Model	Qty.	Notes
Pool				
Ladder	SR Smith	42126	1	.065" x 1.90", 3 step
Ladder Socket	SR Smith	AS-104MG	2	Stainless Steel
Ladder Escutcheon	SR Smith	EP100F	2	Stainless Steel
Stair railings	SR Smith	Custom	1	.109" x 1.5" stainless steel
Stair Escutcheon	SR Smith	EP150	2	Stainless steel
Stair Sockets	SR Smith	AS-204MG	2	Stainless Steel
Spine board	Recreonics	12-335	1	
Head Immobilizer	Recreonics	12-783	1	
First aid kit	Recreonics	12-044	1	
Signage	Recreonics	SPEC	LOT	Per ODH code
Portable vacuum cleaner	Dolphin	WAVE 80	1	

Vacuum accessories	Recreonics	10-863	1	
Test kit	Taylor	K-2006C	1	2 oz reagents
Underwater Light	Pentair	Intellibrite	3	300 watt

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate delivery and installation of pool and pool components with General Contractor. All piping stubs, drain locations, equipment pack locations, etc. are to be coordinated with shop drawings on entire installation.

3.02 INSPECTION

A. Inspect the work area at the beginning of the project and advise owner of any conditions which might affect the satisfactory installation of the pool.

3.03 INSTALLATION

A. Factory fabricate and assemble pools to the greatest extent possible. Where existing building access conditions and shipping restraints dictate, field assemble pool as required. Quality standards applicable to factory assembly are also applicable to field fabrication.

B. Install in accordance with manufacturers recommendation, instructions and shop drawings. Set unit level in proper position.

C. Plumbing Contractor: Run pipes and make connections between spa (pool) and equipment skid. Test system for leaks and apply foam from portable foam pack furnished by spa manufacturer.
   1. Perform hydrostatic pressure test at 20 psi on water lines.

D. Electrical Contractor
   1. Electrically bond entire system, including handrails, pool, equipment skid and equipment to building ground system.
   2. Run electrical line through disconnect to supplied sub-panel.
   3. Run electrical line through disconnect to heater.

E. Fill pool and test for leaks. Operate pumping, heating, filtering, disinfecting and other systems for complete and proper operation for a minimum of 48 hours. Perform all other testing as required by local codes and regulatory agencies. Obtain all necessary approvals in writing from authorized inspectors.

F. Adjust and clean after checking complete operations of system. Clean all exposed surfaces prior to acceptance.

3.04 INSTRUCTION OF OWNER'S PERSONNEL

A. The Pool Contractor shall supply the services of an experienced swimming pool operator instructor for a period of not less than one (1) full day operations and start-up, one (1) full day shut-down assistance after the pool has been filled and initially placed in operation. During this period the Owner's designated representatives shall be thoroughly instructed in all phases of the pool's operation.

B. Prior to this instructor leaving the job, he shall obtain written certification from the Owner's designated representative acknowledging that the instruction period has been completed and all necessary operating information provided. Pool Contractor shall, in his contract, include the cost of one more days of instruction and operational checkout by a qualified representative of the Contractor during the first year's operation. Written reports of this visit outlining the pool's operation, competence and performance of the pool's operating personnel and other pertinent comments shall be submitted to the Owner and Pool Consultant within one week after each visit.

C. Pool Contractor shall deliver three complete sets of operating and maintenance instructions for the swimming pool structures, finishes and all component equipment to the pool consultant.

Including, but not limited to the following:

1. Bound together in a complete manual and three ring binder.
2. All equipment cut sheets.
3. Accurate parts lists.
4. Pool start-up and pool emptying instructions.
5. Narrative on the pool operation through all sequences.
6. All valves must be permanently plastic tagged along with valve legend and explanation.
7. Trouble shooting information.
8. A schematic of piping as installed providing elevations and dimensions.
9. All piping in mechanical room to be labeled with description of line and arrows indicating direction of flow.

3.05 CLEAN UP AND PROTECTION

A. After work of this section has been completed, clean up work area and remove all equipment, excess materials, and debris. Protect pool from damage until time of final completion. Remove and replace finishes which are chipped, cracked, abraded, improperly adhered, or otherwise damaged.

B. Pool Contractor responsible for vacuuming and cleaning of all pools prior to turning over to owner.

END OF SECTION 13 15 00

SECTION 21 01 00

FIRE PROTECTION - GENERAL

PART 1 GENERAL

1.01 REFERENCES

A. Sections 21 01 00 through 21 13 13 (as included), cover Fire Protection work specifically.

1.02 SCOPE

A. This Contractor shall furnish all labor, materials, tools, incidentals, details, etc., necessary to provide a complete, operational and approved Fire Protection System, including but not limited to all items and elements described in the Fire Protection Specification and shown on the Fire Protection Drawings, and as required for coordination and/or interface with work under separate contract as indicated by complete construction documentation package.

B. The edition of all applicable NFPA Pamphlet's as recognized and amended by the Building Code Inspection/Approval Authority shall be the minimum requirement for all materials and methods. As a quality standard only, all materials shall be listed by Underwriter's Laboratories, Inc., and Factory Mutual Laboratories as approved for fire protection installations.

C. Note that work in this contract is associated with the remodeling/revision of an existing structure. Work in this contract shall include items/elements within the remodeled/revised area(s), as well as adjacent areas (including above and below) as necessitated for connection to and/or incorporation with existing systems. Extent of remodeling/revised work area(s) shall be as indicated by and confirmed from architectural documentation. Unless indicated otherwise, the following conditions shall apply:

1. All Fire Protection Contract new supply piping shall connect to, and/or operate in conjunction with existing building Fire Protection Systems and elements.
2. When new work connects to, and/or operates in conjunction with existing building Fire Protection systems and elements, this contractor shall be responsible to provide an installation which shall operate and function properly without conflict or impairment to existing systems or elements upon completion of project. This shall include all necessary adjustments, balancing and confirmation of proper operation as required.
3. This contractor shall be responsible for removal, repair and replacement of existing structures (floors, walls, partitions, ceilings, etc.) as necessitated by new work. Repair and replacement to match original condition and adjacent structures in type, kind and finish.

D. In brief, the Scope of the Work shall include, but is not limited to the following:

1. Revisions to existing Automatic Sprinkler System protection for the revised/remodeled portion of the structure.
2. Design documentation, including all required plans, calculations and flow tests.

E. Installation shall be complete in every respect and meet all requirements of the following regulatory agencies:

1. National Fire Protection Association
2. Local Fire Department/Fire Prevention Authority
3. UFC 3-600-01
4. UFC 3-601-02
5. The Owner's Insurance Underwriter.
6. The State of Ohio Environmental Protection Agency (E.P.A.).
7. Any other authorities having jurisdiction

F. The Fire Protection Contractor shall not submit or bid the sprinkler system as a gridded type system.

G. This Contractor to be a bona fide Fire Protection Contractor licensed by the State of Ohio and presently engaged in fire protection contracting.

H. All holes for pipes, etc., shall be furnished by the Fire Protection Contractor.

I. Failure on the part of the Fire Protection Contractor to fulfill the above requirements will not relieve him of the responsibility of executing all work necessary for a complete and approved installation without extra expense to the Owner.

1.03 PERMITS AND FEES

A. The Contractor shall apply for and pay any testing, inspection, permit, license, and other service fees required by the state and local authorities in connection with the work under this Contract.

1.04 DESIGN

A. The Contractor is required to read the Specifications covering all branches of the work and will be held responsible for coordination of his work with work performed under all other Contracts.

B. The Fire Protection Sprinkler system shall be designed and sized hydraulically and according to NFPA Pamphlet No. 13, and the rules and regulations of the Insuring Company, the Fire Department/Fire Prevention Authority and the Building Code. See plans for design flows, densities, allowances and other conditions as applicable.

C. The Fire Protection Contractor shall include in his Bid the cost for flow test information and hydraulic calculations required for approvals.

D. If the Contractor has any questions concerning the Plans and Specifications, he is to feel free to contact the A/E for clarification before Bids, to fully understand the extent and responsibilities of his work.

1.05 FIRE PROTECTION SUPPLEMENTAL INFORMATION

A. See Architectural Documentation for building construction and occupancy/use group classification information.

1.06 TESTING AND INSPECTION

A. Testing:

1. Sprinkler Installation: The testing of the sprinkler installation shall conform to the applicable provisions of NFPA Pamphlet No. 13.

2. Upon completion, and prior to the acceptance of the installation, the Contractor shall furnish the Owner with three (3) copies of the certification required. Testing of all piping for the Fire Protection system is to be made in accordance with the National Fire Protection Association and in the presence of a representative of the Owner and Insurance Company. As a minimum, copies of "Contractors Certificate of Materials and Tests" properly executed and verifying satisfactory tests shall be furnished to the Owner upon completion of the tests.

B. Inspection: When all work has been completed, the Contractor shall conduct a preliminary but complete inspection and testing of the installation. The system, as a whole, and all component parts thereof, shall receive all inspections and tests necessary to assure that the materials, equipment, devices and all functional operations meet the requirements of this specification and standards referenced herein.

C. The Owner’s representative shall be notified of all scheduled tests at least 7 Business Days before they are scheduled so that he may witness same. If the Contractor performs any test or adjustment without the Owner’s representative present or without properly notifying the Owner’s representative, the Contractor will be required to perform the test or adjustment a second time in the presence of the Owner’s representative.

1.07 COORDINATION

A. All work shall be done in a neat and workmanlike manner and this Contractor shall coordinate his work with all other Contractors on the project and make certain that the installation of his work does not interfere with the proper installation of the other trades. The Fire Protection Contractor shall participate in

the coordination drawing process as described in section 15070 – MANUFACTURER'S DRAWINGS.

1.08 DESIGN DOCUMENTATION

A. The Fire Protection Contractor shall prepare documentation in accordance with NFPA pamphlet no. 13 requirements for a hydraulically designed system/installation, and submit four (4) sets of this documentation to the A/E for "preliminary" review and approval prior to sending to approving agencies.

B. After approval of "preliminary" submittal, design documentation shall be submitted to the construction review authorities for final approval. After final approval is obtained, four (4) sets of this documentation shall be provided to the A/E with the Fire Protection Contractor's and review authorities stamps affixed, for final design review and approval prior to installation.

1.09 SUPERVISION

A. This Contractor shall have in charge of the work, on the job as required, during construction, a competent superintendent experienced in the work installed under this Contract.

1.10 GUARANTEE

A. This Contractor is responsible for all defects, repairs and replacements in materials and workmanship, for a period of one (1) year after final payment is approved by the Owner's representative.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

3.01 Where existing items/elements are indicated to be reused as a part of new work, the Fire Protection Contractor is responsible for action required to assure that such items/elements will function properly in the completed revised setting, and be in compliance with the requirements of the review, inspection and approval authorities. This includes removal, cleaning and/or reconditioning of items/elements if required.

3.02 See general "FIRE PROTECTION NOTES" on plans for additional conditions and requirements relative to the Plumbing Contract.

3.03 Fire Protection items and elements shall be installed with due regard to preservation of the strength of structural members and prevention of damage to walls, surfaces and other structures through installation, bearing support or subsequent usage of Fire Protection items and elements. No framing or other support structure shall be cut, notched or bored in excess of limitations specified in the Building Code, or by the

manufacturer of the framing or other support structure, as confirmed in advance of work by the Fire Protection Contractor.

3.04 Where standards, codes or guidelines are referenced herein and throughout the Fire Protection Contract documentation, including plans and specifications, the latest version/edition shall be applied, unless the Building Code references another version/edition, which shall take precedence.

3.05 Connections to existing building Fire Protection systems shall be made with approved materials of the same type as, or listed for compatibility with, existing materials. Material types to be verified by this contractor in the field in advance of work.

3.06 Refer to project documentation furnished with the complete construction package in advance of work for overall coordination and verification of requirements at work of other trades relating to, interfacing with, and/or impacting work in the Fire Protection Contract. This includes exact locations, quantities, physical sizes, pipe routing, etc., for items included both in the Fire Protection Contract and under separate contract. Coordinate installation and interface requirements with the appropriate contractor(s) in advance of work.

3.07 Include any minor details, items and/or elements essential to necessary approvals and successful operation in addition to the items specified herein and shown on plans.

3.08 The Fire Protection Contractor is responsible for satisfactorily addressing all review and inspection authorities' comments and directives in regard to acceptable methods of installation and testing as required for approval of installation.

3.09 Compliance with codes, standards and guidelines referenced herein to include all listed materials, methods of installation, testing and approved type, kind and/or manufacturer of items/elements as applicable. This includes standards, testing and listing agencies referenced therein, and the requirements of the administering review, inspection and approval authorities for same.

3.10 Unless indicated otherwise herein or in referenced documentation, the Fire Protection Contractor shall apply and pay for any review, inspection, permit, license, testing and/or other fees associated with the Fire Protection Contract, as required by review, inspection and approval authorities

3.11 All Fire Protection Contract items/elements shall have the manufacturer's mark or name and the quality of the product or identification of same cast, embossed, stamped or indelibly marked on each item/element in accordance with the standards under which they are accepted and approved per applicable code(s).

3.12 All Fire Protection Contract items/elements to be installed in strict accordance with the standards under which they are accepted and approved per applicable code(s). In the absence of such standards, the item/element manufacturer's recommendations, as confirmed by the Fire Protection Contractor in advance, shall be followed.

END OF SECTION

SECTION 21 05 10

FIRE-STOPPING

PART 1 GENERAL

1.01 SCOPE

A. This Contractor shall be responsible for fire-stopping at all penetrations of rated structures by work in this contract. Fire-stopping shall be performed by an installer who has been trained & certified by a listed Fire-stopping products manufacturer in the published UL systems installation procedures. Location, rating & specific details of rated structures to be as indicated by the architectural portion of the complete construction documentation set.

B. Fire-stopping is defined as materials or combination of materials used to retain integrity of fire and/or smoke rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in rated structures including walls & floors.

C. Test Requirements:

1. ASTM E-814, "Standard Method of Fire Tests of Through Penetration Fire Stops".

2. ASTM E-84, Standard Test Method for Surface Burning Characteristics of Building Materials.

3. International Fire-stop Council Guidelines for Evaluating Fire-stop Systems Engineering Judgments.

4. Underwriters Laboratories (UL) of Northbrook, IL runs ASTM E-814 under their designation of UL 1479 and publishes the results in their "FIRE RESISTANCE DIRECTORY" that is updated annually.

a. UL Fire Resistance Directory:

i. Through-Penetration Fire-stop Devices (XHCR)
ii. Fire Resistance Ratings (BXUV)
iii. Through-Penetration Fire-stop Systems (XHEZ)
iv. Fill, Voids, or Cavity Material (XHHW)
v. Forming Materials (XHKU)

5. QUALITY ASSURANCE

a. A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of fire-stop systems to train

appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

b. Fire-Stop System installation must meet requirements of ASTM E-814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated.

c. Proposed fire-stop materials and methods shall conform to applicable governing codes having local jurisdiction.

d. Fire-stop systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

e. For those fire-stop applications that exist for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings must follow requirements set forth by the International Fire-stop Council.

6. SUBMITTALS

a. Submit Product Data: Manufacturer’s specifications and technical data for each material including the composition and limitations, documentation of UL fire-stop systems to be used and manufacturer's installation instructions.

b. Manufacturer's engineering judgment identification number and drawing details when no UL system is available for an application. Engineer judgment must include both project name and contractor’s name who will install fire-stop system as described in drawing.

c. Submit material safety data sheets provided with product delivered to job-site.

7. INSTALLER QUALIFICATIONS

a. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the fire-stopping manufacturer as having been provided the necessary training to install manufacturer’s products per specified requirements. A manufacturer’s willingness to sell its fire-stopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

8. DELIVERY, STORAGE, AND HANDLING

    a. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

    b. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

    c. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.

    d. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

    e. Do not use damaged or expired materials.

9. PROJECT CONDITIONS

    a. Do not use materials that contain flammable solvents.

    b. Scheduling

        i. Schedule installation of CAST IN PLACE fire-stop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.

        ii. Schedule installation of other fire-stopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

    c. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

    d. Weather conditions: Do not proceed with installation of fire-stop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

    e. During installation, provide masking and drop cloths to prevent fire-stopping materials from contaminating any adjacent surfaces.

PART 2 PRODUCTS

2.01 GENERAL

A. Provide fire-stopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the

fire-stopping under conditions of service and application, as demonstrated by the fire-stopping manufacturer based on testing and field experience.

B. Provide components for each fire-stopping system that is needed to install fill material. Use only components specified by the fire-stopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

2.02 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through penetration fire-stop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:

1. Hilti, Inc., Tulsa, Oklahoma, (800)879-8000
2. Tremco Sealants & Coatings, Beachwood, Ohio, (216) 292-5000
3. 3M Fire Protection Products, St. Paul, Minnesota, (612) 736-0203
4. Specified Technologies Inc., Somerville, New Jersey, (800) 992-1180
5. Nelson Fire-stop Products, Tulsa, Oklahoma, (918) 641-7299
6. Fox Couplings, Inc., Jacksonville, Florida, (904) 396-2865
7. Proset Systems Inc., Lawrenceville, Georgia, (800) 262-5355
8. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

2.03 MATERIALS

A. Use only fire-stop products that have been UL 1479, ASTM E-814 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Cast-in place fire-stop devices are installed prior to concrete placement for use with non-combustible and combustible plastic pipe (closed and open piping systems) penetrating concrete floors, the following products are acceptable:

1. Hilti CP 680 Cast-In Place Fire-stop Device
2. Fox Coupling, Inc. "Cast-In-Place Fire-stop Coupling".
3. Proset Cast-In-Place Device
4. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

C. Sealant or caulking materials for use with non-combustible items including steel pipe & copper pipe, the following products are acceptable:

1. Hilti FS-ONE Intumescent Fire-stop Sealant
2. 3M Fire Barrier CP25 or Fire-stop Sealant 2000
3. Tremco Fyre Shield
4. STI LC Latex Endothermic Sealant and SSS Intumescent Sealant
5. Nelson LBS Sealant
6. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

D. Intumescent sealant or caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe and plastic pipe, the following products are acceptable:

1. Hilti FS-ONE Intumescent Fire-stop Sealant
2. 3M Fire Barrier CP25WB+
3. Tremco Intumescent Acrylic or TremStop WBM
4. STI SSS Intumescent Sealant
5. Nelson LBS Sealant
6. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

E. Fire-stop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:

1. Hilti CP 642 and CP643 Fire-stop Collar, CP645 Wrap Strip
2. Tremco TREMstop D Combustible Pipe Intumescent Device System and TremStop WS Wrap Strip
3. 3M Ultra Plastic Pipe Device and Fire Barrier FS-195+ Wrap Strip
4. STI SSC Fire-stop Collars and Intumescent SSW Wrap Strip
5. Nelson PCS Plastic Pipe Choke System and WRS Wrap Strip
6. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

F. Materials used for large size/complex penetrations made to accommodate multiple steel and copper pipes, the following products are acceptable:

1. Hilti FS 635 Trowel-able Fire-stop Compound and FS 657 FIRE BLOCK
2. Tremco TremStop M Fire Rated Mortar and PS Pillows
3. 3M Fire Barrier CS-195+ Composite Sheet
4. STI SSM Fire Rated Mortar and SSB Fire-stop Pillows
5. Nelson CMP Fire-stop Compound and PLW Fire-stop Pillows
6. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

G. Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate multiple steel and copper pipes, the following products are acceptable:

1. Hilti FS 657 FIRE BLOCK
2. Tremco PS Fire-stop Pillows
3. 3M CS Intumescent Sheet
4. STI SSB Fire-stop Pillows
5. Nelson PLW Fire-stop Pillows
6. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

H. Provide a fire-stop system with an "F" Rating as determined by UL 1479 or ASTM E814. The F rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated.

PART 3 EXECUTION

3.01 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify penetrations are properly sized and in suitable condition for application of materials.

2. Surfaces to which fire-stop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by fire-stopping materials.

4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of fire-stopping.

5. Do not proceed until unsatisfactory conditions have been corrected.

3.02 COORDINATION

A. Coordinate location and proper selection of cast-in-place fire-stop assemblies with the trade responsible for the associated structure. Ensure fire-stop assembly is set in framing at the proper location & secured in place prior to construction.

B. Responsible trade to provide adequate spacing of field run pipes to allow for installation of cast-in-place fire-stop devices without interferences.

3.03 INSTALLATION

A. Regulatory Requirements: Install fire-stop materials in accordance with UL Fire Resistance Directory.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration joint materials.

C. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

D. Protect materials from damage on surfaces subjected to traffic.

3.04 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

C. Perform under this section patching and repairing of fire-stopping caused by cutting or penetrating of existing fire-stop systems already installed by other trades.

3.05 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed holes and joints to be free of excess fire-stop materials and soiling as work progresses.

END OF SECTION

SECTION 21 05 18

INSERTS, PIPE HANGERS & SUPPORTS

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install all necessary inserts, beam clamps and auxiliary steel for pipe hangers in the building.

B. Furnish and install necessary pipe hangers and supports to properly support all piping and to maintain uniform elevation.

C. Piping & equipment to be installed & supported in accordance with Building Code requirements applicable to the site seismic classification. This includes but is not limited to restraints, sway-bracing, isolation, etc. Seismic classification to be as indicated by project data included with the complete construction package.

D. The use of power-driven anchors is expressly prohibited. Power-driven anchors are defined as anchors which are driven into place by any device which produces an impact force by use of a powder charge, compressed air, gas, or other propellant.

E. Piping, equipment & other elements in this contract to be installed in strict accordance with the manufacturers' guidelines & recommendations for support, confirmed by the contractor in advance of all work.

F. Where non-ferrous piping is specified for installation, all hanger and support components shall also be of non-ferrous construction.

G. All hangers and supports for fire protection piping to be in accordance with the requirements of the NFPA pamphlets listed in section 21 00 00 – FIRE PROTECTION – GENERAL.

PART 2 PRODUCTS

2.01 HANGERS

A. Piping shall be adequately supported by means of hangers and supports, and be in compliance with NFPA Pamphlets 13 & 14 as applicable. Furnish required supplemental listed steel framing, bracing, etc. as necessary for support & stabilization.

B. The Following Items Shall Be Provided:

1. Supplementary channels, plates, etc. where supports are required between building structural members, spanning the space and attached to building structural members by welding or bolting.

2. All rods, angles, rails, struts, braces, plates, platforms, etc., required for suspension and/or support of piping, and all miscellaneous specialties and items/elements required for the attachment of hangers and supports to the structure.

C. Unless Otherwise Noted, Hangers Shall Be As Follows:

1. Piping 8” size and smaller, hanger shall be similar to Anvil Fig. 69, with adjustable nut and carbon steel band.

2. Piping 10” size and larger, hanger shall be similar to Anvil Fig. 260, carbon steel, adjustable wrought Clevis type.

3. Hangers for non-ferrous piping shall be of a similar type/configuration to the steel components listed, except with all brass construction. This includes the hanger, insert, support rod, nuts and all other components.

2.02 Wall brackets to be similar to Anvil figure no. 195.

2.03 Hanger support rods to be listed all-thread type sized in accordance with the hanger manufacturer’s recommendations for associated piping.

2.04 Clamps & inserts to be listed assemblies provided by the hanger manufacturer for the corresponding support rod size.

2.05 Where steel hangers are installed at building exterior locations they are to be provided with a manufacturer applies corrosion resistant galvanized finish for the entire hanger assembly, including nuts, clamps and rods. This includes hangers installed at open parking areas, building overhangs and any other similar locations.

2.06 Hangers, supports & accessories as manufactured/provided by Anvil, B-Line, Michigan, PHD Manufacturing, Erico or Modern Pipe Hangers may be furnished at the Contractor's option.

PART 3 EXECUTION

3.01 Piping shall only be independently supported from building primary structure in an approved manner & in accordance with best construction practices. Piping shall not be supported from or bear on non-load bearing structures, equipment, fixtures, building elements, other piping, or work of other trades. Piping shall not be used as a support for any other elements.

3.02 Piping shall not be supported from or attached to any structure in such a manner as to compromise or weaken said structure. All structural attachment devices shall be listed

for such service & installed in accordance with the manufacturer's guidelines & recommendations.

3.03 Pipe clamps shall be provided at each stack & riser structural floor penetration.

3.04 Wall bracket pipe supports shall be installed where required.

3.05 Fire protection piping to be supported at intervals as specified in the NFPA pamphlets listed in section 21 00 00 – FIRE PROTECTION – GENERAL.

3.06 Support piping at pumps and equipment from floor, ceiling, or walls, so that piping weight is not supported directly from pumps or equipment.

3.07 Piping at equipment and control valves, etc. shall be supported so that those elements/items can be removed without providing additional support elements. Piping shall not introduce any strains or distortions on connected equipment.

END OF SECTION

SECTION 21 05 20

CUTTING & PATCHING

PART 1 GENERAL

1.01 SCOPE

A. Cutting for all openings in structures, framing or other elements required for installation of work in this contract shall be done by this contractor with appropriate tools and methods as to prevent unnecessary damage to surrounding areas or equipment.

B. Unless indicated otherwise patching for all openings left in structures after existing plumbing elements have been removed shall be done by this contractor to match adjacent structure in type, kind & finish.

PART 2 PRODUCTS

2.01 Patching & repair of structural elements to be done with listed compatible materials & methods in accordance with general contract conditions for specific types of structure when applicable.

PART 3 EXECUTION

3.01 Avoid cutting of concrete, masonry and other new work by the use of inserts and sleeves.

3.02 All holes in existing walls and floors shall be cut by use of core drills, using water to keep down the dust, and a method for catching water shall be provided. In addition, a vacuum cleaner shall be used with inlet as close to the hole being drilled as possible to pick up all dust caused by drilling.

3.03 The corners of all openings in poured concrete shall be core drilled to minimize over-cutting.

3.04 Fill and patch openings left by removal of piping and equipment in this contract to match adjacent surfaces.

3.05 Openings in rated structures shall be filled or patched in such a manner as to maintain the appropriate rating including fire-stopping if necessary.

3.06 The Protection of Persons and Property Section of the General Conditions must be followed without exception, including precautions against Fire Hazards.

3.07 No structural member will be cut without the expressed permission of the Owner's Representative obtained in advance.

END OF SECTION

SECTION 21 05 30

TESTS & ADJUSTMENTS

PART 1 GENERAL

1.01 SCOPE

A. After work has been completed but before pipe covering has been applied, the Contractor shall test and adjust the systems he has installed.

B. The Owner's Representative shall be notified of all scheduled tests and adjustments at least 7 Days before they are scheduled so that he may witness same. If the Contractor performs any test or adjustment without the Owner's Representative present or without properly notifying the Owner's Representative, the Contractor will be required to perform the test or adjustment a second time in the presence of the Owner's Representative.

C. If the Owner's Representative determines that any work requires special inspection, testing, or approval, he will, upon written authorization from the Owner, instruct the Contractor to order such special inspection, testing or approval. The Contractor shall give timely notice so the Owner's Representative may observe the inspections, tests or approvals. If such special inspection or testing reveals a failure of the work to comply with the requirements of the Contract Documents, the Contractor shall bear all costs thereof, including compensation for the Owner's Representatives additional services made necessary by such failure; otherwise the Owner shall bear such costs, and an appropriate Change Order shall be issued.

D. Concealed lines shall be tested before being concealed. If this is not done and a leak occurs during the final test, this Contractor shall repair leak and all damage resulting there-from.

E. This Contractor shall adjust all his equipment to obtain proper operation and shall demonstrate to the Owner's Representative that the entire system will function properly.

F. All testing shall be in accordance with the applicable NFPA pamphlets listed in section 21 05 00 – FIRE PROTECTION – GENERAL.

PART 2 PRODUCTS

Not applicable.

PART 3 EXECUTION

3.01 After all equipment, outlets, piping and accessories have been installed this contractor shall properly adjust, balance & activate all water systems, record all final data, prepare a detailed report and submit the report, in triplicate, to the Owner's Representative for review. Each copy of the report shall be dated, signed by an officer or partner in the firm and bound in a suitable cover.

3.02 This Contractor shall check for proper alignment before starting any pumping unit with pump and driver mounted on a common base plate with flexible pipe couplings.

3.03 Before turning job over to Owner this Contractor inspect all valves and repack valves as necessary.

3.04 This Contractor shall adjust all equipment in the fire protection system to obtain proper operation and shall demonstrate to the Owner's Representative that the entire system will function properly.

END OF SECTION

SECTION 21 05 60

MANUFACTURERS DRAWINGS

PART 1 GENERAL

1.01 REFERENCE

A. Applicable Division 1 and General Conditions terms and conditions (if any).

1.02 GENERAL CONDITIONS

A. Unless directed otherwise by the Construction Administration portion of the specifications this Contractor shall provide (6) copies of manufacturers submittal data for specific plumbing equipment, fixtures & materials to the Owner's Representative for review within six weeks after the date of contract. This data shall include performance information, wiring diagrams, utility requirements & any other pertinent information necessary for appropriate evaluation. The Owner's Representative will review the Contractor's submittal data for compliance with project specifications & the ability of the associated elements to be furnished & installed as a properly functioning integral element of the overall plumbing installation. Before providing a submittal to the Owner's Representative the Contractor shall:

1. Review each such submission for conformance with the means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto, all of which are the sole responsibility of the Contractor.

2. Approve each submission & so stamp in advance of forwarding to the Owner's Representative.

B. The required Fire Protection submittals are as follows:

1. Piping, including fittings, valves, accessories & appurtenances.
2. Sprinkler heads & accessories.
3. Hose connection valves.
4. Fire pump including all accessories & appurtenances.
5. Alarm valves & accessories.
6. Alarm initiation devices (tamper switches, flow switches, detectors, pull stations, etc.).
7. Alarm audio/visual devices.
8. Detection & control equipment & accessories.
9. Special suppression systems equipment, accessories & appurtenances.
10. Fire extinguishers & accessories.

C. The Owner's Representative shall return shop drawings and related materials with comments provided that each submission has been called for and is stamped by Contractor as indicated above. The Owner's Representative shall return without comment material not called for or which has not been approved by Contractor.

D. This Contractor shall furnish equipment shop drawings which will indicate power hook up and control connections as required for mechanical equipment. "Stock" wiring diagrams are NOT ACCEPTABLE.

E. The manufacturer shall provide a statement on submittals that equipment furnished complies with the Ohio Energy Code. This previously relates to high efficiency motors, EER's, COP's, etc. If this is not done, submittals will be rejected.

F. Owner's Representative review of manufacturer's drawings or schedules shall not relieve the Contractor from compliance with the requirements of the plans and specifications.

G. Items may be referred to in singular or plural on Plans and Specifications. Contractor is responsible for determining quantity of each item.

PART 2 PRODUCTS

Not applicable.

PART 3 EXECUTION

3.01 Refer to the Construction Administration portion of the specifications & the owner's representative for specific direction in regard to processing submittals for the project, including procedures, time-tables, quantities, routing & approved format.

END OF SECTION

SECTION 21 13 13

FIRE PROTECTION PIPING SYSTEM - WET

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install a complete and approved wet sprinkler system. System to be complete with all pipe supports and offsets necessary to clear structure, and all other items/elements provided under separate contract.

B. Sprinkler system shall be installed complete with all necessary accessories for proper operation, and in strict accordance with the requirements of all regulatory agencies involved.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

A. Pipe and fittings shall be Schedule 40 ASTM A53 black steel pipe with 175 lbs. cast iron or malleable iron screwed fittings per NFPA Standards.

B. The Contractor may, at his option for schedule 40 pipe 2" size and larger, use listed/approved grooved fittings and malleable iron mechanical couplings similar to that manufactured by Victaulic.

1. Couplings shall be similar to Victaulic rigid style 005 Firelock with EDPM gasket and housing fabricated in two or more parts of malleable iron castings. Listed outlet couplings may be used subject to approval by all review and inspection authorities. Final assemblies shall be rated for 300 psig working pressure.

2. Assembly and installation of couplings to be in accordance with the manufacturer's recommendations.

3. Pipe grooving shall be in accordance with the manufacturer's specifications. Roll or cut grooving may be used for schedule 40 pipe at the contractor's option.

4. Elements described elsewhere in this specification may be provided with compatible alternate connections when installed in mechanical coupling piping systems. The mechanical coupling connections for these elements must be provided by the manufacturer with appropriate listings, approvals and pressure ratings as specified. This includes valves, appurtenances, equipment and other elements installed in or connected to mechanical coupling piping systems.

5. Victaulic flexible sprinkler drops may be used at the contractor's option, no equals.

E. Piping down-stream of the sprinkler zone control valve assemblies only may be plenum rated ASTM/fire protection service listed SDR 13.5 CPVC pipe with socket solvent weld pressure fittings rated for 175 psig working pressure. Provide listed adapter/transition fittings for integration of threaded fire protection components.

F. Below slab piping 2-1/2" diameter and smaller down-stream of the sprinkler zone control valve assemblies for use in NFPA 13R light hazard occupancies only shall be UL listed and FM approved BlazeMaster ASTM F 442 fire protection service listed SDR 13.5 CPVC pipe with socket solvent weld pressure fittings rated for 175 psig working pressure. Provide listed adapter/transition fittings for integration of threaded fire protection components.

G. Press Fittings prohibited for use on the FP sprinkler system.

2.06 SPRINKLERS; as specified on plans.

A. In all areas having drop ceilings with surface mounted light fixtures or other items/elements that obstruct sprinkler spray, the Fire Protection Contractor shall install sprinklers with two-piece extended/dropped escutcheon assemblies in lieu of escutcheons specified with the heads.

B. Spare sprinkler head cabinet – provide cabinet at main riser location with sprinkler heads and head wrench(es) for emergency use. Spare head quantities to be as specified by NFPA pamphlet no. 13, corresponding proportionally to the total number of each type installed in the building.

C. All sprinkler heads in light and ordinary hazard occupancy applications to be listed/approved "quick response" type.

D. Sprinkler heads as manufactured/provided by Reliable, Automatic, Central, Grinnell, Gem, Star, Tyco, Viking or Victaulic may be furnished at the Contractor's option.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide drain valves and auxiliary drains per NFPA Requirements, and at low points of system to allow complete drainage. Contractor to be responsible to install sprinkler system to drain properly. Piping shall be installed to drain at the main riser whenever possible.

B. Install valves and specialties where indicated and/or as required for approval.

C. The entire sprinkler system installation shall conform to the requirements of NFPA pamphlet no. 13.

D. Piping must be lined up paralleling and at right angles to the building walls and other primary structural elements; angular offsets such as 45° cuts across corners and elsewhere will not be permitted unless specifically shown.

E. This Contractor MUST assume the full responsibility of verifying present elevations in the field and making any adjustments as may be necessary, all of which MUST be included in his Proposal Price.

3.02 Provide sleeves for pipes where piping penetrates masonry walls. All pipe penetrations through masonry walls shall be adequately sealed with mortar or approved fire resistant caulking.

3.03 SPRINKLER HEADS

A. Quantity and location of sprinkler heads to be determined by the Fire Protection Contractor, as required for proper coverage and protection in accordance with specifications on plans.

B. Unless indicated or required otherwise, nominal sprinkler head operating temperature ratings to be as follows:

1. Finished, general access areas; 155 degrees F.

2. Non-finished, restricted access areas (mechanical/electrical utility rooms, storage rooms, etc.); 200 degrees F.

3. Water sensitive or electronic technology areas (computer rooms, data storage/processing rooms, switchgear/motor control center rooms, tele-communications rooms, etc.); 200 degrees F.

4. The Fire Protection Contractor is responsible to determine if sprinklers with temperature ratings other than those indicated herein are required due to specific conditions at each installation, and provide sprinklers with appropriate temperature rating at these locations.

C. Recess sprinkler heads to be installed with deflectors no greater than 1/2" from maximum recessed capability. Deflectors of adjacent heads to be at same elevation, plus or minus 1/4".

D. Sprinkler heads to be aligned in respect to structure, and adjacent heads to present a uniform, even linear appearance.

END OF SECTION

SECTION 22 00 00

PLUMBING GENERAL

PART 1 GENERAL

1.01 REFERENCE

A. Sections 22 00 00 through 22 06 00 (as included), for items of a general nature which apply to the Plumbing Contract, unless indicated otherwise herein.

B. Sections 22 07 00 through 22 42 00 (as included), cover Plumbing work specifically.

C. Applicable Division 1 and General Conditions terms and conditions (if any).

D. Applicable construction codes, standards and guidelines for all Plumbing Contract elements, including but not limited to the following:

1. City of Columbus Building Code, including Plumbing, Fuel Gas, Mechanical, handicap accessibility and energy conservation portions thereof.

2. Franklin County Board of Health.

3. State of Ohio Environmental Protection Agency (E.P.A.).

4. NFPA pamphlet no. 70, NATIONAL ELECTRIC CODE

5. City of Columbus water utility provider.

6. City of Columbus sewer utility authority.

7. American National Standards Institute (ANSI) standards for materials and construction.

8. American Society of Mechanical Engineers (ASME) standards for materials and construction.

9. American Society of Sanitary Engineering (ASSE) standards for performance and testing.

10. American Society for Testing and Materials (ASTM) standards for materials, construction and testing.

11. American Water Works Association (AWWA) standards for materials, construction and disinfection procedures.

12. National Sanitation Foundation (NSF) standards for materials and construction.

13. Cast Iron Soil Pipe Institute (CISPI) standards for materials and construction.

14. Underwriter's Laboratories (UL) standards for materials and construction.

15. The manufacturer's installation guidelines and recommendations for individual items, elements and/or systems indicated herein.

16. The Owner's material and installation guidelines and/or standards.

1.02 SCOPE

A. This Contractor shall furnish all labor, materials, tools, incidentals, details, etc., necessary to provide a complete, operational and approved Plumbing System, including but not limited to all items and elements described in the Plumbing Specification and shown on the Plumbing Drawings, and as required for coordination and/or interface with work under separate contract as indicated by complete construction documentation package.

B. The Plumbing Contractor is responsible for satisfactorily addressing all review and inspection authorities' requirements and directives in regard to methods of installation necessary for final approval.

1.03 PERMITS AND FEES

A. Unless directed otherwise by the General Conditions portion of project documentation, the Plumbing Contractor shall apply for and pay any review, inspection, permit, license, testing and/or other service fees required by all review/inspection/approval authorities in connection with the work under this Contract.

B. Unless directed otherwise by the General Conditions portion of project documentation, the Plumbing Contractor shall apply for and pay any procurement, tap, capacity, metering, testing and/or other service fees required by all Utility Providers (Water, Gas, Storm, Sewer etc.) in connection with the work under this Contract. This shall include procurement, execution and return of any forms and/or applications required; and participation in individual, initial design/installation consultations with the providers if required.

1.04 PLUMBING UTILITY CONNECTIONS FOR ITEMS OR ELEMENTS NOT INCLUDED IN THE PLUMBING CONTRACT

A. Provide Plumbing supply, waste, drain, vent, and any other piped utilities included for the project as required, as listed herein, and/or as shown on the Plumbing Drawings for items furnished and/or installed under separate contract requiring same. These items shall include, but not be limited to the following:

1. HVAC equipment; final connection (where applicable) by the HVAC Contractor.

2. Owner provided items; final connection (where applicable) by the Plumbing Contractor.

3. Kitchen Equipment; final connection (where applicable) by the Plumbing Contractor

B. Rough-in Plumbing supply, waste, drain, vent, and any other piped utilities included for the project as required, as listed herein, and/or as shown on the Plumbing Drawings for all future items requiring same.

1.05 Concrete housekeeping and support pads for equipment in the Plumbing Contract are the responsibility of the Plumbing Contractor. Concrete pad construction to be in accordance with specifications provided in the General Contract for same.

PART 2 PRODUCTS

2.01 Where items/elements are indicated herein to be listed/approved, the intent of this specification is that said item/element shall be listed by all applicable material/construction standards, and subject to final approval (including methods of installation) by all review/inspection/approval authorities.

2.02 Unless indicated otherwise, all plumbing contract items/elements (pipe, fittings, valves, specialties, fixtures, equipment, etc.) materials, construction, performance, testing and methods of installation to be as listed/approved by all applicable material/construction/installation standards for same, and be in accordance with the requirements of all review/inspection/approval authorities. This includes, but is not limited to, the standards and authorities referenced in this specification. In the absence of such standards and/or requirements, the item/element manufacturer's recommendations, as confirmed by the Plumbing Contractor in advance, shall be followed.

2.03 Unless indicated otherwise, all Plumbing piping shall be in accordance with the following standards in regard to materials, construction, dimensions/tolerances, type of service/transmission medium (water, air, gas, etc,) and methods of installation (as applicable), and shall be so listed. Final approval for use is subject ot the requirements of the review and inspection authorities:

A. Steel pipe, steel, malleable and cast iron fittings and joining methods; per applicable ASTM/ANSI/ASME standards. In addition, where utilized for potable water service, all elements shall be per applicable NSF and ASTM A53 (for carbon steel) standards.

B. Ductile iron pipe, fittings and joining methods; per applicable ASTM/ANSI/ASME/AWWA/NSF standards.

C. Plastic pipe, fittings and joining methods; per applicable ASTM/ANSI/ASME/AWWA/NSF standards.

D. Cast iron pipe, fittings and joining methods; per applicable ASTM/ANSI/ASME/CISPI standards.

E. Copper/copper alloy/brass pipe/tube, fittings and joining methods; per applicable ASTM/ANSI/ASME standards. In addition, where utilized for potable water service, all elements shall be per applicable NSF standards.

2.04 All Plumbing Contract items/elements shall have the manufacturer's mark or name and the quality of the product or identification of same cast, embossed, stamped or indelibly marked on each item/element in accordance with the standards under which they are accepted and approved per applicable code(s).

2.05 PLUMBING UTILITY CONNECTIONS PROVIDED FOR ITEMS OR ELEMENTS NOT INCLUDED IN THE PLUMBING CONTRACT

A. Unless indicated otherwise, the Plumbing Contractor shall furnish and install all traps and stops (as applicable) as required for items furnished under separate contract. This includes items with connections by the Plumbing Contractor or with connections under separate contract.

B. Unless indicated otherwise, Fixture traps above floor slab connected to the sanitary waste system shall be cast brass P-traps with integral cleanout. P-traps below floor slab to be cast iron, less cleanout. See plans for sizes.

C. Unless indicated otherwise, Fixture traps connected to waste or drain systems other than the sanitary waste system shall be of same material and connection type as the associated piping system. P-trap or S-trap to be provided as indicated on plans.

D. Unless indicated otherwise, all waste and drain rough-ins for future shall terminate with a short nipple and cap and no trap.

E. Unless indicated otherwise, Supply rough-ins to be furnished with accessible shut-offs at connection points. Shut-offs at supply rough-ins for fixtures (sinks, lavatories, etc.) to be angle type compression stops. Shut-offs at supply rough-ins for equipment or other elements (HVAC, Food Service, etc.) to be in-line valves as specified for individual services. All supply rough-ins for future shall terminate with a short nipple and cap immediately downstream of the shut-off.

F. Unless indicated otherwise, where connection elements described herein are exposed in locations other than restricted access utility or maintenance areas, all metallic components to be furnished with a polished chrome finish. Wall or other structure piping penetrations at these locations to be provided with polished chrome finish escutcheons.

PART 3 EXECUTION

3.01 Where standards, codes or guidelines are referenced herein and throughout the Plumbing Contract documentation, including plans and specifications, the latest version/edition shall be applied, unless the Building Code references another version/edition, which shall take precedence.

3.02 Refer to project documentation furnished with the complete construction package in advance of work for overall coordination and verification of requirements at work of other trades relating to, interfacing with, and/or impacting work in the Plumbing Contract. This includes exact locations, quantities, physical sizes, rough-in details, pipe routing, connection sizes, etc., for items included both in the Plumbing Contract and under separate contract. Coordinate installation and interface requirements with the appropriate contractor(s) in advance of work.

3.03 Include any minor details, items and/or elements essential to necessary approvals and successful operation in addition to the items specified herein and shown on plans.

3.04 See general "PLUMBING NOTES" on plans for additional conditions and requirements relative to the Plumbing Contract.

3.05 Plumbing items and elements shall be installed with due regard to preservation of the strength of structural members and prevention of damage to walls, surfaces and other structures through installation, bearing support or subsequent usage of Plumbing items and elements. No framing or other support structure shall be cut, notched or bored in excess of limitations specified in the Building Code, or by the manufacturer of the framing or other support structure, as confirmed in advance of work by the Plumbing Contractor.

END OF SECTION

SECTION 22 01 05

PLUMBING GENERAL PROVISIONS

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Furnish all labor, materials, tools, incidentals and details necessary to provide a complete plumbing system, ready to operate, including but not limited to the items listed under the Plumbing Specification Indexes.

B. Include any minor details essential to successful operation and any other items specified or shown on the Drawings.

C. The Contractor is required to read the Specifications covering all branches of the work and will be held responsible for coordination of his work with work performed under all other Contracts.

D. The Contractor is required to visit the site and fully inform himself concerning all conditions affecting the scope of his work. Failure to visit the site shall not relieve the Contractor from any responsibility in the performance of his Contract.

E. The Contractor should feel free to contact the Architect immediately if there is any question regarding the meaning or intent of either Plans or Specifications, or if he notices any discrepancies or omissions in either Plans or Specifications.

F. Other than minor adjustments shall be submitted to the Architect for approval before proceeding with the work.

G. The Contractor shall submit on his letterhead, along with the Bid, the manufacturer's name and the names of all Subcontractors to whom he intends to sublet the work. If the Contractor fails to provide this information with the Bid, the Owner shall have the right to select the manufacturers and Subcontractors with no additional charge.

H. Scheduling of all work performed by this Contractor shall be completely coordinated with the Construction Manager.

I. This Contractor shall furnish to Architect a written description of procedure on this job including scheduling of the work to be done for his approval. This shall be submitted within 10 days after the Contract is awarded. There shall be six (6) copies.

J. All material hoisting by trade involved.

K. Arrangements for storage of tools and material, removal of debris, and interruptions of services shall be made with the Construction manager.

L. Extreme care shall be taken to avoid interference and/or conflict with work of other trades. Consult with the Architect regarding any points where interference and/of conflict is likely to occur and follow dimensions carefully where given on the Drawings. Pay particular attention to minimum clear heights when indicated on the Drawings.

M. It is mandatory that dust and debris be held to a minimum. This Contractor shall provide drop cloths, screens, curtains, etc., to protect all equipment and personnel from dust and dirt during the course of his work. All damage to existing construction or finishes shall be repaired by this Contractor upon removal of dirt and dust protection devices. All dirt, dust and other protection devices shall be approved by the Construction Manager before any work is started in the area involved.

N. The Contractor, insofar as this Contract is concerned, shall at all times keep the premises and the building in a neat and orderly condition.

O. At the completion of the project, this Contractor shall promptly clean up and remove from the site, all debris and excess materials.

1.02 DRAWINGS

A. Consult all Contract Drawings which may affect the locations of any equipment, apparatus, piping and ductwork and make minor adjustments in location to secure coordination.

B. Piping is schematic and exact locations shall be determined by structural and other conditions and verified in the field. This shall not be construed to mean that the design of the system may be changed, it refers only to the exact location of piping to fit into the building as constructed, and to coordination of all work with piping and equipment included under other Divisions of the Specifications.

C. The layout shown on the Drawings is based on a particular make of equipment. If another make of equipment is used which requires modifications or changes of any description from the Drawings or Specifications, this Contractor shall be responsible for making all such modifications and changes, including those involving other trades, as a part of this Contract and the cost thereof shall be included in his Bid. In such case, the Contractor shall submit Drawings and Specifications showing all such modifications and changes prior to starting work, which shall be subject to the approval of the Architect.

D. The Owner and Architect reserves the right to make minor changes in the location of piping and equipment up to the time of rough-in without additional cost to the Owner.

E. Where certain grades and/or elevations are given on the Drawings, they have been obtained from the best information available; however, they are not guaranteed. This Contractor MUST assume the full responsibility of verifying present elevations in the field and making any adjustments as may be necessary, all of which must be included in his Bid Price.

F. Due to the scale of the Drawings, it is impossible to show all offsets and transitions which may be required. This Contractor shall carefully investigate the conditions affecting all work and shall furnish all elbows, fittings, transitions, etc., required to accomplish the desired result at no additional cost to the Owner.

G. Install all work as close as possible to walls, ceilings, struts, members, etc., consistent with the proper space for covering, access, etc., so as to occupy the minimum of space.

H. Actual dimensions shown on the Drawings and field dimensions shall take precedence over scaled dimensions.

1.03 PERMITS, INSPECTIONS AND CODES

A. The Architect will obtain the general building permit. Any other permits required for the project will be obtained by the Contractor performing the work. Fees will be included in the bid price.

B. Completed installations shall conform with all applicable Federal, State and Local Laws, Codes and Ordinances, including but not limited to the latest editions of the following:

1. Ohio Building Code, State of Ohio.

2. A.S.M.E. Pressure Piping Code - Section B31.1

3. National Electrical Code, Bulletin No. 70, National Fire Protection Association.

4. Life Safety Code, Bulletin No. 101, National Fire Protection Association.

C. Nothing contained in the Plans and Specifications shall be construed to conflict with these laws, codes and ordinances and they are hereby made a part of these Specifications.

1.04 LEED for Homes

A. The Plumbing System must comply with all requirements of the LEED for homes rating system. This includes, but is not limited to, efficiencies, power factors, insulation thickness, etc.

1.05 UTILITIES

A. The Contractor shall investigate and locate all utilities prior to construction.

B. Each Contractor is responsible for rerouting or replacing existing utilities where necessary to permit installation of his work.

C. Support, protection and restoration of all existing utilities and appurtenances shall be the responsibility of the Contractor. The cost of this work shall be included in the price bid for the various items.

D. The Contractor shall cause notice to be given to the Ohio Utilities Protection Service and to the Owners of underground utility facilities shown on the plans who are not members of a registered underground protection service in accordance with Section 153.64 of the Revised Code. The above mentioned notice shall be given at least 48 hours, excluding Saturdays, Sundays and legal holidays, prior to commencing work.

E. The Contractor shall alert immediately the occupants of nearby premises as to any emergency that he may create or discover on or near such premises of the underground facility, any break or leak on its lines or any dent, gouge, groove or other damage.

1.06 OPERATING AND MAINTENANCE INSTRUCTIONS

A. This Contractor shall thoroughly instruct and supervise the Owner’s Maintenance Personnel in the proper operation and maintenance of the mechanical system equipment. This Contractor shall be responsible for arranging for the instruction and supervision at a time convenient to the Owner and notifying the Architect of the time at least 48 hours in advance.

Instructions shall include the following:

1. Location of equipment and explanation of what it does.

2. Reference to "Operating Instruction Manuals" for record and clarity.

3. Coordination of written and verbal instruction so that each is understood by all personnel.

4. Specific maintenance to be performed by the Owner.

B. Furnish one (1) copy of the printed Operating and Maintenance Instructions for the Mechanical Systems for review. This Contractor shall furnish two (2) copies of the printed Operating and Maintenance Instructions for the Mechanical Systems and one copy on CD for review. Provide one hardcopy and one digital Adobe pdf set of As-Built drawings. Each copy shall be neat, legible and bound in a hard back 3-ring notebook. Instructions shall consist of the following items:

1. Manufacturer's maintenance manuals for each item of equipment furnished under this Contract. Manuals shall include such items as parts lists, detailed lubrication instructions, procedures for performing normal maintenance functions, preliminary trouble shooting procedures and wiring diagrams.

2. Complete wiring diagrams for the mechanical systems as actually wired diagrams for the mechanical systems as actually wired including control and interlock wiring.

3 Brief but complete instructions for start-up, shut- down and routine maintenance of each system.

4. Copy of corrected shop drawing for each item of equipment furnished under this Contract.

5. Maintenance binder will include: Product name, model number, serial number and manufacturer of all systems, sub-systems and products. Manufacturers written maintenance documentation. List all Trades with corresponding installation Contractor name, phone number and email. Manufacturers recommended maintenance/service schedule.

6. Warranty binder to include: List of all trades/products with corresponding installation contractor name, phone number and email. Contact person from each trade for warranty items and Emergency Service/After – hours Service. Written warranties for all products, equipment, systems and sub-systems.

7. Training: Training will take place prior to Owner acceptance. Training will cover al MEP's low voltage systems, entry systems and any specialty systems.
8. Title Page: Title of Project, address, date of submittal, name and address of Contractor, name of Architect.

9. Second Page: Index of Manual Contents.

10. First Section: A copy of each approved shop drawing and submittal with an index at the beginning of the section.

11. Second Section: A list of all equipment used on the project, together with supplier's name and address.

12. Manufacturer's maintenance manuals for each item of equipment furnished under this contract. Manuals shall include such items as parts list, detailed lubrication instructions, procedures for performing normal maintenance functions, preliminary trouble shooting procedures and wiring diagrams.

13. Complete wiring diagrams for the plumbing systems as actually wired including control and interlock wiring.

14. Brief but complete instructions for start-up, shut- down and routine maintenance of each system.

15. Routine and 24-hour emergency information:

    a. Name, address and telephone number of servicing agency.

    b. Include names of personnel to be contacted for service arrangements.

C. Frame one (1) copy of brief start-up, shut-down and routine maintenance instructions and complete system wiring diagrams under glass and mount on the Equipment Room wall.

1.07 RECORD DOCUMENTS

A. The Contractor shall keep an accurate record of all deviations from Contract Drawings and Specifications. He shall neatly and correctly enter in colored pencil any deviations on Drawings affected and shall keep the Drawings available for inspection. Extra sets of Drawings will be furnished for this purpose.

B. At the completion of project and before final approval, make any final corrections to Drawings and certify to the accuracy of each print by signature and deliver same to Architect

1.08 SUPERVISION

A. This Contractor shall have in charge of the work, on the job during construction, a competent superintendent experienced in the work installed under this Contract.

1.09 UNACCEPTABLE WORK AND OBSERVATION REPORTS

A. Work shall be unacceptable when found to be defective or contrary to the Plans, Specifications, Codes specified or accepted standards of good workmanship.

B. The Contractor shall promptly correct all work found unacceptable by the Architect and/or Construction Manager or the Owner whether observed before or after substantial completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such unacceptable work, including compensation for the Architect's or the Construction Manager's additional services made necessary thereby.

C. During the course of construction, the Architect will prepare "Observation Reports" with a list of items found to be in need of correction. All items listed shall be corrected by the Contractor. A space is provided on the form for the Contractor to note the completion of each item. All prior "Observation Report" items must be completed, the lists signed and returned to the Architect prior to making the final inspection. After the final list is issued, the same procedure will apply.

1.10 FINAL INSPECTION

A. When the Contractor determines all work is completed and working properly per the Contract Documents, he shall request a "final" inspection by the Architect in writing. If more than one reinspection is required after this final inspection, the Contractor shall bear all additional costs including compensation for the Architect's additional services made necessary thereby.

B. As part of the final checkout of the project, the Architect will be checking out the operation of the various systems. This Contractor shall provide such assistance as required (including manpower and tools) to start and stop the various systems, open and close valves etc. The Contractor (not the Architect) is responsible to turn on the systems and demonstrate they are operating properly.

1.11 GUARANTEE

A. This Contractor is responsible for all defects, repairs and replacements in materials and workmanship, for a period of one (1) year after final payment is approved by the Architect.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 22 05 10

MANUFACTURER'S DRAWINGS

PART 1 GENERAL

1.01 SCOPE

A. The Contractor shall submit to the Engineer for review, within one week after date of contract, six (6) copies of manufacturer's drawings, wiring diagrams, or data. The Engineer will review Contractor's shop drawings and related submittals (as indicated below) with respect to the ability of the detailed work, when complete, to be a properly functioning integral element of the overall system designed by the Engineer. Before submitting a shop drawing or any related material to the Engineer, Contractor shall: review each such submission for conformance with the means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto, all of which are the sole responsibility of Contractor; approve each such submission before submitting it; and so stamp each such submission before submitting it. The Engineer shall assume that no shop drawing or related submittal comprises a variation unless Contractor advises Engineer otherwise via a written instrument which is acknowledged by Engineer in writing. The shop drawings and related material (if any) called for are indicated below:

Plumbing Contract

Plumbing fixtures and all trim
Drains and cleanouts
Domestic Hot Water Heaters
Showers
Lavs
Water Closet

C. The Engineer shall return shop drawings and related materials with comments provided that each submission has been called for and is stamped by Contractor as indicated above. The Engieer shall return without comment material not called for or which has not been approved by the General Contractor.

D. This Contractor shall furnish equipment shop drawings which will indicate power hook up and control connections as required for plumbing equipment. "Stock" wiring diagrams are NOT ACCEPTABLE.

E. The HVAC Contractor is to provide sepias of sheet metal drawings for use in coordinating work of Plumbing, Fire Protection and Electrical with layout of air distributions system and related work. Lighting, ceiling grid and ceiling access doors will be shown lightly to verify coordination. HVAC Contractor to provide initial sepias within 60 days of award of contract. Each Prime Contractor is responsible for overlaying his work onto these sepias; for providing information as to size, elevation and location proposed for all components; and for coordination of his work with that of other Contractors. Final resolution of all items to be determined at project meetings held by Lead Contractor.

F. The manufacturer shall provide a statement on submittals that equipment furnished complies with the Energy Code. This previously relates to high efficiency motors, EER's, COP's, etc. If this is not done, submittals will be rejected.

G. The Engineers review of manufacturer's drawings or schedules shall not relieve the Contractor from compliance with the requirements of the plans and specifications.

1.02 QUANTITIES

A. Items may be referred to in singular or plural on Plans and Specifications. Contractor is responsible for determining quantity of each item.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

Not Applicable

PART 3 EXECUTION

Not Applicable

END OF SECTION

SECTION 22 05 13

ELECTRICAL WORK

PART 1 GENERAL

1.01 REFERENCE

A. Section 22 01 05 - Paragraph 1.04 - OHIO ENERGY CODE
B. Division 26 - ELECTRICAL

1.02 SCOPE

A. This Contractor shall furnish all motors for his equipment. Motor starters, safety switches and wired junction boxes shall be furnished and installed by the Electrical Contractor except where specifically specified to be furnished with certain mechanical equipment.

1.03 WORK INCLUDED - This Contractor:

A. All low voltage control wiring unless specified otherwise.

B. 120 volt wiring required for mechanical equipment when not shown or specified elsewhere.

1.05 WORK INCLUDED - Electrical Contractor.

A. All power wiring.

B. Motor starters, contactors, and disconnects where noted under "PRODUCTS" below.

1.06 SHOP DRAWINGS:

A. The Contractor shall furnish to the Electrical Contractor, equipment shop drawings which will indicate power hook-up and control connections as required for mechanical equipment. "Stock" Wiring Diagrams are Not Acceptable.

PART 2 PRODUCTS

2.01 Refer to Section 23 01 05 - Paragraph 1.04 for "Energy Code" requirements (Particularly power factor correction)

2.02 Refer to Division 23 - ELECTRICAL.

2.03 All motors 1/2 HP and larger shall be three phase; all motors, 1/3 HP and smaller shall be single phase unless specified otherwise.

2.04 All single-phase motors provided by this Contractor to have built-in thermal overload protection.

2.05 All motors furnished shall have copper windings and all motors five (5) horsepower and greater shall have factory installed lifting eyebolts. All motors shall conform to ANSI and NEMA standards.

2.06 Motor starters, contactors, and disconnects are provided and installed by the Electrical Contractor, unless part of packaged equipment furnished by this Contractor, or otherwise specified.

2.07 All motors used in variable speed applications shall be high efficiency type and shall be rated for use with variable frequency drives.

PART 3 EXECUTION

3.01 All wiring, conduits, etc., shall be in strict accordance with the requirements of the latest edition of the National Electrical Code and Division 26, Electrical specification.

3.02 All wiring, including low voltage wiring, shall be run in conduit.

3.03 Low voltage wiring may be size and type recommended by the Manufacturer and/or Temperature Control Contractor.

END OF SECTION

SECTION 22 05 16

SLEEVES AND COLLARS

PART 1 GENERAL

1.01 REFERENCE

A. Section 22 05 21 - CUTTING AND PATCHING

1.02 SCOPE

A. This Contractor shall furnish and install all sleeves for his work. Coordinate carefully with the General Contractor.

B. Sleeves shall be provided through all new masonry construction. Sleeves are not required if holes are core drilled through existing walls.

PART 2 PRODUCTS

2.01 Sleeve material: Schedule 40 black steel pipe, machine cut, large enough to allow l/4" clearance all around pipe (around pipe insulation or covering).

PART 3 EXECUTION

3.01 Sleeves in partitions to have length equal to the thickness of finished partitions. Sleeves in floors of finished areas to project l/8" above finished floor. Sleeves in floors of non-finished areas to project 3" above finished floor. Fill space between pipe and sleeves into exposed areas with sealing compound. Ream all sleeves before installing.

3.02 Where pipes pass through fire rated walls or floors, the space between the pipe and sleeve shall be filled with packing to maintain fire integrity.

3.03 Sleeves to be set in forms before concrete is poured and in partitions at the time same are being built.

3.04 In exposed location, other than in Mechanical Equipment Rooms, bare pipe or insulated pipe shall be provided with chromium plated collars at floor, ceiling, and at partitions.

3.05 Cutting required of any masonry wall or floor after it is in place shall be done by core drilling.

3.06 Piping not allowed to bear on sleeves.

3.07 Sleeves shall be installed plumb and true to line, grade, and position.

3.08 Unused sleeves shall be plugged and finished to match adjacent surface.

END OF SECTION

SECTION 220517

FIRESTOPPING

PART 1 GENERAL

1.01 SCOPE

A. Each Contractor shall be responsible for firestopping around all openings for pipes, ducts, conduits, etc., installed by him at all fire walls and smoke walls. Firestopping shall be performed by an installer who has been trained by manufacturer, or manufacturer's representative, in the installation procedures based on published UL tested fire stop systems.

1.02 DEFINITIONS

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

1.03 REFERENCE

A. Division 1 – General Conditions
B. Division 3 – Concrete
C. Division 4 – Masonry
D. Division 9 – Finishes
E. Section 22 05 16 – Sleeves and Collars

1.04 GENERAL REQUIRMENTS

A. Test Requirements: ASTM E-814, "Standard Method of Fire Tests of Through Penetration Fire Stops" (July 1997).

B. Underwriters Laboratories (UL) of Northbrook, IL runs ASTM E-814 under their designation of UL 1479 and publishes the results in their "FIRE RESISTANCE DIRECTORY" that is updated annually.

1. UL Fire Resistance Directory:

a. Through-Penetration Firestop Devices (XHCR)
b. Fire Resistance Ratings (BXUV)
c. Through-Penetration Firestop Systems (XHEZ)
d. Fill, Voids, or Cavity Material (XHHW)
e. Forming Materials (XHKU)

C. International Firestop Council Guidelines for Evaluating Firestop Systems Associating Judgments

D. ASTM E-84, Standard Test Method for Surface Burning Characteristics of Building Materials.

E. The Ohio Building Code (OBC)

F. NFPA 101 - Life Safety Code

1.05 QUALITY ASSURANCE

A. A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

B. Firestop System installation must meet requirements of ASTM E-814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated.

C. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

D. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

E. For those firestop applications that exist for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by the International Firestop Council (September 7, 1994).

1.06 SUBMITTALS

A. Submit Product Data: Manufacturer’s specifications and technical data for each material including the composition and limitations, documentation of UL firestop systems to be used and manufacturer's installation instructions.

B. Manufacturer's engineering judgment identification number and drawing details when no UL system is available for an application. Engineer judgment must include both project name and contractor’s name who will install firestop system as described in drawing.

C. Submit material safety data sheets provided with product delivered to job-site.

1.07 INSTALLER QUALIFICATIONS

A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to

install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.09 PROJECT CONDITIONS

A. Do not use materials that contain flammable solvents.

B. Scheduling

1. Schedule installation of CAST IN PLACE firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.

2. Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 PRODUCTS

2.01 FIRESTOPPING, GENERAL

A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping

under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

B. Provide components for each firestopping system that is needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

2.02 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:

1. Hilti, Inc., Tulsa, Oklahoma, (800)879-8000
2. Tremco Sealants & Coatings, Beachwood, Ohio, (216) 292-5000
3. 3M Fire Protection Products, St. Paul, Minnesota, (612) 736-0203

2.03 MATERIALS

A. Use only firestop products that have been UL 1479, ASTM E-814 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Cast-in place firestop devices are installed prior to concrete placement for use with non-combustible and combustible plastic pipe (closed and open piping systems) penetrating concrete floors, the following products are acceptable:

1. Hilti CP 680 Cast-In Place Firestop Device
2. Fox Coupling, Inc. "Cast-In-Place Firestop Coupling".
3. Proset Cast-In-Place Device

C. Sealant or caulking materials for use with non-combustible items including steel pipe & copper pipe, the following products are acceptable:

1. Hilti FS-ONE Intumescent Firestop Sealant
2. 3M Fire Barrier CP25 or Firestop Sealant 2000
3. Tremco Fyre Shield

D. Sealant or caulking materials for use with sheet metal ducts, the following products are acceptable:

1. Hilti CP 601S Elastomeric Firestop Sealant or CP 606 Flexible Firestop Sealant
2. Tremco Fyre-Shield High Performance Ceramic Firestop Sealant
3. 3M Fire Barrier CP25WB+ or 2000 Silicone Sealant

E. Intumescent sealant or caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe and plastic pipe, the following products are acceptable:

1. Hilti FS-ONE Intumescent Firestop Sealant
2. 3M Fire Barrier CP25WB+
3. Tremco Intumescent Acrylic or TremStop WBM

F. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:

1. Hilti CP 642 and CP643 Firestop Collar, CP645 Wrap Strip
2. Tremco TREMstop D Combustible Pipe Intumescent Device System and TremStop WS Wrap Strip
3. 3M Ultra Plastic Pipe Device and Fire Barrier FS-195+ Wrap Strip

G. Materials used for large size/complex penetrations made to accommodate multiple steel and copper pipes, the following products are acceptable:

1. Hilti FS 635 Trowelable Firestop Compound and FS 657 FIRE BLOCK
2. Tremco TremStop M Fire Rated Mortar and PS Pillows
3. 3M Fire Barrier CS-195+ Composite Sheet

H. Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate multiple steel and copper pipes, the following products are acceptable:

1. Hilti FS 657 FIRE BLOCK
2. Tremco PS Firestop Pillows
3. 3M CS Intumescent Sheet

I. Provide a firestop system with an "F" Rating as determined by UL 1479 or ASTM E814. The F rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated.

PART 3 EXECUTION

3.01 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify penetrations are properly sized and in suitable condition for application of materials.

2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

5. Do not proceed until unsatisfactory conditions have been corrected.

3.02 COORDINATION

A. Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement of concrete.

B. Responsible trade to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

3.03 INSTALLATION

A. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration joint materials.

1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

2. Consult with the Owner’ Representative and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.

3. Protect materials from damage on surfaces subjected to traffic.

3.04 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas. All penetrations are to be labeled in accordance with the Architect’s standard labeling system. The HVAC Contractor shall coordinate all fire stopping requirements with the Architect/Construction Manager prior to start of work.

B. Keep areas of work accessible until inspection and approval have been completed.

C. All fire stopping shall be inspected and approved by a licensed independent Consultant. All unapproved fire stopping products installed by this contractor will be removed and replaced at his expense.

D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

3.05 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

END OF SECTION

SECTION 22 05 19

PIPING SPECIALTIES

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install all necessary piping specialties to include thermometers, gauges, pipe strainers, etc., for piping systems included under this Contract.

PART 2 PRODUCTS

2.01 Thermometers - Trerice "Industrial Type" blue reading thermometer with blue organic fluid in a 9" cast aluminum case, front double- strength clear glass window, straight or angle pattern as required. Provide brass separable socket. Ashcroft, Marsh, Weiss or Palmer of the same type may be furnished at the Contractor's option. Ranges as shown on the Drawings.

2.02 Pressure Gauges - Weiss 4PGA-l, standard single spring, aluminum case, 4-1/2" diameter with gauge cock and pigtail. Range as indicated on the drawings. Trerice, Marsh or Ashcroft of the same type may be furnished at the Contractor's option. Face to be glass, clear plastic fases are not acceptable.

2.03 Pete's Plug -

A. 1/4" MPT fitting to receive either a temperature or pressure probe, 1/8" O.D. fitting and caps shall be brass with valve core of Nordel, rated at 1000 psig.

B. Provide XL (extra long) type Pete's plug in insulated lines.

C. Sisco plugs may be furnished at the Contractor's option.

2.04 Strainers

A. All water lines - Sarco style IF-125 (flanged) or IT (threaded) 125 psig, Y-pattern, cast iron body with perforated brass screen for water. Threaded for 2-1/2" and smaller, flanged for 3" and larger.

B. Dunham-Bush, Armstrong, Trane, McAlear, Mueller, Metraflex, Wheatley or V. D. Anderson strainers may be furnished at the Contractor's option.

2.05 Flexible Vibration Joints

A. Expansion and vibration joint connections shall be Metraflex Metrasphere, Mason Industries sphere type, Minnesota Flexible Corporation, Mercer, Phoenix,

General Rubber Maxi-Joint Style 1015 or Wheatley single sphere of pipe sizes as shown on the Drawings, to be wire reinforced for pump suction and discharge mounting and designed for minimum of 200 psig working pressure and 220°F operating temperature.

B. Body to be neoprene and nylon with steel flanges.
C. Each joint to be furnished with tie rods.

2.06 Backflow preventor by the Plumbing Contractor in accordance with specification 22 11 00 - DOMESTIC WATER PIPING SYSTEM, and in accordance with the Division of Water specifications, including approved manufacturers and installation styles. Capacities as indicated on plans. Confirm installation requirements including dimensions, clearances, orientation, etc.

PART 3 EXECUTION

3.01 All specialties to be installed in accordance with manufacturer's recommendations.

3.02 Flexible vibration joints to be installed within tolerances specified by manufacturer.

3.03 Vent connection to backflow preventer shall be made by means of a fixed air gap. No direct connection will be permitted. Extend line to nearest floor drain.

END OF SECTION

SECTION 22 05 20

PAINTING

PART 1 GENERAL

1.01 REFERENCE

A. Division 9 - FINISHES
B. Section 22 05 53 - TAGGING AND CODING

1.02 SCOPE

A. All steel supports shall be painted by this contractor per Division 9 requirements.

B. Piping in exposed finished areas shall be painted by this contractor per Division 9 requirments. Mechanical room and shell space piping does not require paint.

C. Factory finished equipment which has rusted or been damaged shall be cleaned at the completion of the project and rust spots and marred areas shall be refinished and restored to the original factory finish.

D. Paint all fire protection piping in stairways.

PART 2 PRODUCTS

2.01 Paint shall meet requirements of Division 9 - Finishes

PART 3 EXECUTION

Not Applicable

END OF SECTION

SECTION 22 05 21

CUTTING AND PATCHING

PART 1 GENERAL

Not Applicable

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 Cutting for openings, when necessary, shall be done by this Contractor with such tools and methods as to prevent unnecessary damage to surrounding areas or equipment.

3.02 The corners of all openings in poured concrete shall be core drilled to minimize overcutting.

3.03 Fill space in all areas where core drilled with packing where required to maintain fire rating. Openings shall be temporarily fire-stopped until permanent fire stopping is done.

3.04 All holes cut for the installation of piping, and equipment shall be neatly patched and refinished with the same materials as, and to match, adjacent surfaces, and damages thereto shall be repaired in kind and to match existing conditions by this Contractor.

3.05 Patching shall match adjacent/surrounding surfaces in kind and finish.

3.06 No structural member will be cut into without the expressed permission of the Architect and Structural Engineer.

END OF SECTION

SECTION 22 05 22

FOUNDATIONS AND SUPPORTS

PART 1 GENERAL

1.01 SCOPE

A. All concrete foundations and bases for plumbing equipment will be by the Plumbing contractor.

B. This Contractor shall furnish welded steel frames and supports for all equipment requiring same. Furnish auxiliary steel as required for supporting pipes.

D. The Plumbing Contractor shall provide concrete foundations for all exterior Plumbing pipe supports.

PART 2 PRODUCTS

2.01 All steel for frames and supports shall be standard weight black steel pipe or standard structural steel shapes.

2.02 All exterior frames and supports shall be galvanized.

2.03 Concrete for pads shall be a minimum of 6 bag mix per cubic yard with maximum slump of 4" and shall be air entrained 5 to 7% by volume.

PART 3 EXECUTION

3.01 Grind all sharp corners and projections on supporting steel after fabrication. All steel shall have one (1) coat of metal primer after fabrication. All steel supports exposed to the weather shall be finished with a heavy coat of bitumastic.

END OF SECTION

SECTION 22 05 23

VALVES

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install all necessary valves for piping systems and equipment in the building required to provide proper shut off and balancing of systems included under this Contract.

PART 2 PRODUCTS

2.01 Check valves shall be Crane, Fairbanks, Watts, Jenkins, Nibco, Powell and shall all be by the same manufacturer.

2.02 Ball valves shall be as manufactured by Grinnell, Apollo, Watts. All ball valves to be by the same manufacturer.

2.03 Butterfly valves shall be as manufactured by Keystone, Center Line, Worcester, Watts, Grinnell, Jamesbury. All butterfly valves to be by the same manufacturer.

2.04 Valves in Water Lines:

A. Butterfly Valves

1. 2-1/2" and larger size shall be cast or ductile iron valve. Furnish with lug pattern body, aluminum bronze disc, stainless steel stem, EPDM seat, extended neck for full 2" insulation, and positive shut off at 175 psig W.O.G. (2 ½"-12") and 150 psi W.O.G. (14"-20"). Equal to Keystone Fig. AR-2. Butterfly valves not permitted for size 2" and smaller.

2. 5" and smaller shall have minimum 10 position lever actuators, with positive latching and position indicator. Valves 6" and larger shall have worm gear actuator. Valves shown with chain on Drawings to be chain operated.

3. Valves used on outlets of devices for balance purposes shall have an adjustable memory stop (position lock). A notched operator by itself is not considered a memory stop.

B. Ball Valves

1. 2" size and smaller may be two-piece bronze body full port ball valve, screwed piping connections, union connection body, teflon seats, full

port, blowout proof stem, adjustable packing gland, chrome plated bronze ball, and lever handle labeled for service controlled. Rated for 150 S.W.P. and 400 WOG. Equal to Apollo 70-300 Series.

C. Drain valves shall be ball valves as specified above with hose end connection and cap.

D. Check Valves

1. 3" and larger - iron body, bronze mounted, horizontal swing check with bronze disc, flanged, 125 lb. S.W.P.

2. 2-1/2" and smaller - all bronze, horizontal swing check with bronze or TFE disc, screwed, 125 lb. S.W.P.

3. Non-slam check valves at pumps only - 2-1/2" and larger shall be flanged, cast iron or semi-steel body, bronze trim, center guided lift check with bronze disc and stainless steel spring, 125 lb. S.W.P. 2" and smaller shall be screwed, bronze, cast iron or semi-steel body, bronze trim, center guided lift check with bronze or TFE disc and stainless steel or alloy spring, 125 lb. S.W.P.

4. Clow, McAlear, Mueller or Metraflex non-slam check valves are acceptable manufacturers as well as previously listed manufacturers.

PART 3 EXECUTION

3.01 This Contractor shall install all valves in strict accordance to the manufacturer's recommendations.

3.02 Where drain lines are not piped to floor drains, furnish hose end adapters. Provide caps for all hose end adapters.

3.03 Ball valves and butterfly valves designated with an “M” shall be furnished with memory stops.

END OF SECTION

SECTION 22 05 29

INSERTS, PIPE HANGERS AND SUPPORTS

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install all necessary inserts, beam clamps and auxiliary steel for pipe hangers in the building.

B. Furnish and install necessary pipe hangers and supports to properly support all piping and to maintain uniform elevation.

PART 2 PRODUCTS

2.01 HANGERS

A. Hangers for copper lines, 2" and smaller, shall be similar to Grinnell Fig. CT-99, adjustable carbon steel pipe ring, with 3/8" hanger rods. All copper plated.

B. Hangers for copper lines 2-1/2" to 4" shall be similar to Grinnell Fig. CT-65, adjustable carbon steel clevis, with proper size rods, all copper plated. Unplated clevis may be used if full round lead sleeves 2" wider than the clevis are secured to the pipe at each hanger.

C. When copper lines are insulated and hangers are sized for outside of insulation, provide steel hangers as described below.

D. Hangers for steel lines 2" and smaller shall be similar to Grinnell Fig. 97, adjustable pipe ring, galvanized steel band with 3/8" hanger rods.

E. Hangers for steel lines 2-1/2" and larger shall be similar to Grinnell Fig. 260, adjustable carbon steel clevis, heavy duty, with proper size rods.

2.02 B-Line, F & S, Elcen, Penn, Fee-Mason, PHD Manufacturing or Modern Pipe Hangers of the same type may be furnished at the Contractor's option.

PART 3 EXECUTION

3.01 Riser clamps shall be used at each floor where required.

3.02 Wall bracket pipe supports shall be installed where required.

3.03 All copper piping is to be shielded from steel pipes or electrical conduit with sheet lead or electrical tape wherever pipes would touch each other.

3.04 Galvanized hangers and strap hangers will not be permitted for supporting copper lines except for hangers sized for outside of insulation.

3.05 Provide pipe anchors and guides where and as indicated on the Drawings and elsewhere as required to properly control pipe. Method to suit job conditions.

3.06 Support piping at pumps and equipment from floor, ceiling, or walls, so that piping weight is not supported directly from pumps or equipment.

3.07 All beam clamps and supports for piping and ductwork shall be in place prior to the fireproofing of the structural steel.

3.08 Piping to be supported according to the following schedule. Support at intervals not to exceed spacing listed or elsewhere as required in accordance with good workmanship. No pipe shall be supported from another pipe. All hangers shall be plumbed before insulation is applied and all hangers shall be double nutted.

SPACING					
(1) Steel Pipe			(2) Copper Pipe		
Pipe Size	Rod	Spacing	Pipe Size	Rod	Spacing
Thru 1"	3/8"	7'-0"	Thru 3/4"	3/8”	6'-0"
1-1/4"	3/8"	9'-0"	1"	3/8”	6'-0"
1-1/2"	3/8"	9'-0"	1-1/4"	3/8”	6'-0"
2”	3/8"	10'-0"	2"	3/8”	10'0"
2-1/2”	1/2"	11’-0”	2-1/2”	1/2”	10’-0”
3”	1/2"	12’-0”	3”	1/2”	10’-0”
4”	5/8"	12’-0”	4”	5/8”	10’-0”
6”	3/4"	12’-0”	6”	3/4"	10’-0”

3.09 Support plastic pipe at intervals not to exceed 4 feet, 6 feet on 4 inch and larger.

3.10 Support piping at pumps and equipment from floor, ceiling, or walls, so that piping weight is not supported directly from pumps or equipment.

END OF SECTION

SECTION 22 05 30

INSTALLATION OF PIPING

PART 1 GENERAL

1.01 REFERENCE

A. Section 22 05 19 - PIPING SPECIALTIES
B. Section 22 05 23 - VALVES
C. Section 22 05 29 - INSERTS, PIPE HANGERS AND SUPPORTS
D. Section 22 05 93 - TESTS AND ADJUSTMENTS

1.02 SCOPE

A. The requirements of this Section shall apply to all interior piping systems installed under this Contract, except where otherwise noted on the Drawings or elsewhere in the Specifications.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 All piping systems shall be installed with adequate provisions made for expansion and contraction to prevent stresses on piping, valves and equipment. Anchor and guide piping at all points indicated and/or as required. Type and method of anchoring, guiding and attachments to sustaining members to suit job requirements and conditions and shall be approved by the Architect.

3.02 Provide unions or flanges at each final connection, and at each piece of equipment. Branches from mains to equipment stubs, risers, etc., to have swing joints with at least one change of direction in the horizontal plane, and one change of direction in the vertical plane, before connecting to equipment or fixtures. Piping shall be arranged and unions and flanges located to permit easy removal of parts and equipment for inspection and cleaning without disconnecting any part except unions or flanges. No welded connections shall be made to valves or equipment. Use bronze unions in copper lines. Unions to be downstream of valves.

3.03 Flange bolts shall be cut to proper length so that one thread projects beyond the nut when nut and bolt are tightened.

3.04 Make proper connections to all items of equipment in the Contract as recommended by the Manufacturer or as detailed on the Drawings.

3.05 All piping shall be arranged in accordance with the best standards of the trade with vertical pipes plumb and horizontal runs parallel or perpendicular to the building wall.

3.06 Provide valves and specialties where indicated on the Drawings.

3.07 Provide 3/4" drain valves in piping at low points to provide complete drainage of all systems and as shown on the Drawings.

3.08 Ream ends of pipe and clean before installing.

3.09 All joints in copper piping shall be made with 95-5 solder. Solders and fluxes containing lead are prohibited.

3.10 Use pipe dope on male threads of screwed pipe only. Teflon pipe joint tape may be used, at the Contractor's option.

3.11 Valves to be installed with handwheel at or above center of pipe. Valves outdoors exposed to weather shall be installed with handwheel in the horizontal.

3.12 Make all changes of direction with fittings, rather than bending.

3.13 All valves and unions to be installed so as to be accessible through ceiling, access panels, etc.

3.14 Provide dielectric unions or insulating flanges between dissimilar metals, i.e., copper to steel.

3.15 Bull head connections in any piping service are expressly prohibited.

3.16 At the end of each day's work and otherwise as required or directed, provide caps and/or plugs at all openings in piping for protection. Particular attention must be given to avoid the possibility of any foreign materials entering the pipes, whether it be inadvertent or with malicious intent.

3.17 Flanged joints shall be faced true and square. Flanges shall be same face style as mating surface to which it is connected.

3.18 Install thermometers and gauges so they may be read from floor level.

3.19 Install Pete's Plugs as close as possible to control valves, coils, etc., as shown on the Drawings, and arranged so that a probe may be inserted into the plug.

3.20 Where piping is installed in accessible chases, keep all piping to sides of chase, except portions which must necessarily be in center of chase. Offset vents to side immediately above connection to waste line. All lateral runs are to be located at the floor or minimum 6'-0" above floor, and all vertical piping held close to the wall through that height leaving maximum service space.

3.21 Where pipe drops occur in block walls, pipes to enter and leave walls at block joints. Coordinate with General Contractor.

3.22 Install galvanized sheet metal troughs with drains under pipes crossing electrical equipment. Seal to make water tight.

3.23 Do not run water piping through electrical rooms.

3.24 Properly support all relief valve discharge piping and provide no more than one 90° ell.

END OF SECTION

SECTION 22 05 53

TAGGING AND CODING

PART 1 GENERAL

1.01 SCOPE

A. Provide brass tags on all valves. Tags shall state type of line in which the valve is installed (hot water supply, steam, etc.), building, floor and number of valve (example: HWHS-JH-02-253). Furnish a schedule or schedules of all valves tagged with number, location and purpose of each valve and mount schedules under glass in a frame on Equipment Room wall, or elsewhere as required. Schedules shall be located near and convenient to the valves on the schedule.

B. After exposed piping and insulation is painted, this Contractor shall apply 2" wide color bands on each side of a stenciled legend, lettered with the name of contents of piping. Flow direction arrows of the same colors are to be located adjacent to the Identification Legends. Spacing not over 20 ft. apart and at least once in each room. Piping to be labeled on both sides of the wall where it passes through the wall. Do not use adhesive markers. Labelling and colors shall be as follows:

Contents	Color	Designation
Drain	Green	D
Sanitary	Green	SAN
Storm	Green	STM
Domestic Cold Water	Light Blue	DCWS
Domestic 140^{o} Hot Water	Dark Blue	D140HWS
Domestic 140^{o} Hot Water	Dark Blue	D140HWR
Domestic Hot Water	Dark Blue	DHWS
Domestic Hot Water Return	Dark Blue	DHWR
Natural Gas	Yellow	Gas

PART 2 PRODUCTS

2.01 Valve tags shall be brass minimum 16 gauge.

PART 3 EXECUTION

Not Applicable

END OF SECTION

SECTION 22 05 54

EQUIPMENT IDENTIFICATION

PART 1 GENERAL

1.01 SCOPE

A. This Contractor shall label all disconnects, equipment control panels, motor starters, switches and equipment furnished under this Contract.

PART 2 PRODUCTS

2.01 Labels shall be 1/16" thick laminated plastic nameplates or 0.020" thick aluminum nameplates. Background shall be black with 3/16" letters engraved on the face. Letters shall be white. Labels shall include the areas served by equipment, horsepower, and flows.

PART 3 EXECUTION

3.01 Secure plates with screws. Do not attach to covers where covers can be easily mixed up.

END OF SECTION

SECTION 22 05 93

TESTS AND ADJUSTMENTS

PART 1 GENERAL

1.01 SCOPE

A. After work has been completed but before pipe covering has been applied, the Contractor shall test and adjust the systems he has installed.

B. The Architect shall be notified of all scheduled tests and adjustments at least 48 hours before they are scheduled o that he may witness same. If the Contractor performs any test or adjustment without the Architect present or without properly notifying the Architect the Contractor will be required to perform the test or adjustment a second time in the presence of the Architect.

C. If the Architect determines that any work requires special inspection, testing, or approval, he will, upon written authorization from the Owner, instruct the Contractor to order such special inspection, testing or approval. The Contractor shall give timely notice so the Architect may observe the inspections, tests or approvals. If such special inspection or testing reveals a failure of the work to comply with the requirements of the Contract Documents, the Contractor shall bear all costs thereof, including compensation for the Architect's additional services made necessary by such failure; otherwise the Owner shall bear such costs, and an appropriate Change Order shall be issued.

D. Concealed lines shall be tested before being concealed. If this is not done and a leak appears during the final test, this Contractor shall repair leak and all damage resulting therefrom.

E. This Contractor shall adjust all his equipment in the plumbing system to obtain proper operation and shall demonstrate to the Owner and Architect that the entire system will function properly.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 TESTS

A. After work has been completed but before pipe covering has been applied, the Contractor shall test the systems as follows. At these pressures, the circulation shall be free and the piping free of leaks.

System	Test Medium	Pressure Not Less than	Time Not Less Than	Notes
Water lines	water	125 lbs	6 hours	No drop
Drainage systems	In accordance with applicable plumbing codes			
Gas Piping	In accordance with applicable plumbing codes			

3.02 Purge gas system to outdoors. Purge and test to be witnessed by Gas Company and Architect.

3.03 The Contractor, before starting any pumping unit with pump and driver mounted on a common base plate with a flexible couplings, shall check the unit for proper alignment.

3.04 Before turning job over to Owner, inspect all valves and repack valves as necessary.

3.05 This Contractor shall adjust all equipment in the mechanical system to obtain proper operation and shall demonstrate to the Owner and Engineer that the entire system will function properly.

END OF SECTION

SECTION 22 05 94

PROTECTION AND CLEANING

PART 1 GENERAL

Not Applicable

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 Protect all plumbing equipment against damage from any cause whatsoever and pay the cost of replacing and repairing equipment made necessary by failure to provide suitable protection.

3.02 After all piping and equipment has been approved and after all plastering has been completed, bare piping and insulation provided under this Contract shall be thoroughly cleaned of dirt, grease, rust and oil.

3.03 Repair all dents and scratches in factory prime or finish coats on all plumbing equipment to the satisfaction of Associate. If damage is excessive, replacement may be required.

3.04 Flush out all piping systems to remove all dirt and grease from pipes and equipment before systems are placed in operation.

3.05 Cover all pumps, open pipes, etc., to keep out dirt, water and weather during construction.

3.06 This Contractor shall clean up and remove all debris from the site and shall at all times keep the premises in a neat and orderly condition.

END OF SECTION

SECTION 22 05 95

FLUSHING AND STERILIZATION

PART 1 GENERAL

1.01 SCOPE

A. Flush out all domestic water piping systems to remove all dirt and grease from pipes and equipment before systems are placed into operation. Clean strainers after each flushing until the strainer remains clean.

B. After domestic water lines are all installed, sterilize lines, including outside services as prescribed by AWWA-C-651. Sterilization shall be done under the immediate on the job supervision of a water testing laboratory regularly engaged in the service and shall be done per their instructions. All fees for testing and test equipment shall be paid by this Contractor.

C. Furnish a Certificate of Approval For Human Consumption signed by the Administrative Authority. Certification shall be furnished to the Architect before payment will be made.

PART 2 PRODUCTS

2.01 Sterilization: Chlorinating material either liquid chlorine meeting AWWA Standard C-601-81.

PART 3 EXECUTION

3.01 With all outlets closed, fill system to working pressure and close valve at supply main.

3.02 A cleaning solution containing not less than 150 parts per million of chlorine shall be introduced into the system.

3.03 Each outlet, hot and/or cold, shall be tested during fill to prove the presence of chlorine at that outlet and valves and faucets shall be opened and closed several times during the disinfecting time period.

3.04 Water piping systems shall remain filled for a period of 24 hours and each outlet shall be again tested and shall produce not less than 100 parts per million of chlorine at the end of the retention period.

3.05 All outlets shall be opened wide and the main supply valves opened, flushing system with water until chlorine content is not greater than 0.2 parts per million or until approved by the Health Department. Flush drain valves.

3.06 After final flushing all aerators on plumbing brass shall be removed, cleaned and reinstalled.

3.07 Sterilization test may be performed at the same time the pressure test is placed on the system.

END OF SECTION

SECTION 22 05 97

REMODELING

PART 1 GENERAL

1.01 REFERENCE

A. Division 1 - GENERAL REQUIREMENTS
B. Section 22 05 98 - DEMOLITION

1.02 SCOPE

A. This Contractor shall include the remodeling of and additions to all mechanical work in the areas indicated on the Architectural and Mechanical Drawings and in all areas shown on the Drawings. All necessary or required remodeling or additions to the present mechanical work shall be included in this Contract, as indicated or required, to the end that the work will result in the finished remodeled spaces shown on the Architectural Drawings.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 In all of the remodeling work the mechanical work shall follow the intent of the Mechanical Specification insofar as possible with regard to material and workmanship.

3.02 Where old walls and furrings are removed, exposed piping that will remain in use shall be offset to the nearest available new wall or concealed space and reconnected as necessary or required, using all new material. Note that this shall include piping of every description at both known and unknown locations.

3.03 All piping installed in the remodeling work shall be installed as concealed work. This Contractor shall do all cutting required.

3.04 Existing plumbing fixtures that are to remain but which interfere with the remodeling work of any Contractor shall be removed and replaced later when directed.

End of Section

SECTION 22 05 98

DEMOLITION

PART 1 GENERAL

1.01 REFERENCE

A. Section 22 05 97 - REMODELING

1.02 SCOPE

A. The General Contractor shall be responsible for all plumbing demolition in all areas that will be renovated as part of this project. Refer to the demolition Drawings and demolition notes. The plumbing contractor shall be responsible for equipment disconnects and coordination with the general contractor to identify the equipment, piping, etc that is to be removed.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

End of Section

SECTION 22 07 00

PLUMBING INSULATION

PART 1 GENERAL

1.01 REFERENCE

A. Section 22 05 16 - SLEEVES AND COLLARS
B. Section 22 05 29 – INSERTS, PIPE HANGERS AND SUPPORTS
C. Section 22 00 00 – PLUMBING GENERAL
D. Section 22 13 16 - FACILITY SANITARY WASTE AND VENT PIPING SYSTEM
E. Section 22 11 13 – FACILITY DOMESTIC WATER DISTRIBUTION PIPING

1.02 SCOPE

A. Provide listed insulation cover for all items/elements as specified herein, as shown on plans; and for any other items/elements requiring same.

B. Insulate piping and associated accessories and appurtenances included in the following systems:

1. Domestic cold water.
2. Domestic hot water.

C. Existing piping insulation removed or damaged by new work shall be replaced in accordance with these specifications for new piping of the same system type.

D. Insulate all sanitary waste lines and supply lines under ADA lavatories. Use Pre-Manufactured Insulation covers. Pre-manufactured Insulation covers as manufactured by Handi-Wrap, Pro-Wrap, and Truebro.

PART 2 PRODUCTS

2.01 All insulating materials, including jackets, cements, adhesives, vapor barriers, etc., shall be U.L. listed, with a flame spread rating not to exceed 25, and a smoke development rating not to exceed 50. All exterior finishes shall have a minimum service temperature limit (FSTM 70) of minus 50 to 220 degrees F.

2.02 Molded plastic fitting covers shall be U.L. listed, with a flame spread rating not to exceed 25, and a smoke development rating not to exceed 50.

2.03 Insulation thicknesses are based on insulation having thermal resistance in the range of 4.0 HR F ft^2/Btu to 4.6 HR F ft^2/Btu per inch of thickness on a flat surface at a mean temperature of 75°F. Minimum insulation thickness shall be increased for materials

having R values less than 4.0 or may be reduced for materials having R values greater than 4.6 to give equivalent "R" values.

2.04 Pipe cover shall be similar to Johns Manville "Micro-Lok" glass fiber insulation, rated for 850 degrees F., with a factory applied AP-T all-purpose self-sealing vapor barrier jacket. Butt strips shall be minimum 3" wide, and of same material as jacket. Equal materials, including thickness and conductivity ratings/listings, as manufactured by Owens Corning, Knauf or Manson may be furnished, at the contractor's option. Where insulation thickness is indicated for cover herein, it is nominal MINIMUM required thickness.

2.05 All cements, adhesives, finishes, and associated materials shall be similar to that provided by Foster. Equal materials as provided by Childers or Vimasco may be furnished at the contractor's option.

PART 3 EXECUTION

3.01 Cover cold water as follows:

A. Cover with minimum 1" thickness glass fiber pipe insulation.

B. Butt all edges of insulation and seal all longitudinal laps and butt strips with white vapor barrier cement, similar to Foster no. 85-20; or furnish with manufacturer's integral self-sealing laps.

C. Fittings and mechanical couplings shall be wrapped with compressed fiber glass to same thickness and density as adjacent pipe covering, and covered with a listed molded plastic fitting.

D. All appurtenances and accessories such as valves, flanges, unions, etc. installed in referenced piping (with the exception of backflow prevention assemblies listed at the end of this paragraph) shall be wrapped with full thickness insulation and covered with a listed molded plastic fitting cover; or an open mesh glass cloth shall be applied over wet mastic, and covered with a second coat of fire resistant mastic. Backflow prevention assemblies which require periodic inspection/testing/maintenance shall not be provided with insulation cover, unless these assemblies are in water sensitive locations, such as above lay-in ceilings. If listed backflow prevention assemblies are in water sensitive locations, furnish cover complying with this specification that allows removal and replacement as necessary for required access.

3.02 Cover hot water as follows:

A. Cover with minimum 1" thickness glass fiber pipe insulation.

B. Butt all edges of insulation and seal all longitudinal laps and butt strips with white vapor barrier cement, similar to Foster no. 85-20; or furnish with manufacturer's integral self-sealing laps.

C. Fittings and mechanical couplings shall be wrapped with compressed fiber glass to same thickness and density as adjacent pipe covering, and covered with a listed molded plastic fitting.

D. All appurtenances and accessories such as hangers, valves, flanges, unions, etc. installed in referenced piping shall not be covered. Cover shall be interrupted to allow direct hanger support of referenced piping. All insulation cover termination points shall be stopped with an even flat surface perpendicular to piping, sealed with Foster "Tight-Fit" coating.

3.03 All applications shall be made on clean, dry surfaces with all joints butted firmly together.

3.04 Insulation must run continuous through hangers, sleeves and walls for all cold water piping.

3.05 On all piping 1 ¼" diameter and larger with insulation cover specified to run continuous through hanger assemblies, provide a listed/approved sheet metal protective insulation shield at each hanger.

3.06 Insulation shall not be applied until general construction has progressed sufficiently to minimize potential for physical or moisture damage to the cover assembly. All damaged cover shall be replaced at the contractor's expense.

3.07 Install protective sleeve on all insulated, exposed pipes penetrating floor structure.

3.08 Hanger rods must be perpendicular before insulation is installed.

3.09 Longitudinal lap joints and butt strips for glass fiber piping insulation shall be secured with staples on three (3) inch centers, and sealed with an approved vapor barrier adhesive where applicable. Staples are not required when insulation utilizes a "double" adhesive self-sealing system.

END OF SECTION

SECTION 22 11 16

DOMESTIC WATER PIPING SYSTEMS

PART 1 GENERAL

1.01 SCOPE

A. Provide a complete domestic water supply & return piping system as shown on plans and as necessary to serve all items/elements requiring same.

B. The domestic water piping system shall include, but not be limited to the following:

1. Cold water supply
2. Hot water supply
3. Hot water return
4. Tempered water supply (full temperature range)
5. Trap primer supply
6. Domestic water make-up supply to elements provided under separate contract, such as HVAC equipment/systems, ponds/pools, irrigation systems, etc.
7. Softened/treated water supply

C. All elements specified herein and/or indicated on plans with components/parts in contact with the potable water medium shall be listed for such service, in accordance with referenced code requirements.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

A. Above ground piping up to and including 6” size:

1. Type L hard drawn copper tube with wrot copper fittings and socket solder joints and connections. 3” & larger size joints & fittings to be brazed. Tee drill mechanical saddle connections may be used for branch take-offs, provided they are listed/approved extruded type, in compliance with the requirements of all review, inspection and approval authorities, confirmed by the Plumbing Contractor in advance. Completed installation to be rated for 125 psig working pressure.

2. Type L hard drawn copper tube with roll grooved gasketed mechanical couplings similar to Victaulic style 607, rated for 300 psig working pressure.

3. Plenum rated schedule 80 CPVC pipe with socket solvent weld pressure fittings. Completed installation to be rated for 125 psig working pressure at maximum 140 degrees F water temperature. For concealed installation only.

4. Crosslinked polyethylene PEX-a tubing as manufactured by Uponor or equal conforming to ASTM F876 and ASTM F877, and tested for compliance by a recognized independent thrid party agency. Fittings to be PEX-a cold espansion type manufactured from material listed in ASTM F1960; assembly to consist of an insert and ring similar to Uponor ProPex. Pipe and fittings to be NSF listed.

    a. PEX manifolds shall be a Type L copper body with brass ProPex outlet connections. Body to be of an engineered plastic design with ProPex outlet connections. All manifolds to be provided with inlet connections conforming to supply sizes shown on drawings. Exact quantity of cold and hot water outlet ports to be coordinated in-field in advance of work by this Contractor. NSF listed.

    b. Provide manufacturer recommended bend supports and fittings for all tubing installed in accordance with Manufacturer recommendations.

    c. Where PEX manifolds are installed above hard type ceilings access panels shall be provided by the General Contractor. This contractor shall coordinate location of PEX manifold above hard ceiling with General Contractor and access panel provided. All shut-off valves shall be readily accessible from above the access panel location.

    d. Individual shock absorbers at all fixtures, equipment, and/or devices served by PEX-a tubing shall NOT be required.

    e. All manifolds and outlet ports shall be labeled by the specific room and fixture served.

    f. Hangers and supports for all PEX-a tubing shall be spaced at 1/2 the Manufacturer recommended spacing to provide greater support and restrict sagging/settling of piping after installation.

    g. Completed installation to be rated for 125 psig working pressure at maximum 140 degrees F water temperature.

5. Piping larger than 4” size may be schedule 40 galvanized steel pipe and fittings with class 125 flange and gasket connections. Completed installation to be rated for 175 psig working pressure.

6. Where the shut-off discharge pressure from a booster pump plus the incoming water supply suction pressure exceeds 125 psig, one of the following piping types shall be used:

a. Schedule 40 ASTM A53 steel with class 250 fittings, rated for 300 psig working pressure. All elements to be provided with manufacturer applied galvanized finish.

b. Type K hard drawn copper tube with roll grooved gasketed mechanical couplings similar to Victaulic style 607, rated for 300 psig working pressure.

c. This shall apply to piping to the inlet of pressure reducing/regulating assemblies set to maintain outlet pressure at 125 psig or less, or to a point where hydraulic calculations prove that the system pressure will not exceed 125 psig under any circumstances.

B. Below ground piping 2” diameter and smaller to be listed/approved type K soft copper tubing in a single length with no in-line couplings or joints, and a minimum number of fittings (required by branch take-offs, if any) unless indicated otherwise. Fittings (if required) to be wrot copper with socket solder brazed connections. Completed installation to be rated for 175 psig working pressure. All piping 1” diameter size and smaller below slab on grade to be installed in a schedule 40 PVC 3” diameter conduit. Install conduit from 2" above slab at entry/exit points, and use long sweep elbows for vertical rise/drop from/to below slab. Unless indicated otherwise, horizontal piping and conduit below slab to run in a straight line direct from entry to exit points. <Where copper piping is direct buried, provide listed protective wrap at floor structure penetrations.>

C. Solder, flux and all other pipe joining materials shall be certified "lead free" and listed for use with potable water service.

2.02 SHOCK ABSORBERS

A. Similar to Zurn Shocktrol series Z-1700, sized and installed as recommended by the manufacturer for specific conditions at each location.

B. Equal shock absorbers as manufactured by Zurn, Mifab, J.R. Smith, Josam, Sioux Chief or Precision Plumbing Products may be provided at the contractor's option.

2.03 HOSE BIBBS; as specified on plans, unless indicated otherwise.

A. Equal hose bibbs as manufactured by Zurn, Mifab, J.R. Smith, Josam, Wade, Watts, Woodford or Murdock may be furnished at the contractor's option.

2.04 TRAP PRIMER ASSEMBLIES; as specified on plans, unless indicated otherwise.

A. Equal trap primer assemblies as manufactured by Zurn, J.R. Smith, Josam, Precision Plumbing Products, Wade, Sloan, Mifab or Sioux Chief may be furnished at the contractor's option.

2.05 TEMPERING/MIXING VALVE ASSEMBLIES

A. Low flow capacity or individual fixture/equipment service shall be thermostatic mixer assembly similar to Leonard 210 series with inlet check/stops, bi-metal thermostat, bronze construction, screwdriver adjustable temperature setting, and ½" threaded connections rated for 125 psig working pressure.

B. High flow capacity or multiple simultaneous use fixtures/equipment service shall be thermostatic mixer assembly similar to Leonard TM series with inlet check/stops, bi-metal thermostat, bronze construction, lever adjustable temperature setting, and threaded connections rated for 125 psig working pressure.

C. Assemblies shall be furnished with adjustable position inlets and outlet, incoming temperature range of 120 to 180 degrees F., and nominal pressure differential of 10 psig unless indicated otherwise. Flow capacities, outlet temperature setting and inlet/outlet temperature differential as indicated on plan. Provide assemblies as required to operate properly with temperature differential as indicated.

D. Tempering valves as specified herein may be used for supply to emergency/safety fixtures, provided they are listed by the manufacturer for such service. Tempering valves in this application shall include a cold water bypass feature.

2.06 PRESSURE REDUCING/REGULATING VALVES

A. Low flow (0.5 to 20 gpm) capacity and/or individual fixture/equipment service shall be direct acting diaphragm type bronze construction pressure reducing valve similar to Watts model no. U5LP with integral inlet strainer, outlet pressure gauge, internal thermal expansion bypass, adjustable outlet pressure range and threaded connections rated for 175 psig working pressure. Valve to be rated for maximum 180 degrees F. temperature service. Assembly to be listed in accordance with ASSE 1003 standards.

B. Moderate flow range (1 gpm minimum/120 gpm maximum) diversified load service shall be direct acting diaphragm type bronze construction pressure reducing valve similar to Watts model no. 223 with adjustable outlet pressure range and threaded or flanged connections rated for 175 psig working pressure.

C. Broad flow range (1 gpm minimum/1800 gpm maximum) diversified load service shall be hydraulically operated pilot controlled diaphragm type iron body valve similar to Cla-Val Co. 90-48 series with bronze fittings, integral low flow by-pass, adjustable outlet pressure range and threaded or flanged connections rated for 175 psig working pressure.

D. Assemblies shall be furnished with adjustable position inlets and outlet. Flow capacities, outlet pressure setting and inlet/outlet pressure differential as

indicated on plan. Provide assemblies as required to operate properly with pressure differential as indicated.

E. Assemblies shall be listed for potable water service including certified “lead-free” construction.

F. Equal pressure reducing/regulating valve assemblies as manufactured by Watts, Cla-Val Co., Wilkins, Febco, Ames, Anderson, Watrous or Conbraco may be furnished at the contractor's option.

2.07 BACKFLOW PREVENTORS

A. Reduced pressure principle backflow preventers shall be similar to Wilkins model no. 575 RP Series with ASSE 1013 listing, test cocks, pressure differential relief valve, positive seat check valves, fixed air gap drain/vent fitting & tight-closing shut-off valves before and after the device. Furnish with threaded connections for sizes 2” and smaller, 150 class flange connections for sizes 2-1/2” and larger.

B. Dual check backflow preventor assemblies shall be similar to Watts model no. 7 with ASSE 1024 listing, union connection body, bronze construction, two (2) plastic check modules, buna "N" seals, stainless steel springs and "O" ring check module and union seals. Furnish with threaded inlet and outlet connections.

C. Pressure type in-line vacuum breaker assemblies shall be similar to Watts model no. 800M4QT anti-siphon type with ASSE 1020 listing, bronze construction, isolation valves, test cocks, check assemblies, wall/panel escutcheons and maximum 140 degrees F. temperature rating.

D. Dual check backflow preventors with intermediate atmospheric vent assemblies shall be similar to Watts model no. SD2 with ASSE 1032 listing, bronze construction, priimary and secondary check valves, stainless steel fittings and integral strainer. Furnish with threaded inlet, outlet and vent connections.

E. Double check backflow preventor assemblies shall be similar to Watts model no. 007 for sizes up to and including 2"; sizes larger than 2" to be similar to Watts no. 709. Complete assemblies are to be provided in compliance with ASSE standard 1015, including two (2) isolation/service shut-off valves (N.R.S. for domestic service; O.S.&Y. for fire protection), two (2) check valves, and test cocks. Provide with threaded connections for sizes 2 1/2" and smaller, flanged connections for sizes 3" and larger.

F. At all hose thread outlet connections to the domestic water supply system not furnished with an integral backflow prevention device, provide an vacuum breaker similar to Watts model no. NF8 permanently affixed, with ASSE 1011 ¾” hose thread connection at outlet.

G. Unless indicated otherwise, backflow prevention assemby size shall be as indicated by piping size where installed on plans.

H. All backflow prevention assemblies in finished/exposed locations to be furnished with polished chrome finish with wall/panel/ceiling piping escutcheons.

I. Backflow preventors to be rated for 125 psig working pressure.

J. Equal assemblies as manufactured by Watts, Zurn, Wilkins, Febco, Conbraco, Hersey, Ames, Clayton, Aero or Lawler may be furnished at the contractor's option.

2.08 SECONDARY WATER METER

A. Magnetic modular disc type meter with npt connections rated for 150 psig working pressure, two-piece bronze measuring chamber, integral strainer, hermetically sealed register with hinged cover, bronze construction with stainless steel trim and molded plastic measuring disc piston. Maximum temperature rating of 110 degrees F., and register with readout in U.S. gallons. Peak flow capacity at maximum 5 psig pressure drop, flow range as indicated on plans.

B. Meter assemblies as manufactured by DLJ, Badger, Elster, Hersey, Kent, Neptune, Equimeter or Sensus may be furnished at the contractor's option.

2.09 Panel/wall mounted water outlet fittings to be similar to Water Saver Faucet Co. model no. L-706, with brass construction, integral vacuum breaker, union connection body, panel/wall flange, four-arm operator handle and serrated outlet tip. Providee polished chrome finish on all exposed surfaces in finished areas (including panel/wall flange), and "CW" user identification tag. Equal fittings as manufactured by Chicago Faucet or T & S Brass may be furnished at the contractor's option.

2.10 Wall mounted utility box (for clothes washers and similar applications) to be similar to Guy Gray model no. BB-200TS with 2" drain outlet, individual 1/2" hot and cold water supplies (upfeed or downfeed, as required by installation conditions), angle body shut-off valves and fully recessed wall installation box with trim frame at wall surface. Unless indicated otherwise, install with box centerline at 48" above floor. Use fire rated model in fire rated walls.

PART 3 EXECUTION

3.01 All piping that supplies a flush valve, solenoid valve (other than slow-closing type), foot pedal operator, spring return operator or other quick closing type device shall have a shock absorber installed in accordance with the manufacturer’s recommendations. Unless indicated otherwise, where multiple fixtures or equipment in adjacent locations (such as within a chase or other enclosure) are supplied by common piping manifold, a properly sized and installed shock absorber may be used.

3.02 Run all water piping level and conceal wherever possible. Piping to be installed to allown complete drain down of system back to main riser(s) at base of system whenever possible. Provide ¾” drains at base of riser(s), and any other trapped or low points when such are unavoidable due to project conditions. ¾” Drains to consist of ball valve with outlet connection vacuum breaker as specified herein.

3.03 Install an in-line pressure type vacuum breaker as specified herein in the individual/dedicated supply piping for all valves, fittings, trim or other elements with serrated ends or other outlets capable of hose connection that do not include an integral listed/approved backflow prevention device.

3.04 Balance recirculating branch line flows as required for proper operation of systems. Provide combination balance/shut-off valves, check valve, thermometer and Pete's plugs for each branch recirculating line.-confirm if applicable.

3.05 Horizontal supply piping below slabs on grade to be installed entirely below the slab structure, including conduit sleeve when provided. Underslab piping and/or conduit shall not be embedded in or support slab structures.

3.06 Coordinate installation with structure, site conditions and work of other trades at and adjacent to domestic water service piping installation.

3.07 Maintain necessary clearance from structural support elements as required for installation of domestic water service piping outside of support/bearing zones.

3.08 Piping shall be installed according to the pipe manufacturer’s specifications & recommendations including preparation, joining methods, allowances for expansion/contraction, bedding, backfill, support & restraint.

END OF SECTION

SECTION 22 13 16

BUILDING SOIL, WASTE & VENT PIPING SYSTEM

PART 1 GENERAL

1.01 SCOPE

A. Furnish a complete system of interior soil waste drainage (includes sanitary and vent piping) from building fixtures, equipment, and any other elements requiring same.

B. Provide connection point(s) to building gravity sanitary piping system for sewage ejector(s) as required and as indicated on plans. Sewage ejector(s) included in the Plumbing Contract.

PART 2 PRODUCTS

2.01 Soil (sanitary) waste and vent piping to be as follows:

A. Standard weight cast iron DWV pipe and fittings with neoprene gasket hub and spigot or no-hub mechanical coupling joints and connections. No-hub mechanical couplings to be installed above grade only.

B. Standard weight copper DWV pipe and fittings with socket solder joints and connections. For use above grade only.

C. Schedule 40 ASTM A53 galvanized steel pipe and galvanized cast iron DWV fittings with threaded joints and connections. Optional joints and connections may be grooved pipe mechanical coupling similar to Victaullic styles 75 and 77. For use above grade only.

D. Schedule 40 type ASTM D 2665 PVC DWV pipe and fittings with socket solvent solder joints and connections. Exposed plastic piping not permitted for installation in air plenums.

E. Pumped sanitary sewage ejector piping to be schedule 40 galvanized steel pipe and galvanized cast or malleable iron fittings with threaded joints and connections; or type L copper pipe and wrot copper fittings with socket solder fittings. Piping installation to be rated for 175 psig working pressure.

F. Piping connected to or individually associated with urinal fixtures that do not have integral traps shall not be copper or steel type materials.

2.02 Plastic piping in air plenum spaces to be provided with a listed covering similar to 3M Fire Barrier Plenum Wrap 5A. Plenum wrap installation to be in compliance with the

manufacturers' recommendations & the requirements of the Building Code & inspection authorities.

PART 3 EXECUTION

3.01 All exposed piping in/at parking areas to be galvanized steel as specified; all other piping types are prohibited for use in these areas.

3.02 Furnish and install a cleanout at the base of each stack and elsewhere as required by the Plumbing Code.

3.03 For transition from above slab to underslab piping installation, connect to cast iron soil pipe above the floor line.

3.04 All cast iron soil pipe shall be bitumastic coated inside and out. All cast iron piping (including joints and connections) shall be installed in accordance with standards as set forth by The Cast Iron Soil Pipe Institute (CISPI).

3.05 At the Contractor's option, hubless cast iron soil pipe may be joined by using heavy duty "Clamp All" couplings in lieu of "No-Hub" couplings. Couplings are to be made of 24 gauge type 304 stainless steel with hi-torque clamps and neoprene gaskets. Couplings shall be installed and tested in accordance with the manufacturer's recommendations.

3.06 Tighten cast iron hubless coupling bands per manufacturer's instructions. Test the system hydrostatically per local authority's requirements.

3.07 Test Coupling: Wade #4420 No-Hub coupling and test cap – optional.

3.08 Piping shall be installed according to the pipe manufacturer's specifications & recommendations including preparation, joining methods, allowances for expansion/contraction, bedding, backfill, support & restraint. Cast iron piping 6" size & larger suspended from overhead structure with the top of pipe more than 18" below shall have listed sway bracing provided at each 6" size & larger branch connection greater than 45 degrees, and at each change of direction greater than 45 degrees. In addition all piping 6" size & larger shall have rod & clamp restraints provided for couplings at each branch connection, change of direction (horizontal & vertical) and changes in diameter greater than (2) standard pipe sizes. A tee-wye fitting and/or a wye fitting with a direct attached 1/8 bend elbow is considered a branch connection greater than 45 degrees. Provide listed expansion joint fittings in all plastic piping stack mains extending through two or more floor levels in accordance with the piping manufacturer's recommendations.

A. Roof flashings furnished and set loose in place by the Plumbing Contractor, for final weather-tight installation and integration with roofing elements by roofing installation contractor. Flashings shall be compatible with roofing elements as confirmed with the roofing contractor in advance. Coordinate with roofing contractor for proper installation.

B. Coordinate installation with structure, site conditions and work of other trades at and adjacent to soil, waste and vent service piping installation.

C. Maintain necessary clearance from structural support elements as required for installation of soil, waste and vent service piping outside of support/bearing zones.

3.09 Vents through roof to atmosphere shall comply with the following installation criteria:

A. Maintain minimum 10 feet horizontal from all air intakes, including doors and operable windows; unless the vent termination is extended 24” or more above the top of all intakes.

B. Extend vent terminals to a minimum of 12” above the roof deck.

C. Where the roof is accessible to building occupants or maintenance personnel, extend vent terminals to a minimum 7 feet above the roof deck.

D. Maintain minimum 10 feet horizontal clear from roof perimeter.

E. When possible, install vents through roof on the downstream side of building air intakes, relative to the prevailing wind direction.

END OF SECTION

SECTION 22 33 36

ELECTRIC WATER HEATERS

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install electric water heater(s), accessories and appurtenances as required to provide domestic hot water supply to all items/elements indicated on plans, and to any and all other points requiring same. The assembly shall include all components necessary for automatically maintaining constant water temperature supply.

B. Water heaters must comply with all requirements of the applicable Energy Conservation Code.

PART 2 PRODUCTS

2.01 STORAGE TANK ELECTRIC WATER HEATERS; as specified on plans.

A. Water Heater shall be listed by Underwriters' Laboratories and approved by the National Sanitation Foundation.

B. Glass lined tank shall have 150 psig working pressure and be equipped with extruded, high density magnesium anode. Enclose tank with fiber glass insulation. The outer shell jacket shall have a baked enamel finish.

C. Electric heating elements shall be simultaneous and non-simultaneous operation, switched through magnetic contactors. Elements shall be medium watt density with incoloy sheathing and stainless steel resistors. Elements shall be fused according to the National Electrical Code.

D. Control circuit shall have double pole manual reset high limit and thermostat(s) with sensing element immersed in water.

A. The heater tank shall have a minimum three (3) year limited warranty against corrosion.

B. Equal electric tank type water heaters as manufactured by A.O. Smith, Bradford White, Rheem, Ruud, or State may be furnished at the Contractor's option with owner approval.

2.02 Thermal expansion tanks shall be similar to Amtrol Inc. ST-C extrol series deep drawn model, capacities as indicated on plans. Furnish with ASME approved steel shell, rigid polypropylene liner and heavy duty rubber diaphragm. Liner and diaphragm mechanically bonded to shell to form a separate air chamber and non-corrosive water

reservoir. Air chamber is pre-charged to 55 psig, and provided with a standard air valve fitting.

2.03 All water heater storage tanks that do not include an integral listed/approved anti-siphon device in accordance with ANSI standards shall have a vacuum relief valve installed in cold water supply piping to the tank per inspection/approval authorities requirements. Relief valve to be similar to Watts model no. N36.

2.05 The water heater manufacturer shall assume single source responsibility for the complete assembly, including ensuring proper operation and performance, testing certification, warranty, owner/user instruction and start-up services. These conditions shall apply to the complete assembly, as well as all individual components.

PART 3 EXECUTION

3.01 Install water heaters, piping and accessories as recommended by manufacturer. Provide code approved drain pan and outlet.

3.02 Install ASME rated temperature-pressure relief valves as required and/or as indicated on the plans. Valve setting 210°F and 125 psig. Extend discharge pipe full size to approved drain location.

3.03 Set hot water supply water temperature as indicated on plans.

END OF SECTION

SECTION 22 34 36

GAS DOMESTIC WATER HEATERS

PART 1 GENERAL

1.01 REFERENCE

A. Section 23 01 05 - Paragraph 1.05 - OHIO ENERGY CODE

1.02 SCOPE

A. Furnish and install automatic gas fired water heater, piping and appurtenances as shown on Drawings.

B. Water heaters must comply with all requirements of the State of Ohio Code For Energy Conservation.

C. Provide concentric vent kits for water heaters, terminate as noted on drawings.

PART 2 PRODUCTS

2.01 STORAGE TANK GAS FIRED WATER HEATERS; as specified on plans.

A. Water heater shall be equipped to burn gas and design certified by the American Gas Association and be approved by the National Sanitation Foundation.

B. Glass lined tank shall be insulated with vermin-proof glass fiber insulation and the outer steel jacket shall have a baked enamel finish over a bonderized under coating.

C. Heater shall have a working pressure of 150 psig. Heater shall be provided with an automatic gas shut-off device and safety shut-off in event pilot flame is extinguished; a gas pressure regulator set for the type of gas supplied; an approved draft diverter, and extruded magnesium anode rod rigidly supported for cathodic protection.

D. Heater tank shall have a three year limited warranty against corrosion.

2.02 SEALED COMBUSTION GAS FIRED WATER HEATERS; Power Direct Vent as specified on plans.

A. Heater shall be a sealed combustion unit with a combustion air blower and appurtenances. Schedule 40 CPVC pipe shall be manufacturer approved for combustion air and vent piping. Unit shall be capable of roof or side wall venting. The manufacturer supplied sidewall vent kit shall be used when side wall venting is shown on the drawings. Unit shall be approved by the American Gas Association and meet all applicable energy codes. Boiler shall be equipped with an electric gas valve of the step-opening type, and adjustable limit control which

will break the electric circuit on the temperature rise, intermittent ignition with one second shutdown in the event of pilot flame failure, A gas pressure regulator proper set for the gas to be supplied, and a coil limit switch for shut-off in the event of excessive water temperature, a certified graft diverter and a fully illustrated instruction manual. Unit to have a full 5 year warranty. Unit to operate on 7” WC gas pressure or less.

B. Water heaters by A.O. Smith, State, Rheem, Bradford White, Ruud, PVI or Lochinvar of the same type and capacity may be furnished at the Contractor's option.

2.03 Thermal expansion tanks shall be similar to Amtrol Inc. ST-C ASME rated/approved extrol series, capacities as indicated on plans. Furnish with steel shell, rigid polypropylene liner and heavy duty rubber diaphragm. Liner and diaphragm mechanically bonded to shell to form a separate air chamber and non-corrosive water reservoir. Air chamber is pre-charged to 55 psig, and provided with a standard air valve fitting. Tanks to be ASME listed construction when heater input is 200,000 BTUH or greater and/or when total tank volume exceeds 200 gallons.

2.04 All Water Heaters that do not include an integral listed/approved anti-siphon device in accordance with ANSI standards shall have a vacuum relief valve installed in Cold Water supply piping to the heater per inspection/approval authorities requirements. Relief valve to be similar to Watts model no. N36.

2.05 Heater shall have a Glass lined tank and shall be insulated with vermin-proof glass fiber insulation and the outer steel jacket shall have a baked enamel finish over a bonderized under coating.

2.06 Heater shall have a working pressure of 150 psig. Heater shall be provided with an automatic gas shut-off device and safety shut-off in event pilot flame is extinguished; a gas pressure regulator set for the type of gas supplied; an approved draft diverter, and extruded magnesium anode rod rigidly supported for cathodic protection.

2.07 Heater shall be equipped with a brass drain valve, ASME pressure and temperature relief valve with drain piping, and tank anode protection.

PART 3 EXECUTION

3.01 Install water heaters as recommended by manufacturer.

3.02 Install ASME rated temperature pressure relief valve as indicated on the Drawings. Valve setting 200°F. and 125 psig. Extend discharge pipe full size to 6" above floor, not to floor drain.

3.03 Set supply water temperature for normal usage at 110°F.

END OF SECTION

SECTION 22 34 37

BREECHINGS, CHIMNEYS, AND STACKS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manufactured chimneys for category II, III, & IV gas fired equipment

1.2 RELATED SECTIONS

A. Section 22 34 36 – Gas Domestic Water Heaters

1.3 REFERENCES

A. ANSI Z228.1 (NFPA 54) – The National Fuel Gas Code
B. ASHRAE – Handbook, equipment Volume, Chapter “Chimney, Gas, Vent, and Fireplace Systems”
C. NFPA 211 – Standard for Chimneys, Fireplace, Vents, and Solid Fuel – Burning Appliances
D. SMACNA – HVAC Duct Construction Standards – Metal and flexible
E. UL 1738 – Standard for Venting Systems for Gas-Burning Appliances Categories II, III, and IV

1.4 DEFINITIONS

A. **Breeching:** The conduit conveying flue gas from the appliance to the chimney.
B. **Chimney:** A structure containing one or more vertical or nearly vertical passageways for conveying flue gases to the outside.
C. **Vent:** A flue gas conveying system intended for use only with certain gas, liquid, or pellet fuel-fired appliances that do not produce flue gas outlet temperatures higher than a value specified in the listing vent standards.
D. **Vent Connector:** The pipe that connects a fuel-burning appliance to a gas vent or Type L vent.
E. **Venting System:** A continuous, open passageway from the flue collar or draft hood of a fuel-burning appliance to the outside atmosphere for the purpose of removing flue gases.

1.5 SUBMITTALS

A. Submit shop drawings under provisions of Section 01330.
B. Submit shop drawings indicating general construction, dimensions, support, and layout of breechings. Where factory built units are used, submit layout drawings including plan view and elevations.
C. Submit product data under provisions of Section 01330.
D. Submit product data indicating factory built chimneys, including dimensional details of components and flue caps, dimensions and weights.
E. Submit manufacturer’s installation instructions under provisions of Section 01330.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of products specified in this Section with minimum three years documented experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable ANSI Z223.1 code (NFPA 54) for installation of natural gas burning appliances and equipment.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Van-Packer Co., Inc.
B. Metal-Fab
C. Enervex
D. Z-vent
E. Or equal

2.2 DOUBLE WALL METAL STACKS

A. Provide double wall metal vents, tested to UL 1738 and UL listed for use with category II, III, and IV gas fired appliances.
B. Vent shall be rated for 550° F. and 5” water column positive pressure.
C. Fabricate with 1-inch minimum air space between walls. Construct inner liner of 24 gauge minimum corrosion resistant stainless steel in accordance with UL listing. Construct outer shell of 24 gauge minimum (aluminized steel) (type 430 stainless steel).
D. Vent shall be listed for 2” clearance to combustibles and 0” clearance to non-combustibles.
E. Provide all required accessories for a complete system each bearing factory applied UL Label, including but not limited to supports, appliances connectors, drain fittings, and terminations.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer’s instructions.
B. Install in accordance with recommendations of ASHRAE – Handbook, Equipment Volume, Chapter “Chimney, Gas, Vent, and Fireplace Systems” and ANZI Z223.1, (NFPA 54).
C. Install breechings with minimum of joints. Align accurately at connections with internal surfaces smooth.
D. Support breechings from building structure, rigidly with suitable ties, braces, hangers, and anchors to hold to shape and prevent buckling. Support vertical vent as required to adjacent structural surfaces. Refer to SMACNA HVAC duct Construction Standards – Metal and Flexible for equivalent duct support configuration and size.
E. Install concrete inserts for supporting vent in coordination with formwork.

F. Pitch breechings with positive slope up from equipment to chimney or stack.
G. Maintain UL listed minimum clearances from combustibles.
H. Inner pipe joints shall be sealed by use of Vee Bands and Silicone Sealant.
I. Assemble pipe and accessories as required for complete installation.
J. Chimneys extending above roof surfaces must terminate as required by local code, or as required in NFPA 211.
K. Level and plumb chimneys.
L. Clean breeching and chimney during installation, removing dust and debris.
M. At appliances, provide slip joints permitting removal of appliances without removal or dismantling of breechings or chimneys.
N. All parts exposed to the outer atmosphere that are fabricated from aluminized steel shall be protected by a minimum of one base coat and one finish coat of paint, such as Rust-O-Leum Clean Metal Primer and appropriate top coat, or equivalent. Paint shall be suitable for the temperature of the application, color selected by the Architect. Paint to be supplied and applied by installing contractor.

END OF SECTION

SECTION 22 42 00

PLUMBING FIXTURES

PART 1 GENERAL

1.01 REFERENCE

A. Section 22 00 00 – PLUMBING GENERAL
B. Section 22 11 00 – DOMESTIC WATER PIPING SYSTEM
C. Section 22 13 19 – DRAINS, CLEANOUTS, AND DRAINAGE SPECIALTIES

1.02 SCOPE

A. Furnish and install all plumbing fixtures and associated accessories as specified herein at locations indicated on plans. Fixtures to be provided free of defects and set in a neat, finished and uniform manner.

B. Where fixtures are indicated to be handicap accessible, install as directed herein and in compliance with the codes and guidelines referenced.

PART 2 PRODUCTS

2.01 Plumbing fixtures, trim, fittings, accessories, appurtenances, etc. not included herein are as specified on plans.

2.02 China plumbing fixtures and accessories as manufactured by American Standard, Kohler, Eljer, or Toto may be furnished at the Contractor's option.

2.03 Stainless steel sinks and accessories as manufactured by Elkay, Just, Carlton or Advance Tabco may be furnished at the Contractor's option.

2.04 Manual flush valves for water closets and urinals as manufactured by Sloan, Zurn, Toto or Delany.

2.05 Sensor operated flush valves for water closets and urinals as manufactured by Sloan, Zurn, Toto or Delany

2.04 FAUCETS

A. Manual operation faucets and accessories as manufactured by American Standard, Symmons, Elkay, Kohler, Chicago Faucet, Zurn, T & S Brass or any of the listed fixture manufacturers may be furnished at the Contractor's option.

B. Sensor operation faucets and accessories as manufactured by Sloan, Bradley, Zurn, Delaney, Symmons or any of the manufacturers listed for manual operation faucets may be furnished at the Contractor's option.

C. Where solid cast metal body faucets with integral waterways are specified, alternate stamped metal hollow body faucets with tubing waterways shall not be accepted.

2.05 Seats for water closets as manufactured by Bemis, Church, Olsonite, Beneke or Centoco may be furnished at the Contractor's option. All seats are to be furnished with self-sustaining check hinges unless otherwise indicated.

2.06 Fixture carriers shall be floor mounted and specified as manufactured by Josam, Zurn, J. R. Smith, Ancon or Wade may be furnished at the Contractor's option.

2.07 Equivalent precast molded stone or terrazzo mop sink receptors as manufactured by Fiat, Williams, Creative Industries, Mustee or Cutler may be furnished at the Contractor's option.

2.08 Unless indicated otherwise, all exposed metallic parts, piping, trim, fittings, accessories, appurtenances, etc. associated with plumbing fixtures shall be polished chrome finished when available. Provide polished chrome plated brass escutcheons on piping at all exposed structure penetrations (walls, floors, ceilings, casework, etc.), and at all fixture connections.

2.09 At all handicap access lavatories and/or sinks with exposed supply and drain piping below, provide pre-fabricated closed cell vinyl insulation/cover assemblies with seamless PVC jacket for all supply (full range of hot, cold and tempered) and drain piping. Assembly to be similar to McGuire Pro-Wrap series. Offset drains (if used) to be provided with cover assemblies specifically designed for same. Assemblies to be listed by manufacturer as handicap access compliant.

2.10 Provide tempering valves at all public lavatories. set outlet at lavatory to be at 109.9 degrees Faharenheit.

2.11 Shower valve and shower head and arm as manufactured by Moen, American Standard or Kohler may be furnished at the Contractor's option.

PART 3 EXECUTION

3.01 Chrome plated brass escutcheons shall be installed on waste and supply piping penetrating walls and floors in exposed locations.

3.02 Provide individual **chrome plated brass** accessible stop valves on all fixture and equipment supply piping.

3.03 Furnish fixture carriers where specified to suit wall construction as indicated on Architectural Drawings. Carriers to be anchored securely to floor.

3.04 Install all fixtures according to manufacturer's recommendations.

3.05 Individual fixture connections sized as indicated in Section 22 11 00, "DOMESTIC WATER PIPING SYSTEMS", unless directed otherwise.

3.06 Mounting heights of fixtures and associated equipment as indicated on the Architectural drawings.

3.07 Install vandal resistant 0.5 gpm flow restrictors on all lavatory faucets in public access areas, similar to Chicago Faucet Model Number E-2805.

3.08 Provide insulation on hot water, cold water and drain piping exposed below handicap access lavatories. See Section 22 07 00, PLUMBING INSULATION for requirements.

3.09 At all countertop or other casework conditions, verify exact location and installation of all items with Architectural documentation before any work is performed. Coordinate installation with the General Contractor.

3.10 At handicap access water closet enclosures, verify “wide side” of enclosure from Architectural Drawings and provide flush valve assemblies with handle in corresponding location to comply with A.D.A. requirements.

3.11 All handicap access fixture controls, including faucets and flush valves, to be provided with operators requiring 5 lb. pressure or less for operation.

3.12 Provide a floor mounted fixture carrier for all wall mounted lavatories and all electric water coolers.

END OF SECTION

SECTION 22 63 13

HOUSE LINES - GAS

PART 1 GENERAL

1.01 REFERENCE

A. Section 22 00 00 – PLUMBING GENERAL

1.02 SCOPE

A. Extend gas piping from meter setting building entry point to all items/elements indicated on plans & any other points requiring same.

B. Provide gas cock, 6" long dirt leg, and approved union connection in accessible location adjacent to connection point for each item/element. All connection points to be confirmed in field with items/elements as actually installed.

C. Final connection to all items is by the Plumbing Contractor, whether items are furnished and/or installed in the Plumbing Contract or not.

D. Installation of all elements specified herein and shown on plans shall be in accordance with the requirements of the Gas provider, the referenced standards, and all review, inspection and approval authorities.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

A. Maximum 14" w.c. (1/2 psig) working pressure Gas Pipe in Exposed Locations - Standard weight (schedule 40) black steel pipe. Fittings shall be threaded standard weight black malleable iron; to maximum 1 ¼" pipe size. Gas system piping in accordance with any of the following criteria shall be standard weight (schedule 40) black steel pipe and fittings with butt welded joints and connections:

1. Piping in concealed Locations (includes above accessible ceilings, and within accessible structures/chases where not normally visible).
2. All piping 1 ½" size and larger.
3. All piping with greater than 1/2 psig working pressure.
4. All piping in air plenums, as confirmed from project HVAC documentation.

B. Valves, fittings and any other elements not available with welded connections indicated to be installed in welded gas piping shall be furnished with listed/approved welding adapters or listed/approved class 125 flanges and gaskets.

C. All piping in concealed locations (includes above accessible ceilings, and within accessible structures/chases where not normally visible) shall not have valves, unions, tubing fittings or running threads.

D. Piping within last ten (10) feet of appliance may be screwed if approved by Code authorities for specific conditions.

2.02 SECONDARY GAS PRESSURE REGULATOR (where required)

A. Similar to Equimeter series 243 or 121 (according to flow capacity requirements) diaphragm type adjustable pressure regulator, with cast iron valve body, aluminum diaphragm case and vent assembly with outlet connection. Furnish with blocked throat and remote sensing line when indicated on plan in monitoring configuration. See plans for size and capacity requirements.

B. Equivalent Regulators as manufactured by Fisher, American, Sprague or Maxitrol may be provided at the Contractor's option.

PART 3 EXECUTION

3.01 Electrical requirements including voltage and amperage ratings for electrically operated elements specified herein to be as indicated by electrical documentation, coordinated in advance or work with the Electrical Contractor.

3.02 Provide listed/approved dielectric fitting at equipment with dissimilar material type gas supply piping connections.

3.03 All gas piping shall be installed level. Inspect, test and purge all gas lines to outside as required by the Gas provider, referenced standards and the review/inspection/approval authorities..

3.04 Install listed/approved pipe sleeves on gas piping at all structural penetrations.

3.05 All branch connections shall be made on the top or side of horizontal piping.

3.06 Pressure regulation valves (including those provided loose or installed with packaged equipment assemblies) installed within the building structure are to be individually vented to atmosphere in compliance with the Gas provider, referenced standards and the review/inspection/approval authorities.

END OF SECTION

SECTION 23 01 05

HVAC GENERAL PROVISIONS

PART 1 GENERAL

1.1 REFERENCES

A. Division 23 (as included), covers Heating, Ventilating and Air Conditioning and HVAC control work specifically. The Heating, Ventilating and Air Conditioning Contractor shall conform to all provisions of these divisions and is to consider the word "Contractor" to mean themselves.

1.2 GENERAL REQUIREMENTS

A. Furnish all labor, materials, tools, incidentals and details necessary to provide a complete mechanical system, ready to operate, including but not limited to the items listed under the Mechanical Specification Indexes.

B. Include any minor details essential to successful operation and any other items specified or shown on the Drawings.

C. The Contractor is required to read the Specifications covering all branches of the work and will be held responsible for coordination of his work with work performed under all other Contracts.

D. The Contractor is required to visit the site and fully inform himself concerning all conditions affecting the scope of his work. Failure to visit the site shall not relieve the Contractor from any responsibility in the performance of his Contract.

E. The Contractor should feel free to contact the Owner’s Representative immediately if there is any question regarding the meaning or intent of either Plans or Specifications, or if he notices any discrepancies or omissions in either Plans or Specifications.

F. Other than minor adjustments shall be submitted to the Owner’s Representative for approval before proceeding with the work.

G. The Contractor shall submit on his letterhead, along with the Bid, the manufacturer's name and the names of all Subcontractors to whom he intends to sublet the work. If the Contractor fails to provide this information with the Bid, Owner’s Representative shall have the right to select the manufacturers and Subcontractors with no additional charge.

H. Scheduling of all work performed by this Contractor shall be completely coordinated with the Owner’s Representative.

I. This Contractor shall furnish to Owner’s Representative a written description of procedure on this job including scheduling of the work to be done for his

approval. This shall be submitted within 10 days after the Contract is awarded. There shall be six (6) copies.

J. All material hoisting by trade involved.

K. Arrangements for storage of tools and material, removal of debris, and interruptions of services shall be made with the Owner's Representative.

L. The Contractor, insofar as this Contract is concerned, shall at all times keep the premises and the building in a neat and orderly condition.

M. At the completion of the project, this Contractor shall promptly clean up and remove from the site, all debris and excess materials.

1.3 DRAWINGS

A. Consult all Contract Drawings which may affect the locations of any equipment, apparatus, piping and ductwork and make minor adjustments in location to secure coordination.

B. Piping and duct layout is schematic and exact locations shall be determined by structural and other conditions and verified in the field. This shall not be construed to mean that the design of the system may be changed, it refers only to the exact location of piping and ductwork to fit into the building as constructed, and to coordination of all work with piping and equipment included under other Divisions of the Specifications.

C. The layout shown on the Drawings is based on a particular make of equipment. If another make of equipment is used which requires modifications or changes of any description from the Drawings or Specifications, this Contractor shall be responsible for making all such modifications and changes, including those involving other trades, as a part of this Contract and the cost thereof shall be included in his Bid. In such case, the Contractor shall submit Drawings and Specifications showing all such modifications and changes prior to starting work, which shall be subject to the approval of the Owner's Representative.

D. The Owner's Representative reserves the right to make minor changes in the location of piping and equipment up to the time of rough-in without additional cost to the Owner.

E. Where certain grades and/or elevations are given on the Drawings, they have been obtained from the best information available; however, they are not guaranteed. This Contractor MUST assume the full responsibility of verifying present elevations in the field and making any adjustments as may be necessary, all of which must be included in his Bid Price.

F. Due to the scale of the Drawings, it is impossible to show all offsets and transitions which may be required. This Contractor shall carefully investigate the conditions affecting all work and shall furnish all elbows, fittings, transitions, etc., required to accomplish the desired result at no additional cost to the Owner.

G. Install all work as close as possible to walls, ceilings, struts, members, etc., consistent with the proper space for covering, access, etc., so as to occupy the minimum of space.

H. Actual dimensions shown on the Drawings and field dimensions shall take precedence over scaled dimensions.

1.4 PERMITS, INSPECTIONS AND CODES

A. This Contractor shall file all Drawings, pay all necessary charges and fees, and obtain all necessary permits and certificates of inspection relative to his work.

B. Completed installations shall conform with all applicable Federal, State and Local Laws, Codes and Ordinances, including but not limited to the latest editions of the following:

1. Ohio Building Code, Department of Industrial Relations, State of Ohio.

2. Specific Safety Requirements Relating to Building and Construction Work, Industrial Commission and Department of Industrial Relations, State of Ohio.

3. Specific Safety Requirements Covering the Installation of Pressure Piping Systems, Industrial Commission and Department of Industrial Relations, State of Ohio.

4. Ohio Pressure Piping Systems Rules, Ohio Board of Building Standards and Department of Industrial Relations, State of Ohio.

5. A.S.M.E. Pressure Piping Code - Section B31.1

6. National Electrical Code, Bulletin No. 70, National Fire Protection Association.

7. Air Conditioning and Ventilating, Bulletin No. 90 A, National Fire Protection Association.

8. Life Safety Code, Bulletin No. 101, National Fire Protection Association.

9. City of Columbus, Building Code.

10. All Work Under Jurisdiction of Local Fire Marshal shall conform to requirements set forth by Fire Marshal's Office and National Fire Protection Association.

C. Nothing contained in the Plans and Specifications shall be construed to conflict with these laws, codes and ordinances and they are hereby made a part of these Specifications.

1.5 ENERGY CODE

A. The Mechanical System must comply with all requirements of the ASHRAE Standard 90.1 – 2010. This includes, but is not limited to, efficiencies, power factors, insulation thickness, etc.

B. All motors 1 HP or more shall be “energy efficient” motors meeting all requirements of ASHRAE Standard 90.1 – 2010.

1.6 UTILITIES

A. The Contractor shall investigate and locate all utilities prior to construction.

B. The Contractor shall alert immediately the occupants of nearby premises as to any emergency that he may create or discover on or near such premises of the underground facility, any break or leak on its lines or any dent, gouge, groove or other damage.

1.7 OPERATING AND MAINTENANCE INSTRUCTIONS

A. This Contractor shall thoroughly instruct and supervise the Owner's Maintenance Personnel in the proper operation and maintenance of the mechanical system equipment. This Contractor shall be responsible for arranging for the instruction and supervision at a time convenient to Owner and notifying the Owner’s Representative of the time at least 48 hours in advance.

Instructions shall include the following:

1. Location of equipment and explanation of what it does.

2. Reference to "Operating Instruction Manuals" for record and clarity.

3. Coordination of written and verbal instruction so that each is understood by all personnel.

4. Explanation of Temperature Control System including panels.

5. Specific maintenance to be performed by Owner.

B. Furnish one (1) electronic copy in PDF format of the Operating and Maintenance Instructions for the Mechanical Systems for review. After final approval, provide one (1) electronic copy in PDF format and (1) printed copy for submittal to the Owner. Printed instructions shall be neat, legible and bound in a hardback 3-ring notebook. Instructions shall consist of the following items:

1. Title Page: Title of Project, address, date of submittal, name and address of Contractor, name of Architect and Engineer.

2. Second Page: Index of Manual Contents.

3. First Section: A copy of each approved shop drawing and submittal with an index at the beginning of the section.

4. Second Section: A list of all equipment used on the project, together with supplier's name and address.

5. Manufacturer's maintenance manuals for each item of equipment furnished under this contract. Manuals shall include such items as parts list, detailed lubrication instructions, procedures for performing normal maintenance functions, preliminary trouble shooting procedures and wiring diagrams.

6. Complete wiring diagrams for the mechanical systems as actually wired including control and interlock wiring.

7. Brief but complete instructions for start-up, shut- down and routine maintenance of each system.

8. Routine and 24-hour emergency information:

   a. Name, address and telephone number of servicing agency.

   b. Include names of personnel to be contacted for service arrangements.

1.8 RECORD DOCUMENTS

A. The Contractor shall keep an accurate record of all deviations from Contract Drawings and Specifications. He shall neatly and correctly enter in colored pencil any deviations on Drawings affected and shall keep the Drawings available for inspection. Extra sets of Drawings will be furnished for this purpose.

B. At the completion of project and before final approval, make any final corrections to Drawings and certify to the accuracy of each print by signature and deliver same to the Owner.

1.9 SUPERVISION

A. This Contractor shall have in charge of the work, on the job during construction, a competent superintendent experienced in the work installed under this Contract.

1.10 UNACCEPTABLE WORK AND OBSERVATION REPORTS

A. Work shall be unacceptable when found to be defective or contrary to the Plans, Specifications, Codes specified or accepted standards of good workmanship.

B. The Contractor shall promptly correct all work found unacceptable by the Owner’s Representative or Owner whether observed before or after substantial

completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such unacceptable work, including compensation for the Owner's Representative's additional services made necessary thereby.

C. During the course of construction, the Owner's Representative will prepare "Observation Reports" with a list of items found to be in need of correction. All items listed shall be corrected by the Contractor. A space is provided on the form for the Contractor to note the completion of each item. All prior "Observation Report" items must be completed, the lists signed and returned to the Owner's Representative prior to making the final inspection. After the final list is issued, the same procedure will apply.

1.11 FINAL INSPECTION

A. When the Contractor determines all work is completed and working properly per the Contract Documents, he shall request a "final" inspection by the Owner's Representative in writing. If more than one reinspection is required after this final inspection, the Contractor shall bear all additional costs including compensation for the Owner's Representative's additional services made necessary thereby. A final inspection will not be made until Operating and Maintenance Manuals and Air Balance Reports are submitted and approved and all prior "Observation Report" punch lists completed, signed and returned to the Owner's Representative.

B. As part of the final checkout of the project, the Owner's Representative will be checking out the operation of the various systems. This Contractor shall provide such assistance as required (including manpower and tools) to start and stop the various systems, open and close valves etc. and simulate summer, winter and other temperature control sequences. The Contractor (not the Owner's Representative) is responsible to turn on the systems and demonstrate they are operating properly.

1.12 GUARANTEE

A. This Contractor is responsible for all defects, repairs and replacements in materials and workmanship, for a period of one (1) year after final payment is approved by the Owner's Representative.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION 23 01 05

SECTION 23 01 10

MANUFACTURER'S DRAWINGS

PART 1 GENERAL

1.1 REFERENCE

A. Section 013300 - SUBMITTAL PROCEDURE

1.2 SCOPE

A. The Contractor shall submit manufacturer's drawings, wiring diagrams, fan curves and other submittals to the Owner's Representative for review. Shop drawings shall be submitted electronically in PDF format. The Engineer will review Contractor's shop drawings and related submittals (as indicated below) with respect to the ability of the detailed work, when complete, to be a properly functioning integral element of the overall system designed by the Engineer. Before submitting a shop drawing or any related material to the Engineer, Contractor shall: review each such submission for conformance with the means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto, all of which are the sole responsibility of Contractor; approve each such submission before submitting it; and so stamp each such submission before submitting it. The Engineer shall assume that no shop drawing or related submittal comprises a variation unless Contractor advises Engineer otherwise via a written instrument which is acknowledged by Engineer in writing. The shop drawings and related material (if any) called for are indicated below:

<u>Heating, Ventilating and Air Conditioning Contract</u>

Split System Air Handling Units
Outdoor Heat Pump Units
Electric Cabinet Unit Heaters
Electric Duct Heaters
Fans
Registers, Grilles and Diffusers
Dampers
Louvers
Intake and Exhaust Vent Terminals
HVAC Insulation

B. The Engineer shall return shop drawings and related materials with comments provided that each submission has been called for and is stamped by Contractor as indicated above. The Engineer shall return without comment material not called for or which has not been approved by Contractor.

C. This Contractor shall furnish equipment shop drawings which will indicate power hook up and control connections as required for mechanical equipment. "Stock" wiring diagrams are NOT ACCEPTABLE.

D. The manufacturer shall provide a statement on submittals that equipment furnished complies with the Energy Code. This previously relates to high efficiency motors, EER's, COP's, etc. If this is not done, submittals will be rejected.

E. The Engineer's review of manufacturer's drawings or schedules shall not relieve the Contractor from compliance with the requirements of the plans and specifications.

1.3 QUANTITIES

A. Items may be referred to in singular or plural on Plans and Specifications. Contractor is responsible for determining quantity of each item.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

Not Applicable

END OF SECTION 23 01 10

SECTION 23 05 13

ELECTRICAL WORK

PART 1 GENERAL

1.1 REFERENCE

A. Section 230105 - Paragraph 1.05 - ENERGY CODE
B. Division 16 - ELECTRICAL

1.2 SCOPE

A. This Contractor shall furnish all motors for his equipment. Motor starters, safety switches and wired junction boxes shall be furnished and installed by the Electrical Contractor except where specifically specified to be furnished with certain mechanical equipment.

1.3 WORK INCLUDED - This Contractor:

A. All control wiring unless otherwise specified. Temperature Control wiring by HVAC Contractor except as noted below by Electrical Contractor.

B. 120 volt wiring required for mechanical equipment when not shown or specified elsewhere.

1.4 WORK INCLUDED - Electrical Contractor.

A. All power wiring.

B. All conduit and wiring incidental to Temperature Controls, including switches, controls, transformers and relays shall be the responsibility of the HVAC Contractor, except wiring as indicated on the Electrical Drawings will be by the Electrical Contractor.

C. Motor starters, contactors, and disconnects where noted under "PRODUCTS" below.

1.5 SHOP DRAWINGS:

A. The Contractor shall furnish to the Electrical Contractor, equipment shop drawings which will indicate power hook-up and control connections as required for mechanical equipment. "Stock" Wiring Diagrams are Not Acceptable.

PART 2 PRODUCTS

2.1 Refer to Section 23 01 05 - Paragraph 1.05 for "Energy Code" requirements (Particularly power factor correction)

2.2 Refer to Division 16 - ELECTRICAL.

2.3 All motors 1/2 HP and larger shall be three phase; all motors, 1/3 HP and smaller shall be single phase unless specified otherwise.

2.4 All single-phase motors provided by this Contractor to have built-in thermal overload protection.

2.5 All motors furnished shall have copper windings and all motors five (5) horsepower and greater shall have factory installed lifting eyebolts. All motors shall conform to ANSI and NEMA standards.

2.6 Motor starters, contactors, and disconnects are provided and installed by the Electrical Contractor, unless part of packaged equipment furnished by this Contractor, or otherwise specified.

2.7 All motors used in variable speed applications shall be high efficiency type and shall be rated for use with variable frequency drives.

PART 3 EXECUTION

3.1 All wiring, conduits, etc., shall be in strict accordance with the requirements of the latest edition of the National Electrical Code and Division 16, Electrical specification.

3.2 All wiring, including low voltage wiring, shall be run in conduit.

3.3 Low voltage wiring may be size and type recommended by the Manufacturer and/or Temperature Control Contractor.

END OF SECTION 23 05 13

SECTION 23 05 16

SLEEVES AND COLLARS

PART 1 GENERAL

1.1 REFERENCE

A. Section 230521 - CUTTING AND PATCHING

1.2 SCOPE

A. This Contractor shall furnish and install all sleeves for their work. Coordinate carefully with the General Contractor.

B. Sleeves shall be provided through all new masonry construction. Sleeves are not required if holes are core drilled through walls.

C. Podium Penetrations: Contractor shall provide dimensioned locations for all podium penetrations and shall carefully coordinate the openings with the structure.

PART 2 PRODUCTS

2.1 Sleeve material: black steel pipe, machine cut, large enough to allow l/4" clearance all around pipe (around pipe covering on chilled water and cold water).

PART 3 EXECUTION

3.1 Sleeves in partitions to have length equal to the thickness of finished partitions. Sleeves in floors of finished areas to project l/8" above finished floor. Sleeves in floors of non-finished areas to project 3" above finished floor. Fill space between pipe and sleeves into exposed areas with sealing compound. Ream all sleeves before installing.

3.2 Where pipes pass through fire rated walls or floors, the space between the pipe and sleeve shall be filled with packing to maintain fire integrity.

3.3 Sleeves to be set in forms before concrete is poured and in partitions at the time same are being built.

3.4 Cutting required of any masonry wall or floor after it is in place shall be done by core drilling.

3.5 Piping not allowed to bear on sleeves.

3.6 Sleeves shall be installed plumb and true to line, grade, and position.

3.7 Unused sleeves shall be plugged and finished to match adjacent surface.

END OF SECTION 23 05 16

SECTION 23 05 17

FIRESTOPPING

PART 1 GENERAL

1.1 SCOPE

A. Each Contractor shall be responsible for firestopping around all openings for pipes, ducts, conduits, etc., installed by him at all fire walls and smoke walls. Firestopping shall be performed by an installer who has been trained by manufacturer, or manufacturer's representative, in the installation procedures based on published UL tested fire stop systems.

1.2 DEFINITIONS

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

1.3 REFERENCE

A. Division 1 – General Conditions
B. Division 3 – Concrete
C. Division 4 – Masonry
D. Division 9 – Finishes
E. Section 23 05 16 – Sleeves and Collars
F. Section 23 07 00 – HVAC Insulation

1.4 GENERAL REQUIRMENTS

A. Test Requirements: ASTM E-814, "Standard Method of Fire Tests of Through Penetration Fire Stops" (July 1997).

B. Underwriters Laboratories (UL) of Northbrook, IL runs ASTM E-814 under their designation of UL 1479 and publishes the results in their "FIRE RESISTANCE DIRECTORY" that is updated annually.

1. UL Fire Resistance Directory:

a. Through-Penetration Firestop Devices (XHCR)
b. Fire Resistance Ratings (BXUV)
c. Through-Penetration Firestop Systems (XHEZ)
d. Fill, Voids, or Cavity Material (XHHW)
e. Forming Materials (XHKU)

C. International Firestop Council Guidelines for Evaluating Firestop Systems Associating Judgments

D. ASTM E-84, Standard Test Method for Surface Burning Characteristics of Building Materials.

E. The Ohio Building Code (OBC)

F. NFPA 101 - Life Safety Code

1.5 QUALITY ASSURANCE

A. A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

B. Firestop System installation must meet requirements of ASTM E-814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated.

C. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

D. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

E. For those firestop applications that exist for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by the International Firestop Council (September 7, 1994).

1.6 SUBMITTALS

A. Submit Product Data: Manufacturer’s specifications and technical data for each material including the composition and limitations, documentation of UL firestop systems to be used and manufacturer's installation instructions.

B. Manufacturer's engineering judgment identification number and drawing details when no UL system is available for an application. Engineer judgment must include both project name and contractor’s name who will install firestop system as described in drawing.

C. Submit material safety data sheets provided with product delivered to job-site.

1.7 INSTALLER QUALIFICATIONS

A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer’s products per specified requirements. A manufacturer’s

willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.9 PROJECT CONDITIONS

A. Do not use materials that contain flammable solvents.

B. Scheduling

1. Schedule installation of CAST IN PLACE firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.

2. Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 PRODUCTS

2.1 FIRESTOPPING, GENERAL

A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

B. Provide components for each firestopping system that is needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

2.2 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:

1. Hilti, Inc., Tulsa, Oklahoma, (800)879-8000
2. Tremco Sealants & Coatings, Beachwood, Ohio, (216) 292-5000
3. 3M Fire Protection Products, St. Paul, Minnesota, (612) 736-0203

2.3 MATERIALS

A. Use only firestop products that have been UL 1479, ASTM E-814 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Cast-in place firestop devices are installed prior to concrete placement for use with non-combustible and combustible plastic pipe (closed and open piping systems) penetrating concrete floors, the following products are acceptable:

1. Hilti CP 680 Cast-In Place Firestop Device
2. Fox Coupling, Inc. "Cast-In-Place Firestop Coupling".
3. Proset Cast-In-Place Device

C. Sealant or caulking materials for use with non-combustible items including steel pipe & copper pipe, the following products are acceptable:

1. Hilti FS-ONE Intumescent Firestop Sealant
2. 3M Fire Barrier CP25 or Firestop Sealant 2000
3. Tremco Fyre Shield

D. Sealant or caulking materials for use with sheet metal ducts, the following products are acceptable:

1. Hilti CP 601S Elastomeric Firestop Sealant or CP 606 Flexible Firestop Sealant
2. Tremco Fyre-Shield High Performance Ceramic Firestop Sealant
3. 3M Fire Barrier CP25WB+ or 2000 Silicone Sealant

E. Intumescent sealant or caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe and plastic pipe, the following products are acceptable:

1. Hilti FS-ONE Intumescent Firestop Sealant
2. 3M Fire Barrier CP25WB+
3. Tremco Intumescent Acrylic or TremStop WBM

F. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:

1. Hilti CP 642 and CP643 Firestop Collar, CP645 Wrap Strip
2. Tremco TREMstop D Combustible Pipe Intumescent Device System and TremStop WS Wrap Strip
3. 3M Ultra Plastic Pipe Device and Fire Barrier FS-195+ Wrap Strip

G. Materials used for large size/complex penetrations made to accommodate multiple steel and copper pipes, the following products are acceptable:

1. Hilti FS 635 Trowelable Firestop Compound and FS 657 FIRE BLOCK
2. Tremco TremStop M Fire Rated Mortar and PS Pillows
3. 3M Fire Barrier CS-195+ Composite Sheet

H. Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate multiple steel and copper pipes, the following products are acceptable:

1. Hilti FS 657 FIRE BLOCK
2. Tremco PS Firestop Pillows
3. 3M CS Intumescent Sheet

I. Provide a firestop system with an "F" Rating as determined by UL 1479 or ASTM E814. The F rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated.

PART 3 EXECUTION

3.1 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify penetrations are properly sized and in suitable condition for application of materials.

2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

5. Do not proceed until unsatisfactory conditions have been corrected.

3.2 COORDINATION

A. Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement of concrete.

B. Responsible trade to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

3.3 INSTALLATION

A. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration joint materials.

1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

2. Consult with the Owner' Representative and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.

3. Protect materials from damage on surfaces subjected to traffic.

3.4 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas. All penetrations are to be labeled in accordance with the University's standard labeling system. The HVAC Contractor shall coordinate all fire stopping requirements with the University prior to start of work.

B. Keep areas of work accessible until inspection and approval have been completed.

C. All fire stopping shall be inspected and approved by a licensed independent Consultant. All unapproved fire stopping products installed by this contractor will be removed and replaced at his expense.

D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

3.5 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

END OF SECTION 23 05 17

SECTION 23 05 20

PAINTING

PART 1 GENERAL

1.1 REFERENCE

A. Section 099123 - INTERIOR PAINTING

1.2 SCOPE

A. All steel supports shall be painted by this contractor per section 099123 requirements.

B. Piping in exposed finished areas shall be painted by the General Contractor. Exposed piping in mechanical rooms and shell space areas is not required to be painted.

C. Factory finished equipment which has rusted or been damaged shall be cleaned at the completion of the project and rust spots and marred areas shall be refinished and restored to the original factory finish.

PART 2 PRODUCTS

2.1 Paint shall meet the requirements of Division 09, section 099123.

PART 3 EXECUTION

Not Applicable

END OF SECTION 23 05 20

SECTION 23 05 21

CUTTING AND PATCHING

PART 1 GENERAL

Not Applicable

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.1 Except where noted otherwise on the drawings, cutting for openings, when necessary, shall be done by this Contractor with such tools and methods as to prevent unnecessary damage to surrounding areas or equipment.

A. All field cut openings through structural members shall be made in accordance with the structure supplier's guidelines and instructions. Careful coordination with the structure supplier is required.

3.2 Fill space in all areas where core drilled with packing where required to maintain fire rating.

3.3 All holes cut for the installation of piping, ductwork and equipment shall be neatly patched and refinished with the same materials as, and to match, adjacent surfaces.

END OF SECTION 23 05 21

SECTION 23 05 22

FOUNDATIONS AND SUPPORTS

PART 1 GENERAL

1.1 SCOPE

A. This Contractor shall furnish welded steel frames and supports for all equipment requiring same. Furnish auxiliary steel as required for supporting pipes.

B. Roof curb and roof supports shall be by this contractor. Setting of roof curbs and roof supports shall be by this contractor. The Roofing Subcontractor shall make all cuts in the roof system and weatherproof all curb and supports. Auxiliary steel for supporting roof mounted equipment by this Contractor unless otherwise noted on the Drawings.

C. The HVAC Contractor shall provide all exterior HVAC pipe supports.

PART 2 PRODUCTS

2.1 All steel for frames and supports shall be standard weight black or galvanized steel pipe or standard structural steel shapes.

2.2 All exterior frames and supports shall be galvanized.

PART 3 EXECUTION

3.1 Grind all sharp corners and projections on supporting steel after fabrication. All steel shall have one (1) coat of metal primer after fabrication. All steel supports exposed to the weather shall be hot dip galvanized.

END OF SECTION 23 05 22

SECTION 23 05 29

INSERTS, PIPE HANGERS AND SUPPORTS

PART 1 GENERAL

1.1 SCOPE

A. Furnish and install all necessary inserts, beam clamps and auxiliary steel for pipe hangers in the building.

B. Furnish and install necessary pipe hangers and supports to properly support all piping and to maintain uniform elevation.

C. Ceiling grid systems shall not be supported from ductwork, heating or plumbing lines, and vice versa. Each utility system and the ceiling grid system shall be a separate installation and each shall be independently supported from the building structure. Where interference's occur, provide trapeze type hangers or other suitable supports where they will not interfere with access to air handling units, fire dampers, heating coils, valves, and other appurtenances requiring servicing.

PART 2 PRODUCTS

2.1 HANGERS

A. Hangers for copper lines, 2" and smaller, shall be similar to Grinnell Fig. CT-99, adjustable carbon steel pipe ring, with 3/8" hanger rods. All copper plated.

B. When copper lines are insulated and hangers are sized for outside of insulation, provide steel hangers as described below.

C. Provide vibration isolation for mechanical equipment, per manufacturer's recommendations.

2.2 SUPPORTS

A. Supports for exterior piping, equipment, and ductwork shall be 18 gauge galvanized steel, utilized construction with integral base plate, continuous welded corner seams, pressure treated wood nailer, counterflashing with lag screws similar to Pate Model ES-2.

B. Use correct size hanger to allow for increased diameters of line caused by pipe covering. Contractor will not be allowed to cut or reduce specified covering to allow application of hangers, unless otherwise specified. Coordinate all hanging systems so as to avoid all conflicts with ducts, piping and beams.

C. Support mechanical coupling pipe at each joint.

D. Other means of hanging must be approved by the Owner's Representative. Do not use perforated band iron or wire as hangers.

2.3 Pipe hangers by B-Line, F & S, Elcen, Penn, Fee-Mason, PHD Manufacturing or Modern Pipe Hangers of the same type may be furnished at the Contractor's option.

2.4 Supports by RPS Corp. or Thycurb of the same type may be furnished at the Contractor's option.

PART 3 EXECUTION

3.1 Riser clamps shall be used at each floor where required.

3.2 Wall bracket pipe supports shall be installed where required.

3.3 All copper piping is to be shielded from steel pipes or electrical conduit with sheet lead or electrical tape wherever pipes would touch each other.

3.4 Galvanized hangers and strap hangers will not be permitted for supporting copper lines except for hangers sized for outside of insulation.

3.5 Provide pipe anchors and guides where and as indicated on the Drawings and elsewhere as required to properly control pipe. Method to suit job conditions.

3.6 Unless indicated otherwise, piping to be supported according to the following schedule. Support at intervals not to exceed spacing listed herein or elsewhere as required, and in accordance with good workmanship. No pipe shall be supported from another pipe. All hangers shall be plumbed before insulation is applied and all hangers shall be double nutted.

SPACING

(1) Steel Pipe			(2) Copper Pipe	
Pipe Size	Rod	Spacing	Pipe Size	Spacing
Thru 1"	3/8"	7'0"	Thru 3/4"	6'0"
1-1/4"	3/8"	9'0"	1"	7'0"
1-1/2"	3/8"	9'0"	1-1/4"	9'0"

3.7 Support plastic pipe at intervals not to exceed 4 feet.

3.8 Support piping at equipment from floor, ceiling, or walls, so that piping weight is not supported directly from equipment.

END OF SECTION 23 05 29

SECTION 23 05 30

INSTALLATION OF PIPING

PART 1 GENERAL

1.1 REFERENCE

A. Section 230516 - SLEEVES AND COLLARS
B. Section 230529 - INSERTS, PIPE HANGERS AND SUPPORTS
C. Section 230593 - TESTS AND ADJUSTMENTS

1.2 SCOPE

A. The requirements of this Section shall apply to all interior piping systems installed under this Contract, except where otherwise noted on the Drawings or Specifications.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

3.1 Make proper connections to all items of equipment in the Contract as recommended by the Manufacturer or as detailed on the Drawings.

3.2 All piping shall be arranged in accordance with the best standards of the trade with vertical pipes plumb and horizontal runs parallel or perpendicular to the building wall.

3.3 Provide valves and specialties where indicated on the Drawings.

3.4 Ream ends of pipe and clean before installing.

3.5 All joints in copper piping shall be made with 95-5 solder. Solders and fluxes containing lead are prohibited.

3.6 Make all changes of direction with fittings, rather than bending.

3.7 Provide dielectric unions or insulating flanges between dissimilar metals, i.e., copper to steel.

3.8 At the end of each day's work and otherwise as required or directed, provide caps and/or plugs at all openings in piping for protection. Particular attention must be given to avoid the possibility of any foreign materials entering the pipes, whether it be inadvertent or with malicious intent.

3.9 Do not route ductwork or piping above electrical or elevator equipment.

END OF SECTION 23 05 30

SECTION 23 05 54

EQUIPMENT IDENTIFICATION

PART 1 GENERAL

1.1 SCOPE

A. This Contractor shall label all air handling units, condensing units, fans, disconnects, motor starters, switches and other equipment furnished under this Contract.

PART 2 PRODUCTS

2.1 Labels shall be 1/16" thick laminated plastic nameplates or 0.020" thick aluminum nameplates. Background shall be black with 3/16" letters engraved on the face. Letters shall be white or natural aluminum. Labels shall include the areas served by equipment, horsepower, and flows.

PART 3 EXECUTION

3.1 Secure plates with screws. Do not attach to covers where covers can be easily mixed up. Coordinate with the other contractors so that all nameplates are the same type and design.

END OF SECTION 23 05 54

SECTION 23 05 93

TESTS AND ADJUSTMENTS

PART 1 GENERAL

1.1 SCOPE

A. After work has been completed but before pipe covering has been applied, the Contractor shall test and adjust the systems they have installed.

B. The Owner's Representative shall be notified of all scheduled tests and adjustments at least 48 hours before they are scheduled so that they may witness same. If the Contractor performs any test or adjustment without the Owner's Representative present or without properly notifying the Owner's Representative, the Contractor will be required to perform the test or adjustment a second time in the presence of the Owner's Representative.

C. If the Owner's Representative determines that any work requires special inspection, testing, or approval, he will, upon written authorization from the Owner, instruct the Contractor to order such special inspection, testing or approval. The Contractor shall give timely notice so the Owner's Representative may observe the inspections, tests or approvals. If such special inspection or testing reveals a failure of the work to comply with the requirements of the Contract Documents, the Contractor shall bear all costs thereof, including compensation for the Owner's Representative additional services made necessary by such failure; otherwise the Owner shall bear such costs, and an appropriate Change Order shall be issued.

D. Concealed lines shall be tested before being concealed. If this is not done and a leak appears during the final test, this Contractor shall repair leak and all damage resulting therefrom.

E. This Contractor shall adjust all his equipment in the mechanical system to obtain proper operation and shall demonstrate to the Owner and Owner's Representative that the entire system will function properly.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.1 TESTS

A. After refrigerant piping system is completed, it shall be thoroughly tested for leaks. Inert gas at 250 psig may be used for initial test. After system is tight, all inert gas shall be evacuated. Full refrigerant charge for proper operation shall be furnished and placed in the system by this Contractor. System shall be leak

tested with Halogen Leak Detector after installation of refrigerant. All defective materials shall be replaced.

3.2 Balancing Air Systems:

A. This Contractor shall procure the services of an independent company which specializes in the testing and balancing of air and water systems. All balancing work shall be done under the direct supervision of a qualified Heating and Ventilating Engineer. It shall be the responsibility of this Contractor to make all necessary arrangements with the Balancing Company for balancing the air and water systems after all equipment, ductwork, outlets, piping and accessories have been installed. A detailed report on all balancing work shall be prepared and submitted, in triplicate, to the Owner's Representative for review. Each copy of the report shall be dated, signed by the supervising Engineer of the Balancing Company and bound in a suitable cover. The Balancing Company shall be selected by the Contractor from the following qualified firms:

1. Any member of the Associated Air Balance Council approved by the Owner's Representative.
2. Any member of the NEBB approved by the Owner's Representative.

B. Verify total airflow for split system air handling units and exhaust fans located in apartment units. It is not necessary to balance each air device in apartment units.

C. All common area systems (lobbies, corridors, etc.) shall be balanced in accordance with the requirements indicated below, including balancing individual air terminals.

D. Balancing procedures and report to be in accordance with procedures set forth by the Associated Air Balance Council. Report shall also include fan curves for all equipment.

E. Balance reports shall include starter element sizes, and amperage ratings for each motor. If starter elements amperage rating is more than 10 percent greater or less than motor nameplate amperage, this Contractor shall inform the Electrical Contractor to furnish and install proper size elements. Balance report shall include the corrected proper size starter element sizes and amperage ratings.

F. Air quantities at individual registers or diffusers shall be adjusted to within 10% of quantities shown on the Drawings and total air quantity handled by each system to within 5% of the quantity shown or specified.

G. Balance Subcontractor shall report by letter to the Engineer on preliminary results of balancing before the final balance report is prepared. This report shall include any problems encountered during balancing or major deviations from specified conditions.

H. If required, a meeting shall be arranged between this Contractor, the Balance Subcontractor and the Engineer to resolve any problems or deviations from the Contract Drawings and Specifications before the final balance work is completed and final report is submitted for review by the Engineer.

3.3 All dampers and damper operators shall be checked and adjusted for proper operation and travel.

3.4 This Contractor shall adjust all equipment in the mechanical system to obtain proper operation and shall demonstrate to the Owner and Engineer that the entire system will function properly.

END OF SECTION 23 05 93

SECTION 23 05 94

PROTECTION AND CLEANING

PART 1 GENERAL

Not Applicable

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.1 Protect all mechanical equipment against damage from any cause whatsoever and pay the cost of replacing and repairing equipment made necessary by failure to provide suitable protection.

3.2 After all piping, equipment and ductwork has been approved and after all plastering has been completed, bare piping and insulation provided under this Contract shall be thoroughly cleaned of dirt, grease, rust and oil.

3.3 Repair all dents and scratches in factory prime or finish coats on all mechanical equipment to the satisfaction of the Owner's Representative. If damage is excessive, replacement may be required.

3.4 Ductwork and air handling equipment is to be cleaned out and blown out before painting is started by the General Contractor.

3.5 If air handling units are operated for temporary conditioning during construction, this Contractor shall replace all filters before the building is turned over to the Owner. Filters must be in units at any time fans are operated.

A. Provide (1) new set of filters for each air handling unit at project completion. HVAC contractor shall install the final set of filters in each air handling unit.

3.6 Cover all motors, fans, pumps, open pipes, etc., to keep out dirt, water and weather during construction.

3.7 This Contractor shall clean up and remove all debris from the site and shall at all times keep the premises in a neat and orderly condition.

3.8 Ductwork shall be covered at all times to keep out dirt, debris, and moisture. This includes open ends of all installed ductwork, and all ductwork stored on site prior to installation.

END OF SECTION 23 05 94

SECTION 23 05 96

SUBSTITUTIONS

PART 1 GENERAL

1.1 SCOPE

A. The Base Bid shall be based on equipment as specified. Where items are mentioned thusly, "may be furnished at the Contractor's option", the Contractor may use any one of the items named for his Base Bid. Proposals for substitutions are welcomed, but must be noted separately from the Base Bid and applied for in writing at Bid submittal.

B. Any proposed equipment or material not specified or listed as an equal must be bid as a substitution.

C. Where the Contractor furnishes equipment or material specified as equal or which is accepted as a substitution, he is responsible for all modifications required for his work, and work of all other trades to install the equipment and insure performance as originally specified.

D. Equipment and materials furnished as equal or as a substitution must be equal in quality, design, features, performances, arrangement, and appearance to that specified as standard.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

Not Applicable

END OF SECTION 23 05 96

SECTION 23 07 00

HVAC INSULATION

PART 1 GENERAL

1.1 REFERENCE

A. Section 230105 - Paragraph 1.05 – ENERGY CODE

1.2 SCOPE

A. Extent of Work - Insulate pipes and other surfaces as follows:

Supply Air, Return Air, Outside Air and Exhaust Air Ducts (as noted below)
Refrigerant Suction Piping
Condensation Drain Piping

PART 2 PRODUCTS

2.1 All insulating materials, including jackets, cements, adhesives, vapor barriers, etc., shall be U.L. listed with a flame spread rating not to exceed 25 and a smoke developed rating not to exceed 50.

2.2 Molded plastic fitting covers shall be U.L. approved with a flame spread rating not to exceed 25 and a smoke developed rating not to exceed 50.

2.3 Pipe insulation shall be Johns Manville "Micro-Lok" glass fiber insulation rated for 850°F with factory applied AP-1 all purpose, self-sealing vapor barrier jacket. Butt strips shall be minimum 3" wide of same material as jacket.

2.4 All pipe cover above shall be by Johns Manville. Equivalent type thickness and conductivity insulation by Owens Corning, Knauf, or Manson meeting all requirements may be furnished at the Contractor's option.

2.5 Refrigerant suction pipe insulation shall be 25/50 rated flexible closed cell, elastomeric Armaflex AP rated for -40°F to 220°F.

2.6 All refrigerant suction pipe insulation shall be by Armstrong. Equivalent type thickness and conductivity insulation by Aerotube, Halstead, Imcoa or Rubatex meeting all requirements may be furnished at the Contractor's option.

2.7 Duct insulation shall be Johns Manville blanket flexible type or rigid type as noted with FSK glass fiber reinforced foil faced flame resistant kraft paper vapor barrier facing.

2.8 All duct cover above shall be by Johns Manville. Equivalent type thickness and conductivity insulation by Owens Corning, Knauf, or Certain Teed meeting all requirements may be furnished at the Contractor's option.

2.9 Insulation thicknesses are based on insulation having thermal resistance in the range of 4.0 Hr F ft.^{2}/BTU to 4.6 Hr F ft^2/BTU per inch of thickness on a flat surface at a mean temperature of 75°F. Minimum insulation thickness shall be increased for materials having R values less than 4.0 or may be reduced for materials having R values greater than 4.6 to give equivalent "R" values.

PART 3 EXECUTION

3.1 Cover refrigerant piping as follows:

A, Conventional (ducted) split systems – insulate suction line piping only.
Ductless split systems – both lines shall be insulated; suction and liquid.

B. Insulate with elastomeric pipe insulation. Insulation for piping located inside the building shall be 1/2" thick. Insulation for piping located outside the building shall be 1" thick.

C. Cover valves (including bonnet), unions, flexible connections and appurtenances in cold lines.

D. Seal all butt joints with Armstrong No. 520 adhesive.

E. Fittings shall be covered with elastomeric insulation to the same thickness as adjacent pipe. Seal all joints with Armstrong No. 520 adhesive.

F. Install a rigid elastomeric insert between pipe and hanger at each pipe hanger to prevent excessive compression of the elastomeric insulation. At the Contractor's option, cork stoppers or wood blocks may be installed at each hanger. Vapor barrier to be maintained throughout.

G. Pipe covering outside of building shall be coated with Armstrong Type WB finish to make weather resistant.

3.2 Cover condensation drain piping as follows:

A. Insulate with 1/2” thick elastomeric pipe insulation.

B. Seal all butt joints with Armstrong No. 520 adhesive.

C. Fittings shall be covered with elastomeric insulation to the same thickness as adjacent pipe. Seal all joints with Armstrong No. 520 adhesive.

D. Install a rigid elastomeric insert between pipe and hanger at each pipe hanger to prevent excessive compression of the elastomeric insulation. At the Contractor's

option, cork stoppers or wood blocks may be installed at each hanger. Vapor barrier to be maintained throughout.

3.3 Cover all supply air, outside air, bathroom exhaust, janitor's room exhaust and dryer exhaust ducts as follows:

A. The following ducts shall be insulated with 1 lb. density blanket flexible duct insulation:

1. All outside air ducts shall be insulated with 2" thick insulation.

2. Cover all bathroom exhaust, janitor's room exhaust and dryer exhaust ducts located within 10 feet of an exterior wall or roof penetration with 1-1/2" thick insulation.

3. Cover all supply air ducts, in all spaces throughout the project, with 1" thick insulation. Plenum boxes behind supply air devices shall also be insulated with 1" thick insulation.

4. Note that flexible ductwork will be provided with integral insulation.

B. Supply air ductwork located inside the building that is required to be lined per specification section 23 31 13.13 is not required to be wrapped.

C. Adhere insulation to duct surface with Foster No. 85-20 adhesive applied in 6" wide strips on 12" centers. Butt all edges of insulation and seal all joints with a foil-skrim-kraft tape or flange adhered over the joint. Secure insulation with flare door staples until the adhesive sets.

D. Seal all breaks and joints in vapor barrier with 2-1/2" wide pressure sensitive tape to match vapor barrier facing. Adhere with Foster 85-20 adhesive where necessary.

3.4 Cover outside air ducts for common areas as follows:

A. Cover ducts with 2" thick, 1 lb. density blanket flexible duct insulation.

B. Adhere insulation to duct surface with Foster No. 85-20 adhesive applied in 6" wide strips on 12" centers. Butt all edges of insulation and seal all joints with a foil-skrim-kraft tape or flange adhered over the joint. Secure insulation with flare door staples until the adhesive sets.

C. Seal all breaks and joints in vapor barrier with 2-1/2" wide pressure sensitive tape to match vapor barrier facing. Adhere with Foster 85-20 adhesive where necessary.

3.5 Cover all louver plenums for common areas as follows:

A. Cover all plenums with 1 lb. density blanket flexible duct insulation. Insulation thickness shall be 3” on the top, sides and back, insulation thickness shall be 2” on the bottom.

B. Adhere insulation to duct surface with Foster No. 85-20 adhesive applied in 6" wide strips on 12" centers. Butt all edges of insulation and seal all joints with a foil-skrim-kraft tape or flange adhered over the joint. Secure insulation with flare door staples until the adhesive sets.

C. Seal all breaks and joints in vapor barrier with 2-1/2" wide pressure sensitive tape to match vapor barrier facing. Adhere with Foster 85-20 adhesive where necessary.

3.6 Application shall be made on clean, dry surfaces with all joints butted firmly together.

3.7 All duct insulation to be continuous through floors, walls, ceilings, roofs and pipe hangers.

3.8 Insulation shall not be applied until the general construction has progressed sufficiently to insure against physical or moisture damage to the insulation. All damaged insulation shall be replaced at this Contractor's expense.

3.9 Install 20 gauge galvanized steel insulation protectors on all insulated exposed pipes passing through floor. Sleeves to be 12" above the floor.

3.10 Hanger rods must be perpendicular before insulation is installed.

3.11 Longitudinal lap joints and butt strips for glass fiber pipe insulation shall be secured with staples or three (3") inch centers and sealed with an approved vapor barrier adhesive where applicable. Staples are not required when insulation utilizes a "double" adhesive self sealing system.

END OF SECTION 23 07 00

SECTION 23 21 13.33

CONDENSATION DRAIN AND DRAIN PIPING SYSTEMS

PART 1 GENERAL

1.1 REFERENCE

A. Section 23 05 30 - INSTALLATION OF PIPING
B. Section 23 07 00 - HVAC INSULATION

1.2 SCOPE

A. Provide condensation drain piping from drain connections of all air conditioning equipment and run indirect to floor drains, hub drains, and elsewhere as shown on the Drawings.

PART 2 PRODUCTS

2.1 PIPE

A. Type "L" hard copper with wrought copper fittings with sweat joints with 95-5 solder.

B. At the contractor's option, schedule 40 PVC with solvent welded drain waste and vent fittings may be used, except PVC piping is not permitted in return air plenum spaces.

1. Do not use PVC piping in mechanical spaces. Plenum rated schedule 40 CPVC piping may be used in rooms that have HVAC air handling units.

PART 3 EXECUTION

3.1 All condensation drain lines shall be trapped. Provide cleanouts at traps and in the piping system where pipe changes direction.

3.2 Pitch all condensation and other drain lines down a minimum of 1" per 8' in the direction of flow.

3.3 Prior to leaving the jobsite, the HVAC Contractor shall flood the cooling coil drain pans with the units operating to verify that the drain pans are draining properly.

END OF SECTION 23 21 13.33

SECTION 23 23 00

REFRIGERANT PIPING SYSTEM

PART 1 GENERAL

1.1 REFERENCE

A. Section 230530 - INSTALLATION OF PIPING
B. Section 230700 - HVAC INSULATION

1.2 SCOPE

A. Provide a complete system of refrigerant piping from outdoor condensing units to the associated air handling units and ductless fan coil units as shown on the Drawings.

B. All refrigerant piping shall be installed for minimal pressure drop.

PART 2 PRODUCTS

2.1 Pipe - Type L-ACR hard dehydrated scale free copper tubing.

2.2 Fittings - wrought copper, solder type.

2.3 Shut-off valves in refrigerant lines shall be similar to Henry, balanced-acting diaphragm type with brass body, solder type ends, composition seat disc, a laminated metal diaphragm, positive back seat with valve in full open position and ball check for sealing balancing channel during diaphragm inspection.

PART 3 EXECUTION

3.1 Install all refrigerant piping according to ASHRAE 15.

3.2 Install piping in short and direct arrangement, with minimum number of joints, elbows, and fittings.

3.3 Arrange piping to allow normal inspection and service of compressor and other equipment. Install valves and specialties in accessible locations to allow for service and inspection.

3.4 Install piping with adequate clearance between pipe and adjacent walls and hangers, or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation. Maximum fill: 40%

3.5 Properly clean ends of all tubing before soldering.

3.6 All joints in split system refrigerant piping shall be made with 95/5 solder.

3.7 Brazing Filler Metals: AWS A5.8, Classification BAg-1 (Silver).

3.8 During construction, this Contractor shall take precaution to minimize contamination of system by dirt, scale, moisture or other foreign matter. All foreign material and moisture in the system shall be removed.

3.9 This Contractor shall provide oil for compressors and proper refrigerant charges for systems.

3.10 Refrigerant pipe size and configuration for split systems shall be per the refrigerant piping detail included on the drawings. If a manufacturer other than the basis of design is chosen to provide the air handling units and condensing units, the HVAC Contractor shall be responsible for all additional accessories and appurtenances required by the actual manufacturer to make the units suitable for use with this project.

3.11 A quality installation is critical to avoid functional problems and to maximize the system reliability and service life. Arbitrary changes due to field conditions or contractor preferences can drastically affect the results; all revisions must be coordinated with the Owner’s Representative.

3.12 Due to the risk of tenants puncturing the refrigerant piping while driving screws or nails into the walls, all refrigerant piping passing through apartment unit walls must be shielded.

3.13 All refrigerant suction lines shall be insulated per specification 23 07 00, inside and outside of the building. Do not install insulation until system testing has been completed and all leaks have been eliminated.

3.14 Support all refrigerant piping above the roof with polycarbonate pillow block type pipe stands equal to Miro Industries Model 1.5 or Model 3-R. Support all piping a minimum of 6 feet on center.

3.15 Slope refrigerant piping as follows: Install horizontal suction lines with a uniform slope of 0.4 percent downward to compressor. Install traps and double risers where indicated and where required to entrain oil in vertical runs. Liquid lines may be installed level.

3.16 Use fittings for changes in direction and branch connections.

3.17 Reduce pipe sizes using eccentric reducer fittings installed with level side down.

3.18 Install unions to allow removal of solenoid valves, pressure-regulating valves, expansion valves, and at connections to compressors and evaporators.

3.19 Install refrigerant valves according to manufacturer's written instructions.

3.20 Charge and purge systems, after testing, dispose of refrigerant following ASHRAE 15 procedures.

3.21 Install hangers for copper tubing with the following maximum spacing and minimum rod sizes. Tube sizes are nominal or standard tube sizes as expressed in ASTM B88.

A. 1/2 Inch: Maximum span, 60 inches; minimum rod size, 1/4 inch.
B. 5/8 Inch: Maximum span, 60 inches; minimum rod size, 1/4 inch.
C. 1 Inch: Maximum span, 60 inches; minimum rod size, 1/4 inch.
D. 1-1/4 Inches: Maximum span, 72 inches; minimum rod size, 1/4 inch.
E. 1-1/2 Inches: Maximum span, 96 inches; minimum rod size, 3/8 inch.

3.22 Install permanent filter dryers in low-temperature systems using hermetic compressors, and before each solenoid valve.

3.23 Install refrigerant valves according to manufacturer's written instructions.

3.24 Inspect and test refrigerant piping according to ASME B31.5, Chapter VI. Pressure test with nitrogen to 200 psig. Perform final tests at 27-psig vacuum and 200 psig using halide torch or electronic leak detector. Test to no leakage.

3.25 Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

3.26 Adjust thermostatic expansion valve to obtain proper evaporator superheat requirements.

3.27 Before installation of copper tubing other than Type ACR, clean tubing and fittings with trichloroethylene.

3.28 Charge system using the following procedures:

A. Install core in filter dryer after leak test, but before evacuation.
B. Evacuate refrigerant system with vacuum pump until temperature of 35 deg is indicated on vacuum dehydration indicator.
C. During evacuation, apply heat to pockets, elbows, and low spots in piping.
D. Maintain vacuum on system for minimum of 5 hours after closing valve between vacuum pump and system.
E. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
F. Complete charging of system, using new filter-dryer core in charging line. Provide full-operating charge.

END OF SECTION 23 23 00

SECTION 23 31 13.13

LOW PRESSURE DUCTWORK

PART 1 GENERAL

1.1 REFERENCE

A. Section 23 37 00 - REGISTERS, GRILLES AND DIFFUSERS
B. Section 23 07 00 - HVAC INSULATION
C. Section 23 33 13 - DAMPERS

1.2 SCOPE

A. Furnish, install and insulate low pressure sheet metal work and appurtenances with sizes as shown on the Drawings.

B. All sheet metal work including ductwork, dampers, etc., shall be fabricated in accordance with the recommendations of the Sheet Metal and Air Conditioning Contractors National Association, Inc., (SMACNA) latest edition of the FOLLOWING:

1. HVAC DUCT CONSTRUCTION STANDARDS, Metal and Flexible.

C. Where indicated on the Drawings and as noted herein, sheet metal ductwork shall be fabricated with a thermal and acoustical liner as hereinafter specified.

1. All ducts cross-hatched on the Drawings
2. All rectangular supply air and return air ducts for common area split systems.
3. Outside air ducts shall not be internally lined.

Metal nosings shall be securely installed over transversely oriented liner edges facing the airstream at forward discharge and at any point where lined duct is preceded by unlined duct.

D. All ducts shall be sealed with duct sealer, except spiral ductwork with self sealing gaskets. Duct sealer shall not be used exposed ductwork located in areas that do not have dropped ceilings.

PART 2 PRODUCTS

2.1 Sheet Metal Ductwork:

A. Unless otherwise noted, all sheet metal ducts and plenums shall be fabricated of lock forming quality, hot-dipped galvanized steel sheets and shall comply with 2" w.g. pressure class construction. Metal gauges shall be in accordance with current SMACNA Standards.

1. In consideration of the limited ceiling space height available in most areas, ductwork shall be constructed with flat slip type connectors where possible to minimize the overall duct dimensions.

B. Dryer exhaust ducts shall be constructed of 26 gauge galvanized steel with joints sealed water tight.

C. Flexible duct shall comply with NFPA requirements, Pamphlets 90A and 90B, and shall be listed under UL Standard 181 as a Class 1 flexible air duct. The flame spread rating shall not exceed 25 and the smoke developed rating shall not exceed 50. Duct shall be a factory-fabricated assembly composed of a coated spring steel wire helix permanently bonded to a coated woven fiberglass or CPE cover. Flexible ductwork shall not be used for dryer exhaust systems.

1. Flexible ductwork for exhaust systems more than 10 ft. from the exterior wall penetration shall be equivalent to Thermaflex model S-TL.

2. Flexible ductwork for return air systems shall be equivalent to Thermaflex model S-TL.

3. All other flexible ductwork shall be equivalent to Thermaflex model M-KE.

   Exhaust ducts within 10 ft. of exterior walls shall have 1-1/4”, 0.76 lb. density fiberglass blanket insulation.

   All supply air ducts shall have 1-1/4”, 0.76 lb. density fiberglass blanket insulation.

   All outside air ducts shall have 2”, 0.71 lb. density fiberglass blanket insulation.

4. Flexible duct shall be terminal duct for air system and shall not exceed 20 feet in length. Bend radius for flexible ducts shall be a minimum of two (2) times the duct diameter.

5. Flexible duct shall not be used at penetrations through structural bearing walls. Transition to rigid sheet metal ductwork and provide firestopping at each structural bearing wall penetration.

D. All fan flexible connections shall be made with commercial grade neoprene coated glass fabric (heavy duty).

E. All duct sealing compounds, mastics and duct tape shall meet NFPA 90A standards and shall be UL listed with ratings not to exceed 25 for flame spread and 50 for smoke development.

F. Access doors shall be insulated, airtight, "hinged" and gasketed style, with a minimum of two quick action latches. Door shall be mounted in a galvanized steel frame with an inside "fold-over" flange for duct attachment. Door height

shall be 24"; width shall be equal to the duct width or 12", whichever is less, unless otherwise shown or noted on drawings.

G. Sealer for ducts shall be equal to 3M Model EC-800.

PART 3 EXECUTION

3.1 SHEET METAL DUCTS

A. Except as noted or shown otherwise on the Drawings, all sheet metal work including ductwork, dampers, etc., shall be fabricated and supported in accordance with the recommendations of the SMACNA "HVAC Duct Construction Standards".

B. Cross break all flat surfaces or reinforce with a bead approximately 5/16" wide x 3/16" deep on 12" centers, to prevent vibration on all ducts 19" maximum dimension and larger.

C. Sheet metal plenums shall be single wall construction, reinforced with steel angles 2 ft. on center. Provide close off sheet metal as required. Gauges same as specified for ducts, unless otherwise noted.

D. Seal all seams and joints in outside air plenums. All plenums shall be watertight.

E. Seal all seams and joints in dryer exhaust ducts to make ducts watertight.

3.2 LINED DUCTWORK

A. All portions of duct designed to receive duct liner shall be completely covered with 1” thick Johns Manville Permacote Linacoustic unless otherwise noted. All liner for return air ducts shall be 1” thick. All liner for supply air ductwork shall be 1” thick.

B. The smooth, black coated surfaces of the liner shall face the airstream. All liner shall be cut to assure tight, overlapped corner joints. The top pieces shall be supported by the side pieces.

C. Liner shall be adhered to the sheetmetal with full coverage of an approved adhesive, and all exposed leading edges and transverse joints shall be neatly butted without gaps and be coated with Permacote factory-applied edge coating. Shop or filed cuts shall be liberally coated with Johns Manville SuperSeal Edge Treatment or approved adhesive.

D. The liner shall be additionally secured with mechanical fasteners spaced per the manufacturer’s recommendations. The pin length should be such as to hold the material firmly in place with minimum compression of the material.

E. Liner shall be kept clean and dry during transportation, storage and installation. Care should be taken to protect the liner from exposure to the elements or damage from mechanical abuse.

F. Omit liner for a distance of approximately 6" where dampers are installed in ducts to permit proper fit of dampers.

G. Metal nosings shall be securely installed over transversely oriented liner edges facing the airstream at forward discharge and at any point where lined duct is preceded by unlined duct.

H. Seal all leading edges of liner, including at duct joint, coils and dampers, with a thick coat of Johns Manville SuperSeal Edge Treatment.

I. Liner installation shall comply with the recommendations of the SMACNA "HVAC Duct Construction Standard".

3.3 FLEXIBLE AND ROUND DUCT CONNECTIONS

A. Connection of flexible and round ducts to rectangular ducts to be made with spin-in type fittings.

3.4 FITTINGS AND ACCESSORIES

A. Install flexible connections in all duct connections to fans and air handling units, unless otherwise noted.

B. Install manual balancing dampers with locking quadrants where shown on the Drawings and as required for proper balancing of the systems. Note that manual balance dampers should not be provided in apartment units, corridors and other areas where manual balance dampers are not specifically shown. In those areas, balancing will be accomplished using the opposed blade dampers behind the air devices or via constant volume regulators. Locking quadrants shall be easily accessible. On insulated ducts, locking quadrants shall be installed on outside of insulation.

C. Install double turning vanes in all right angle elbows. Install 45° tap collar for branch ducts and register openings.

D. Provide access doors in ducts to all automatic dampers, fire dampers, smoke dampers and elsewhere as shown on drawings unless otherwise noted. Doors shall be minimum 12" x 12", or duct width x 12", whichever is smaller, unless otherwise noted. Access doors at fire dampers shall be located so that fire dampers may be reopened from them in case of fusible link failure.

E. All duct joints in duct systems shall be made tight. Duct tape or joint tape may be used to seal joints.

F. The use of multi-piece adjustable angles and elbows is prohibited.

G. All dampers, including "motorized dampers", shall be provided by the Heating Contractor.

3.5 DUCT COORDINATION

A. Carefully coordinate duct routing in all areas of the building, especially in the apartment units. Avoid airflow restrictions in flexible ductwork due to pipe or conduit routing conflicts.

END OF SECTION 23 31 13.13

SECTION 23 33 13

DAMPERS

PART 1 GENERAL

1.1 REFERENCE

A. Section 233113.13 - LOW PRESSURE DUCTWORK

1.2 SCOPE

A. Furnish and install dampers and appurtenances with size and capacities as shown on the drawings.

PART 2 PRODUCTS

2.1 MANUAL BALANCING DAMPERS

A. Based on Ruskin Type MD-35/OB opposed blade with molded synthetic bearings, 6" wide 16 gauge galvanized steel blades, extended shaft and linkage.

1. Balance dampers for round ducts shall be Ruskin MDRS- 25 single blade, 20 gauge galvanized steel.

2. All dampers shall be equipped with locking quadrants.

B. At the Contractor’s option, manual balancing dampers shall be manufactured by the Contractor per SMACNA Standards. Dampers shall have locking quadrants on both sides of the duct.

C. Manual balance dampers shall not be provided for supply air branch ducts located above gypsum board ceilings in apartment units. Provide manual balance dampers for branch ducts in all other areas.

2.2 MOTOR OPERATED DAMPERS

A. Outside air ducts: Based on Honeywell model EARD round damper with a 24 Vac, spring-open return damper motor with the following features:

1. Adjustable open position range stops.
2. Shipped as power open/spring return closed damper.
3. Blade closes off tightly against gasket for minimal leakage.
4. Galvanized steel.
5. Rated to operate up to 1 in. w.c.
6. Simple, easy-to-wire, two-wire installation.
7. Male (crimped) and female (uncrimped) ends to connect to any rigid or flexible round duct.

B. All other applications: Ruskin Type CD-50, opposed blade with self- lubricating molded synthetic bearings, 5" X 1" X .125-6063 T5 extruded aluminum hat channel with hat mounting flanges on both sides of frame. 6" wide 6063 T5 heavy gauge extruded aluminum airfoil shape blades. Anti-leakage jamb seals, vinyl gasket blade seals, extended shaft and linkage. Maximum allowable leakage through dampers, 6 CFM per sq. ft. at 4" of static pressure behind louver. All dampers shall be equipped with multiple 120 volt, 60 cycle, single phase motor operators as required. Spring closed.

2.3 FIRE DAMPERS

A. Fire dampers in low velocity ductwork shall be Ruskin model DIBD2 Dynamic Type "B" with interlocking hinged blades out of the airstream unless otherwise noted. All dampers shall be UL approved and labeled and shall meet all requirements of NFPA No. 90A. Furnish with UL labeled fusible links with temperature ranges to conform to NFPA recommendations. All fire dampers shall be dynamic type.

1. Furnish and install, at locations shown on the plans, dynamic fire dampers tested, constructed and labeled in accordance with the latest edition of UL Standard 555. Dampers shall have a fire rating of 11/2 hours and shall meet the requirements of the latest edition of NFPA90A.

2. Each damper shall include a 165°F fusible link and shall be labeled for use in dynamic systems. Dampers labeled for use in static systems only are not permitted. The damper shall be rated for dynamic closure at 2000 fpm and 4 inches w.g. static pressure and shall be rated to close with airflow in either direction.

3. Each dynamic fire damper shall include a steel sleeve and mounting angles furnished by the damper manufacturer to ensure appropriate installation. Submittal information shall include the fire protection rating, maximum velocity/pressure ratings and the manufacturer's UL installation instructions. The dampers shall be installed in accordance with the manufacturer’s UL installation instructions.

2.4 CEILING RADIATION DAMPERS

A. Ceiling radiation dampers may be any of the manufacturers and model numbers listed in the U.L. details for the assembly that they will be installed in. Refer to the architectural drawings for the specified U.L. assembly design numbers. Confirm the actual assemblies being used prior to ordering ceiling radiation dampers. The following dampers are approved for use with the basis of design U.L. assemblies:

1. Floor / Ceiling U.L. Design No. L563:

For use with min 18 in. deep trusses Max plenum box size nom 19 in. long by 19 in. wide and 11-7/8 in. high fabricated from galv steel. Aggregate damper openings shall not exceed 128 sq in. per 100 sq ft of

ceiling area. Damper installed in accordance with the manufacturer's installation instructions provided with the damper.

AIRE TECHNOLOGIES INC — Models: CRD model 50 w/Boot, CRD model 50EA w/Boot, CRD model 55 w/Boot, CRD model 55 EA w/Boot.

LLOYD INDUSTRIES INC — Model CRD 50-BT, CRD 50-EA-BT, CRD 55-BT, CRD 55 EA-BT

UNITED ENERTECH CORP — Model C-S/R-WT-L, C-S/R-EA-L, C-S/R-BT, C-S/R-EA-BL

For use with min 18 in. deep trusses Max plenum box size nom 13 in. long by 13 in. wide and 11-7/8 in. high fabricated from galv steel. Aggregate damper openings shall not exceed 50 sq in. per 100 sq ft of ceiling area. Damper installed in accordance with the manufacturer's installation instructions provided with the damper.

LLOYD INDUSTRIES INC — Model CRD 50-BT-6, CRD 50-EA-BT-6, CRD 55-BT-6, CRD 55 EA-BT-6, CRD50- w X-BT-6

For use with min 18 in. deep trusses Max size ceiling outlet in plenum box nom 12 in. long by 12 in. wide. Plenum box fabricated from galv steel. Aggregate damper openings shall not exceed 72 sq in. per 100 sq ft of ceiling area. Installed in accordance with the manufacturer's installation instructions provided with the damper.

AIRE TECHNOLOGIES INC — Models: CRD model 50 w/Boot, CRD model 50EA w/Boot, CRD model 55 w/Boot, CRD model 55 EA w/Boot.

LLOYD INDUSTRIES INC — Model CRD 50-95BT, CRD 50-EA-95BT, CRD 55-95BT, CRD 55 EA-95BT

For use with min 18 in. deep trusses. Max size ceiling outlet in plenum box nom 16 in. long by 16 in. wide. Aggregate damper openings shall not exceed 128 sq in. per 100 sq ft of ceiling area. Damper installed in accordance with the manufacturer's installation instructions provided with the damper.

CROWN PRODUCTS CO INC — Models CRD50-FGPB-4.2-CP, -6.0-CP; CRD50-FGPB-4.2-EA-CP, -6.0-EA-CP.

LLOYD INDUSTRIES INC — Models CRD 50- FGPB-4.2, - 4.2 NI, -6.0, - 6.0 NI; CRD50-EA-FGPB-4.2, -4.2 NI, -6.0, -6.0 NI.

For use with min 18 in. deep trusses Max plenum box size nom 15 in. long by 15 in. wide and 11-7/8 in. high fabricated from galv steel. Aggregate damper openings shall not exceed 72 sq in. per 100 sq ft of

ceiling area. Damper installed in accordance with the manufacturer's installation instructions provided with the damper.

LLOYD INDUSTRIES INC — Models 45-CRD-LT-BT and 45-CRD-LTD-BT

For use with min 18 in. deep trusses Max size ceiling outlet in plenum box nom 10 in. long by 10 in. wide. Plenum box fabricated from galv steel. Aggregate damper openings shall not exceed 50 sq in. per 100 sq ft of ceiling area. Installed in accordance with the manufacturer's installation instructions provided with the damper.

LLOYD INDUSTRIES INC — Model 45-LTD-95-BT-4

For use with min 18 in. deep trusses Max plenum box size nom 19 in. long by 15 in. wide and 11-7/8 in. high fabricated from galv steel. Aggregate damper openings shall not exceed 96 sq in. per 100 sq ft of ceiling area. Damper installed in accordance with the manufacturer's installation instructions provided with the damper.

LLOYD INDUSTRIES INC — Model CRD50- w X-BT

For use with min. 18 in. deep trusses. Max. nom area shall be 349 sq in. Max. overall length and width shall not exceed 18-11/16 in. by 18-11/16 in. with max. 16 in. by 16 in. register opening. Aggregate damper openings shall not exceed 175 sq in. per 100 sq ft of ceiling area. Damper installed in accordance with the manufacturer's installation instructions provided with the damper. An aluminum or steel grille (Item 9) shall be installed in accordance with installation instructions.

MIAMI TECH INC — Model Series RxCRD, RxCRDS or RxCRPD

For use with min 18 in. deep trusses Max plenum box size nom 19 in. long by 19 in. wide and 11-7/8 in. high fabricated from galv steel. Aggregate damper openings shall not exceed 128 sq in. per 100 sq ft of ceiling area. Damper installed in accordance with the manufacturer's installation instructions provided with the damper.

METAL-FAB INC — Models MSCD-HC and MRCD-HC

For use with min 18 in. deep trusses Max plenum box size nom 14 in. long by 16 in. wide and 15 in. high fabricated from galv steel. Aggregate damper openings shall not exceed 112 sq in. per 100 sq ft of ceiling area. Damper installed in accordance with the manufacturer's installation instructions provided with the damper.

METAL-FAB INC — Model MCCD

2. Roof / Ceiling U.L. Design No. P544:

Maximum plenum box size nom. 19 in. long by 19 in. wide and 11-7/8 in. high fabricated from galvanized steel. Installed in accordance with the manufacturers installation instructions provided with the damper. Maximum damper openings
not to exceed 128 sq. in. per 100 sq ft of ceiling area.

AIRE TECHNOLOGIES INC — Models: CRD model 50 w/Boot, CRD model 50EA w/Boot, CRD model 55 w/Boot, CRD model 55 EA w/Boot

LLOYD INDUSTRIES INC — Model CRD 50-BT, CRD 50-EA-BT, CRD 55-BT, CRD 55 EA-BT

UNITED ENERTECH CORP — Model C-S/R-WT-L, C-S/R-EA-L, C-S/R-BT, C-S/R-EA-BL

Maximum plenum box size nom. 13 in. long by 13 in. wide and 11-7/8 in. high fabricated from galvanized steel. Installed in accordance with the manufacturers installation instructions provided with the damper. Maximum damper openings not to exceed 50 sq. in. per 100 sq ft of ceiling area.

HEATING AND COOLING PRODUCTS — Models 272-1, 272-2

LLOYD INDUSTRIES INC — Model CRD 50-BT-6, CRD 50-EA-BT-6, CRD 55-BT-6, CRD 55 EA-BT-6, CRD50-W, X-BT-6.

Maximum size ceiling outlet in plenum box nom. 12 in. long by 12 in. wide. Plenum box fabricated from galvanized steel. Installed in accordance with the manufacturers installation instructions provided with the damper. Maximum damper openings not to exceed 72 sq. in. per 100 sq ft of ceiling area.

AIRE TECHNOLOGIES INC — Models: CRD model 50 w/Boot, CRD model 50EA w/Boot, CRD model 55 w/Boot, CRD model 55 EA w/Boot

LLOYD INDUSTRIES INC — Model CRD 50-95BT, CRD 50-EA-95BT, CRD 55-95BT, CRD 55 EA-BT-6, CRD 55 EA-95BT.

Max size ceiling outlet in plenum box nom 16 in. long by 16 in. wide. Aggregate damper openings shall not exceed 128 sq in. per 100 sq ft of ceiling area. Damper installed in accordance with the manufacturers installation instructions provided with the damper.

CROWN PRODUCTS CO INC — Models CRD50-FGPB-4.2-CP, -6.0-CP; CRD50-FGPB-4.2-EA-CP, -6.0-EA-CP

LLOYD INDUSTRIES INC — Models CRD 50- FGPB-4.2, - 4.2 NI, -6.0, -6.0 NI; CRD50-EA-FGPB-4.2, -4.2 NI, -6.0, -6.0 NI

Max plenum box size nom 15 in. long by 15 in. wide and 11-7/8 in. high fabricated from galvanized steel. Aggregate damper openings shall not exceed 72 sq in. per 100 sq ft of ceiling area. Damper installed in accordance with the manufacturers installation instructions provided with the damper.

LLOYD INDUSTRIES INC — Models 45-CRD-LT-BT and 45-CRD-LTD-BT

Max size ceiling outlet in plenum box nom 10 in. long by 10 in. wide. Plenum box fabricated from galvanized steel. Aggregate damper openings shall not exceed 50 sq in. per 100 sq ft of ceiling area. Installed in accordance with the
manufacturers installation instructions provided with the damper.

LLOYD INDUSTRIES INC — Model 45-LTD-95-BT-4

Max plenum box size nom 19 in. long by 15 in. wide and 11-7/8 in. high fabricated from galv steel. Aggregate damper openings shall not exceed 96 sq in. per 100 sq ft of ceiling area. Damper installed in accordance with the manufacturers installation instructions provided with the damper.

LLOYD INDUSTRIES INC — Model CRD50-W X-BT

Max. nom area shall be 349 sq in. Max. overall length and width shall not exceed 18-11/16 in. by 18-11/16 in. with max. 16 in. by 16 in. register opening. Aggregate damper openings shall not exceed 175 sq in. per 100 sq ft of ceiling area. Damper installed in accordance with the manufacturers installation instructions provided with the damper. An aluminum or steel grille (Item 9) shall be installed in accordance with installation instructions.

MIAMI TECH INC — Model Series RxCRD, RxCRDS or RxCRPD

Max plenum box size nom 19 in. long by 19 in. wide and 11-7/8 in. high fabricated from galvanized steel. Aggregate damper openings shall not exceed 128 sq in. per 100 sq ft of ceiling area. Damper installed in accordance with the
manufacturers installation instructions provided with the damper.

METAL-FAB INC — Models MSCD-HC and MRCD-HC

B. All ceiling radiation dampers shall be installed per the manufacturer’s installation instructions and in accordance with the U.L. assembly detail requirements for each assembly type. Do not exceed the maximum plenum box size or maximum aggregate damper opening size limitations indicated in the U.L. details. Refer to the architectural fire rated assembly sheets for the basis of design U.L. assembly details.

2.5 Dampers by Ruskin, Greenheck, Pottorff or Nailor, of the same type and meeting specified requirements, may be furnished at the Contractor's option.

PART 3 EXECUTION

3.1 Install dampers as recommended by manufacturer.

3.2 Inspect areas to receive dampers. Notify the Owner’s Representative of conditions that would adversely affect the installation or subsequent utilization of the dampers. Do not proceed with installation until unsatisfactory conditions are corrected.

3.3 Install dampers at locations indicated on the drawings and in accordance with manufacturer's UL approved installation instructions.

3.4 Install dampers square and free from racking with blades running horizontally.

3.5 Do not compress or stretch damper frame into duct or opening.

3.6 Handle damper using sleeve or frame. Do not lift damper using blades, actuator, or jackshaft.

3.7 Install bracing for multiple section assemblies to support assembly weight and to hold against system pressure. Install bracing as needed.

3.8 All dampers and damper operators shall be checked and adjusted for proper operation and travel.

3.9 All dampers shall be labeled per Ohio Building Code requirements.

3.10 Provide access doors in the ductwork at all motor operated, fire and smoke dampers.

3.11 Dampers must be accessible to allow inspection, adjustment, and replacement of components. The sheet metal contractor shall furnish access doors in ductwork or plenums where required to provide this access. The general contractor shall furnish any access doors required in walls, ceilings, or other general building construction.

END OF SECTION 23 33 13

INLINE CABINET EXHAUST FANS

PART 1 GENERAL

1.1 REFERENCE

A. Section 23 01 05, Paragraph 1.5 - ENERGY CODE
B. Section 23 05 13 - ELECTRICAL WORK
C. Section 23 31 13.13 - LOW PRESSURE DUCTWORK

1.2 SCOPE

A. Furnish and install duct mounted inline exhaust fans and appurtenances with sizes and capacities as shown on the drawings.

PART 2 PRODUCTS

2.1 Inline ceiling cabinet fans based on Greenheck SP and CSP series with dynamically balanced forward curved centrifugal wheel, direct drive type motor, in embossed galvanized steel casing. Fans shall have a factory installed internal plug in type disconnect. The outlet duct collar shall include a spring loaded aluminum backdraft damper. The housing interior shall be lined with 0.5" acoustical insulation. SP series fans shall be furnished with non-yellowing high impact polystyrene intake grille attached to the housing with screws.

2.2 Fan ratings shall be AMCA certified and fan shall bear AMCA seals and shall be U.L. Listed.

2.3 Motor shall be 115/60/1 with built in thermal overload protection. The motor shall be mounted on vibration isolators.

2.4 Furnish fans with a factory mounted variable speed switch for balancing the fan system airflow.

2.5 Inline exhaust fans by Cook or Twin City of the same type, size and meeting capacity requirements, may be furnished at the Contractor's option.

PART 3 EXECUTION

3.1 Provide flexible connections at inlet and discharge ducts.

3.2 Mount unit from vibration isolators furnished with the unit minimum 90% efficient.

3.3 Auxiliary steel for supporting units to be furnished and installed by the HVAC Contractor.

3.4 HVAC Contractor shall provide line voltage thermostats for fan control where specified on the drawings.

3.5 Wiring of fans and line voltage thermostats and by the Electrical Contractor.

3. 6 All ductwork for fans that discharge into the ceiling plenum space shall be lined.

END OF SECTION 23 34 17

SECTION 23 34 20

BATHROOM EXHAUST FANS

PART 1 GENERAL

1.1 REFERENCE

A. Section 230105, Paragraph 1.05 - ENERGY CODE
B. Section 230513 - ELECTRICAL WORK
C. Section Section 233113.13 - LOW PRESSURE DUCTWORK

1.2 SCOPE

A. Furnish and install duct bathroom exhaust fans and appurtenances with sizes and capacities as shown on the drawings.

PART 2 PRODUCTS

2.1 Fans based on Broan LP80 with dynamically balanced forward curved centrifugal wheel, direct drive type motor, corrosion resistant galvanized steel housing and polymeric grille. Fans shall have a factory installed internal plug in type disconnect. The outlet duct collar shall include a spring loaded aluminum backdraft damper.

2.2 Fan shall be ENERGY STAR® qualified and have an energy efficient permanent split capacitor motor.

2.3 Fan ratings shall be AMCA certified and fan shall bear AMCA seals and shall be U.L. Listed.

2.4 Motor shall be 115/60/1 with built in thermal overload protection. The motor shall be mounted on vibration isolators.

PART 3 EXECUTION

3.1 Provide flexible connections at inlet and discharge ducts.

3.2 Auxiliary steel for supporting units to be furnished and installed by the HVAC Contractor.

3.3 Wiring of fans by the Electrical Contractor.

END OF SECTION 23 34 20

SECTION 23 37 00

REGISTERS, GRILLES AND DIFFUSERS

PART 1 GENERAL

1.1 REFERENCE

A. Section 233113.13 - LOW PRESSURE DUCTWORK

1.2 SCOPE

A. Furnish and install registers, grilles, diffusers and appurtenances with size and capacities as shown on drawings.

PART 2 PRODUCTS

2.1 SUPPLY AIR REGISTERS

A. Single deflection two-way supply air registers with ½" lanced front bars with 30 degree deflection angle. Furnish with parallel blade dampers, operable from face of register.

1. AirMate series 160, steel, surface mounted.

B. Double deflection supply air registers with vertical front bars, horizontal rear bars and opposed blade dampers, key-operated.

1. Titus 300RS, steel, surface mounted.

2.2 RETURN/TRANSFER AIR GRILLES

A. Grilles with angled horizontal face bars, fixed at 45 degrees.

1. Titus 350RL, steel, surface mounted.

B. Single deflection stamped face return air grilles, ½" lanced front bars with 30 degree deflection angle.

1. AirMate series 170, steel, surface mounted.

2.3 EXHAUST AIR REGISTERS

A. Registers with angled horizontal face bars, fixed at 45 degrees and opposed blade dampers, key operated.

1. Titus 350RL, steel, surface mounted.

2.4 LINEAR CEILING SUPPLY AIR DIFFUSERS

A. Extruded aluminum straight line diffusers with concealed keyways and alignment clips. Number of slots, direction of throw, size and capacities as shown on the Drawings. Install manual dampers in branch ducts to linear diffusers. Units shall have integral volume and pattern control. Air pattern to be adjustable from full horizontal to full vertical. Pattern controllers must be capable of shut-off for each slot.

1. Titus ML, adjustable blow, concealed mounting, type 2B border. See Drawings for slot width and quantity. Furnish with 14" high insulated plenum; match plenum connection sizes with the duct sizes indicated on the drawings.

2.5 Commercial registers, grilles and diffusers by Krueger, Nailor or Price of the same type, size and meeting other requirements may be furnished at the Contractor's option. Residential stamped air devices by Hart & Cooley or USAire of the same type, size and meeting other requirements may be furnished at the Contractor's option. Performance data shall be included in the product submittals in order for alternate manufacturers to be considered.

PART 3 EXECUTION

3.1 All steel registers and grilles shall be furnished with factory prime coat of paint. Outlets in ceilings shall be furnished with factory white finish unless otherwise noted.

3.2 Diffusers in ceilings shall have flush appearance and shall initially be set by Mechanical Contractor for horizontal air pattern distribution.

3.3 Furnish frames and trim compatible with ceilings shown on Architectural drawings. Verify the grid face dimension of the ceiling suspension system for all lay-in devices. Furnish narrow tee type devices where required.

3.4 All diffusers shall be installed with equalizing grid.

3.5 Coordinate the exact location of all air devices located in apartment units with the General Contractor.

3.6 Provide additional support hangers for grilles and registers mounted in lay-in ceiling tiles.

3.7 Manufacturer's drawings shall include the "K" factor for use with an Alnor Velometer for each size and type of register, grille and diffuser furnished.

END OF SECTION 23 37 00

LOUVERS

PART 1 GENERAL

1.1 REFERENCE

A. Section 23 31 13.13 - LOW PRESSURE DUCTWORK

1.2 SCOPE

A. Furnish and install louvers and appurtenances with size and capacities as shown on the drawings.

PART 2 PRODUCTS

2.1 STATIONARY LOUVERS

A. Heavy duty, drainable head type stationary louvers shall be Greenheck ESD-435, 4" deep of 12 gauge (.081") 6063-T5 extruded aluminum with 1/2" aluminum mesh birdscreen inside. Louvers shall be certified to be weathertight when handling CFM's indicated on Drawings. For comparison purposes, a 4'-0" x 4'-0" louver must have a minimum free area of 8.92 sq. ft. and a maximum pressure drop of 0.06" at 600 FPM through the free area (intake or ehxaust). Water penetration shall be no more than 0.01 ounces of water per square foot of free area when tested for 15 minutes at 989 FPM per AMCA Standard 511. Louvers shall have AMCA certified rating seal. Provide data with submittals. Louvers to have continuous blade appearance.

2.2 Louvers by Greenheck, Ruskin or Nailor, of the same type and meeting specified requirements, may be furnished at the Contractor's option.

PART 3 EXECUTION

3.1 Stationary louvers to be installed by this Contractor. Caulk all around louvers with gun grade "Sonolastic" sealant. Caulking shall be applied with a hand gun and work shall be left neat and clean.

A. Finish to be Kynar 500, black. Confirm color selection with the Architect during submittal review.

B. Caulk color to match louver finish as closely as possible.

3.2 Louvers shall be installed per the manufacturer’s installation instructions.

END OF SECTION 23 37 23

SECTION 23 82 39.13

CABINET UNIT HEATERS (ELECTRIC)

PART 1 GENERAL

1.1 REFERENCE

A. Section 230105, Paragraph 1.05 - ENERGY CODE
B. Section 230513 - ELECTRICAL WORK

1.2 SCOPE

A. Furnish and install electric cabinet unit heaters and appurtenances with size and capacities as shown on the Drawings.

PART 2 PRODUCTS

2.1 Units to have electric heating elements with built-in automatic reset overheat protection. Units shall meet all UL and NEC requirements and bear UL label. Units shall be furnished with 1” thick throwaway filters.

1. Manufacturer – QMark

2. Wall mounted units shall be furnished with surface mounting or recessed mounting frames as indicated on the drawings.

2.2 Motors - fractional HP, voltage, phase and hertz as shown on the drawings shall be furnished with contactor.

2.3 Heater shall have sheathed finned tubular elements.

2.4 Provide built-in or remote thermostat as indicated on the drawings for control and a fan delay switch.

2.5 Units shall be constructed with front of 16 gauge, top and sides of 18 gauge steel. Prime coat concealed units at the factory. Baked enamel finish on wall and exposed ceiling units; color selection by Architect.

2.6 Heaters shall be furnished with circuit breakers.

2.7 Cabinet unit heaters by Trane, Indeeco or Marley, meeting all requirements may be furnished at the Contractor's option.

PART 3 EXECUTION

3.1 All electrical wiring by the Electrical Contractor.

3.2 Provide auxiliary support steel for ceiling mounted units.

3.3 Install cabinet unit heaters 8” above the finished floor elevation.

END OF SECTION 23 82 39.13

SECTION 23 82 46

ELECTRIC DUCT HEATER

PART 1 GENERAL

1.1 REFERENCE

A. Section 23 05 13 - ELECTRICAL WORK
B. Section 23 31 13.13 - LOW PRESSURE DUCTWORK

1.2 SCOPE

A. Furnish and install electric open coil type duct heaters of size, capacity and electrical characteristics as shown on the Drawings. Heaters shall be U.L. approved and conform to National Electrical Code requirements.

PART 2 PRODUCTS

2.1 Units shall be slip-in design with unit mounted controls.

2.2 Element shall be open type design with 80/20 Ni Chrome iron-free wire in high temperature ceramic bushings with reinforced steel supports on 3-1/2” (max.) centers. Terminals shall be stainless steel, machine crimped to element. Frames shall be constructed of aluminized or galvanized steel. Three phase coils shall be equally balanced on all phases.

2.3 Terminal box/control cabinet shall have solid hinged cover and shall be insulated from the duct. Cover shall have thumb-latch fasteners (no sheet metal screws). On lined ducts, the terminal box shall be recessed by the thickness of the duct liner or extended cold pin leads shall be provided.

2.4 Units shall be provided with the following control components:

A. Terminal blocks.
B. Automatic reset thermal cutout for primary over-temperature protection.
C. Manual reset thermal cutout with backup contactors for secondary over-temperature protection in each heater stage.
D. Differential pressure switch to prove airflow.
E. Fuse blocks with "Time Delay Fuses" as required by NEC.
F. Non-fused, door interlocked disconnect.
G. Pilot lights of push-to-test type for the following:
    1) Air Pressure Switch Open
    2) Each step of heating.
H. Fused 24 volt control transformer.
    1) Controls by Unit Manufacturer.
    2) 24 Volt fan interlock relay.
    3) Magnetic contactors.

4) Weatherproof terminal box.
5) 24 Volt fused control transformer.
6) One time replaceable manual reset cutouts (provide six spares per heater).

2.5 24 volt thermostats shall be furnished by the HVAC contractor. Thermostats shall be capable of controlling two stages of heat. The heat pump compressor shall be the first stage of heat. The electric duct heater shall be the second stage of heat.

2.6 Contactors shall be by Square D, ITE or Allen Bradley. See Electrical Specifications for type and spare fuses required.

2.7 Heat limiters or other fusible over temperature protective devices shall not be acceptable.

2.8 Panels shall be U.L. listed, constructed of heavy gauge steel with continuous welded seams and baked enamel finish. Panel doors shall be hinged with 2-point locking handle.

2.9 Duct heater shall be U.L. listed for 0-clearance to combustibles and use with packaged rooftop H&AC units.

2.10 Duct heaters by JCI, Indeeco, Tutco or QMark, meeting all specification requirements may be furnished at the Contractor's option.

PART 3 EXECUTION

3.1 Install heaters in ductwork in accordance with manufacturer's recommendations.

3.2 The heater shall be wired such that it is only energized when the associated air handling unit fan is operating.

3.3 All power wiring by Electrical Contractor.

3.4 All control and interlock wiring by the HVAC Contractor.

END OF SECTION 23 82 46

SECTION 23 90 10

HVAC ALTERNATES

PART 1 GENERAL

1.1 REFERENCE

A. Section 235413 - SPLIT SYSTEM AIR HANDLING UNITS
B. Section 236214 - AIR COOLED HEAT PUMP UNITS
C. Section 238113.13 - VERTICAL PACKAGED TERMINAL A/C UNITS

1.2 SCOPE

A. Proposals shall clearly call out all specification items that are not met by the alternate equipment manufacturer. This includes, but is not limited to capacities, controls, construction, etc.

B. Separate prices for individual equipment items specified herein must be provided to allow comparison between manufacturers. If separate prices are not provided, the Bid will not be considered.

C. ALTERNATE BID NO. H1 – AIR HANDLING UNITS & CONDENSING UNITS TWO-YEAR LABOR WARRANTIES

Bidders shall state the amount to be ADDED TO the Base Bid for providing two-year labor warranties for the air handling units and condensing units. This is in addition to the five-year parts warranties required under the base bid.

D. ALTERNATE BID NO. H2 – AIR HANDLING UNITS & CONDENSING UNITS THREE-YEAR LABOR WARRANTIES

Bidders shall state the amount to be ADDED TO the Base Bid for providing three-year labor warranties for the air handling units and condensing units. This is in addition to the five-year parts warranties required under the base bid

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

Not Applicable

END OF SECTION 23 90 10

SECTION 23 99 00

HVAC COMMISSIONING

PART 1 - GENERAL

1.1 SUMMARY

A. Commissioning is a systematic process of ensuring that applicable building systems perform according to the design intent and the owner's operational needs. The commissioning process encompasses and coordinates the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing, and training.

B. This section includes requirements that apply to implementation of commissioning with regard to specific division 23 systems, subsystems, and equipment being commissioned.

1.2 RELATED WORK

A. Section 23 05 93 - TESTS AND ADJUSTMENTS

1.3 SCOPE

A. The HVAC Contractor shall provide commissioning for all HVAC systems in accordance with the minimum requirements of the following documents:

1. NEBB Procedural Standards - 1999 Procedural Standards for Building Systems Commissioning
2. ASHRAE Guideline 1-1996 - The HVAC Commissioning Process

B. The HVAC Contractor or a subcontractor thereof shall assume all duties and responsibilities of the Commissioning Authority (CxA). Provide all labor and materials required for commissioning of the HVAC systems/equipment.

C. HVAC systems/equipment to be commissioned:

1. Split System Air Handlers
2. Air Cooled Heat Pumps
3. Exhaust fans
4. Electric Unit Heaters
5. Dampers
6. All unitary Controls

1.4 COMMISSIONING PROCESS OVERVIEW

The following describes typical commissioning tasks during construction and the general order in which they occur.

A. Commissioning during construction begins with a scope meeting conducted by the CxA where the commissioning process is reviewed with the commissioning team members, including the Construction Manager, Owner's Project Manager, Architect, Engineer, TAB contractor, Controls contractor and any other installing subcontractors or suppliers of equipment.

B. Additional meetings are scheduled by the CxA with appropriate commissioning team members on an as-needed basis.

C. The Contractors and/or their equipment manufacturer's representatives, under their own direction, execute and document equipment startups. This may include the CxA witnessing startup of selected equipment. The CxA shall be notified a minimum of 48 hours in advance of starting up equipment.

D. The CxA develops specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each Contractor responsible to execute a test provides assistance to the CxA in developing the procedures. Prior to execution, the CxA provides test procedures to the Contractors who review them for feasibility, safety, and equipment warranty protection. When requested, the CxA will submit the tests to the A/E for review.

E. The functional performance test procedures are executed by the Contractors/Sub-Contractors, under the direction and supervision of the CxA. Test results are documented by the CxA.

F. Items of non-compliance in material, installation or setup are corrected at the Contractors/Sub-Contractors' expense. Functional performance test procedures are repeated as necessary.

G. The CxA reviews the O&M documentation for completeness.

H. The CxA verifies that adequate owner training is provided.

I. Commissioning is completed before Substantial Completion is achieved.

J. Deferred testing is conducted, as specified or required.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 RESPONSIBILITIES

A. Coordinate and ensure cooperation and participation of all trades associated with mechanical contract work, such as sheet metal, test and balance and controls. Coordinate and direct commissioning activities in a logical, sequential and efficient manner.

B. Complete all test and balance work for all systems/equipment to be commissioned prior to commencement of functional performance testing.

C. Collect testing certificates for all factory tested items. Submit a copy of all testing certificates to the Construction Manager.

D. Establish functional performance test procedures for equipment and systems. This may include direct digital control system trending, stand-alone data logger monitoring or manual functional testing.

E. Supervise and direct functional performance testing by contractors / subcontractors of applicable equipment and systems.

F. Maintain a master deficiency and resolution log.

G. Compile and maintain a commissioning record.

H. Review the final O&M manuals.

I. Provide a final commissioning report.

J. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.

END OF SECTION 23 99 00

SECTION 260000

GENERAL PROVISIONS

PART 1 GENERAL

1.01 REFERENCE

A. The General Conditions and other Contract Documents as set forth in the foregoing pages are hereby incorporated into and become a part of the Specifications for work under this title.

B. All Specifications under this Division Title are directed to and are the responsibility of the Electrical Contractor. Unless other trades or persons are specifically mentioned, "Electrical Contractor" is inferred and intended.

1.02 CONTRACT DRAWINGS

A. The Drawings accompanying these Specifications are complementary each to the other and what is called for by one shall be as if called for by both.

B. Consult all Contract Drawings that may affect the location of equipment, conduit and wiring and make minor adjustments in location to secure coordination.

C. Wiring layout is schematic and exact locations shall be determined by structural and other conditions. This does not mean that the design of the system may be changed. It refers only to the exact locations of conduit and equipment to fit into the building as constructed and with the coordination of conduit and other equipment with piping and equipment included under other divisions of the Specifications.

D. Coordinate layout of Electrical work with other trades. Make minor adjustments in location required for coordination. Locations of structural systems, heating work and plumbing lines shall take preference over locations of conduit lines where conflict occurs.

E. Other than minor adjustments shall be submitted to the A/E for approval before proceeding with the work.

F. The location of outlets and switches shown on the Drawings is approximate, and the A/E shall have the right to relocate any outlets or switches before they are installed without additional cost.

G. The first manufacturer listed in these Specifications or on the drawings, in schedule or coded note form, is the basis for design. Any manufacturers listed below this base manufacturer are considered to be other acceptable manufacturers. It shall be the responsibility of the Contractor and the Supplier to coordinate these other acceptable manufacturers' equipment with all building trades and building architecture. The other acceptable manufacturers' products shall match the base manufacturer's products in size, quality and performance.

1.03 MANUFACTURER'S DRAWINGS

A. The Contractor shall submit to the A/E for review highly-legible, original (not printed and scanned) copies of manufacturer's drawings and wiring diagrams in PDF format. The A/E will review Contractor's shop drawings and related submittals (as indicated below) with respect to the ability of the detailed work, when complete, to be a properly functioning integral element of the overall system designed by the A/E. Before submitting a shop drawing or any related material to the A/E, Contractor shall: review each such submission for conformance with the means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto, all of which are the sole responsibility of Contractor; approve each such submission before submitting it; and to electronically stamp each such submission before submitting it. The A/E shall assume that no shop drawing or related submittal comprises a variation unless Contractor advises A/E otherwise via a written instrument which is acknowledged by A/E in writing. The items, types of submittals and related material (if any) called for are indicated below:

ITEMS	TYPE SUBMITTALS REQUIRED
Lighting Control Equipment	Catalog Cuts/Shop Drawings
Protective Devices	Shop Drawings
Electrical System Coordination and Fault Study	Full Report
Distribution Panelboards	Shop Drawings
Panelboards	Shop Drawings
Load Centers	Shop Drawings
Meter Centers	Shop Drawings
Wiring Devices	Catalog Cuts
Fuses	Catalog Cuts
Disconnect Switches	Catalog Cuts
Motor Starters and Controls	Shop Drawings
Lighting Fixtures, Lamps, Power Supplies	Catalog Cuts, Shop Drawings where specified custom
Fire Alarm System	Sealed Shop Drawings

B. The A/E shall return shop drawings and related materials with comments provided that each submission has been called for and is stamped by Contractor as indicated above. The A/E shall return, without comment, material not called for or which Contractor has not approved, or shop drawings that, at the A/E's discretion, are not legible.

C. A/E's review of Manufacturer's Drawings or Schedules shall not relieve the Contractor from responsibility for errors or omissions in Manufacturer's Drawings or Schedules and deviation from A/E's Drawings or Specifications.

D. At the completion of the Job, before final payment is made, the Contractor shall submit one (1) full-size, detailed copy of Manufacturer's red-lined "As-Built" Drawings to the A/E for inclusion in record drawings.

E. The HVAC Contractor is to provide ¼" scale reproducible vellums of sheet metal drawings for use in coordinating work of Plumbing, Fire Protection and Electrical with layout of air distributions system and related work. Lighting, ceiling grid and ceiling access doors will be shown lightly to verify coordination. HVAC Contractor to provide initial vellums within 60 days of award of contract. The Electrical Contractor is responsible for overlaying his work onto these vellums. He is also responsible for providing information as to size, elevation and proposed locations of all components and for coordination of his work with that of other Contractors. Final resolution of all items is to be determined at project meetings held by A/E.

1.04 JOB-SITE COPY OF DOCUMENTS

A. Maintain at the site, one copy of all Drawings, Specifications, Addenda, approved Shop Drawings, Change Orders and other modifications, in good order. The Drawings shall be marked to record all changes made during construction, especially deviations made necessary to incorporate equipment different from base equipment specified. These shall be available to the A/E. The Drawings shall be marked to record all changes made during construction and shall be delivered to the A/E for the Owner upon completion of the work. The A/E will furnish an additional set of Drawings for this purpose upon request.

PART 2 PRODUCTS

2.01 MATERIALS

A. All materials shall be new and undeteriorated and of a quality not less than the minimum specified.

B. Materials and equipment for which there are Underwriters' Laboratories (UL) Standard requirements, listing and labels shall have listing of Underwriters' Laboratories and be so labeled.

2.02 SUBSTITUTIONS

A. It is the intent of this article to make the Specification open in every respect to all available brands of material of equal quality during the period of bidding.

B. Bid shall be based on furnishing one of the brands of material and equipment mentioned in the Specifications. Submit, attached to the Bid, selected list of all material and equipment brands intended to be furnished if awarded the Contract. No change of brands shall be made after receipt of Bid and attached material brands list, unless approved in writing by the A/E.

C. Refer to "Instructions to Bidders" regarding substitutions.

D. Where the Contractor furnishes equipment or material specified as equal or which is accepted as a substitution, he is responsible for <u>all</u> modifications required for his work, and work of <u>all other trades</u> to install the equipment and insure performance as originally specified.

2.03 GUARANTEES

A. The Electrical Contractor shall be responsible for all defects, repairs and replacements in materials and workmanship for a period of one (1) year after final written acceptance by the A/E.

B. Product guarantees greater than one (1) year shall be passed along to the Owner for full benefit of the manufacturer's warranty.

2.04 QUANTITIES

A. Items may be referred to as singular or plural on the Drawings and in the Specifications. The Contractor is responsible for determining quantity of each item required.

PART 3 EXECUTION

3.01 INSTALLATION

A. Furnish and install all necessary hangers, supports, straps, boxes, fittings and other similar appurtenances not indicated on the Drawings but which are required for a complete and properly installed system consistent with the Architectural treatment of the building.

B. All conduit and cabling shall be properly supported. This Contractor may install, at his option, trapeze type supports fabricated with galvanized steel, slotted, and sized so capacity can be increased by 50% in future without exceeding specified design load limits. Secure raceway and cables to these hangers with conduit clamps. Extend ground conductor to these supports when supporting non-metallic cable/conduit.

C. Contractor shall inform himself fully regarding peculiarities and limitations of space available for installation of materials and apparatuses under this contract, and see that all equipment necessary to be reached from time to time for operation and maintenance are made easily accessible. Clearances, when possible, shall be greater than those required by Code.

D. Working Clearances: At least 6'-6" clear headroom must be maintained in front of all electrical equipment. Provide at least 3'-0" for 208/120 volt clear space in front of all electrical equipment as wide as the equipment with a minimum of 2'-6" wide. The same clearance shall be required at the rear of rear access equipment.

3.02 WORKMANSHIP

A. Electrical work shall meet or exceed the standards of installation and workmanship set forth in the latest edition of the National Electrical Contractors Association publication entitled National Electrical Contractors Association publications, except as otherwise modified in these Specifications or shown on the Drawings.

B. The A/E or Owner reserves the right to direct the removal and replacement of any item which, in his opinion, does not present an orderly, neat or workmanlike appearance, provided that such item can be properly installed in an orderly way by methods usual in such work, or which does not comply with the contract drawings or these Specifications. Perform such removals or replacements when directed in writing by the A/E and at the Contractor's expense.

C. The Electrical Contractor shall at all times keep the premises in a neat and orderly condition, and at the completion of the work shall properly clean up and cart away debris and excess materials.

END OF SECTION 260000

SECTION 260015

WORK INCLUDED

PART 1 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, tools, transportation, incidentals and appurtenances to complete in every detail and leave in working order all items of work called for herein and shown on the accompanying Drawings.

B. It is the intent that the ensuing work shall be complete in every respect and that any material or work not specifically mentioned or shown on the Drawings, but necessary to fully complete the work, shall be furnished.

1.02 COORDINATION OF PLANS AND SPECIFICATIONS

A. Contact the A/E immediately if there is any question regarding the meaning or intent of either the Plans or Specifications, or upon noticing any discrepancies or omissions in either the Plans or Specifications.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 SITE VISITATION

A. The Bidder is required to visit the site and fully inform himself concerning all conditions affecting the scope of the work. Failure to visit the site shall not relieve him from any responsibility in the performance of this Contract.

3.02 SUPERVISION OF WORK

A. The Contractor shall have in charge of the work, at all times during construction, a competent superintendent with a large experience in the work to be done under this Specification.

B. Refer to the Specifications covering all branches of the work and keep fully informed of the progress of general construction. Install all work that is concealed and built into the building in sufficient time to insure proper location without delays to the work of the other trades. Properly attend to the work during the process of building-in to prevent misalignment and damage.

3.03 TEMPORARY SERVICE

A. Furnish and install weatherproof temporary services to a central location as determined on the site by the General Contractor and the Power Company. The temporary service size is to be 200 amperes, 208/140 volt, 3-phase, 4-wire minimum and shall be installed in accordance with the Power Company's recommendations.

B. Furnish and install a weatherproof temporary panel. Extension of service to other parts of the project from this panel shall be at the expense of the Contractor requesting such service.

C. Temporary wiring and lighting shall be installed by the Electrical Contractor in accordance with NEC and OSHA.

D. Temporary electrical service shall be provided with a meter to monitor power consumption.

3.04 CUTTING AND PATCHING

A. Avoid cutting of concrete, masonry and other work by using inserts and sleeves instead. When necessary, cutting shall be done by the Electrical Contractor with

such tools and methods as to prevent unnecessary damage to surrounding areas or equipment.

B. Electrical Contractor shall give the General Contractor locations and sizes of all openings required for the installation of electrical equipment before walls, slab, etc., are started. If it becomes necessary to cut into new work because of the failure of this Contractor to notify the General Contractor, then the General Contractor shall coordinate any necessary cutting by this Contractor. Patching shall be at this Contractor's expense.

C. No cutting shall be done which will in any way reduce the structural strength of the building. Should such cutting be found necessary, the A/E must first be fully informed of in writing, and consent to, the proposed operation.

D. All work through post tension concrete podium must be approved in writing in advance by structural engineer. No core drilling of concrete podium shall be acceptable unless approved in writing. All cutting through poured concrete slabs and walls shall be done with core drills. No jackhammers will be allowed.

E. Patching shall match existing surfaces in type and finish and shall be done by the General Contractor at the Electrical Contractor’s expense.

F. Repair of damages created by this Contractor to newly painted areas shall be done by the General Contractor at the Electrical Contractor’s expense in type and finish to match surrounding areas.

G. All conduits, equipment, etc., that penetrate walls or floors shall have openings, sleeves, etc., filled and closed off to prevent the possible spread of fire or products of combustion through the wall or floor.

H. Where required to maintain fire rating, openings shall be sealed utilizing 3M Brand Fire Barrier Penetration Sealing systems. Fire barrier or fire stop systems from Crouse-Hinds, Thomas & Betts or Dow Corning may be used at Contractor's option. Openings shall be temporarily fire-stopped until permanent fire stopping is done. Sample UL listed fire stop details are included on the drawings for reference, and all fire-stopping shall be UL listed for the application used.

3.05 CLEANING AND PAINTING

A. All electrical equipment shall be kept dry and clean during the construction period. Switchgear, Panelboards, Transformers, Generators, etc., shall be covered with fiberglass reinforced plastic sheeting as a minimum form of protection. Provide additional protection if job conditions so require.

B. Interiors of all enclosures, switchgear, panelboards, motor control centers, transformers, etc., shall be thoroughly vacuumed and cleaned, and all dirt and debris shall be removed before installation of trims or covers.

C. All finished surfaces of equipment furnished under this Contract shall be thoroughly cleaned of dirt. All scratched or damaged surfaces shall be touched up with matching materials before final acceptance of the work. No exposed ferrous metal surfaces shall be left unpainted. Touch-up all galvanized surfaces, if scratched, with two coats of aluminum paint.

D. Prime and paint all steel hangers, boxes, straps, rods, etc. which are not provided with rust-protective finish or if the protective finish is damaged during installation. Paint is to be zinc chromate primer with aluminum bronze finish. This includes unfinished, mechanical and "exposed to view" locations.

E. Prime and paint both sides and edges of all wood mounting panels with two (2) coats of gray flameproof paint.

F. When all work is completed and has been satisfactorily tested and accepted by the A/E, all fixtures, conduit and other exposed surfaces shall be thoroughly cleaned.

3.06 EXCAVATION AND BACKFILL

A. Provide all excavation and backfill necessary to get the work in place. Such excavation shall be carried to the minimum dimensions and depths indicated, or as necessary for the proper installation and completion of the work.

B. Remove all formwork and debris before backfill is placed. Backfill is to be brought to the proper elevation and shall be puddled, tamped and thoroughly compacted. Finished grade shall be replaced in kind, i.e., sod, gravel, blacktop, concrete, etc., to match future surroundings.

C. Surplus soil and debris shall be removed from site by this Contractor unless the General Contractor requests that it be retained as future fill for rough grades.

D. All excavated areas shall be barricaded and properly protected.

E. Direct-buried conduits and cables shall have a compacted granular base and backfill to protect the buried services from sharp edges exposed during the original excavation.

F. Provide warning tape with traceable metallic line for each buried duct bank.

3.07 CAST-IN-CONCRETE ITEMS

A. Anchor bolts, boxes, conduit, sleeves or any other items required to be in poured-in-place concrete shall be furnished along with full location information to proper Contractor in time to cause no delay in work.

B. Shop Drawings for pre-cast units containing such items shall be approved by Electrical Contractor.

END OF SECTION 260015

SECTION 26 00 20

CODES AND FEES

PART 1 GENERAL

1.01 CODES

A. All work performed under this Specification shall be done in accordance with the latest edition of the National Electrical Code as prepared and published by the National Fire Protection Association; National Electrical Safety Code; Standards of National Bureau of Fire Underwriters; and any Federal, State or Local Codes that apply.

1.02 PERMITS AND FEES

A. Obtain and pay for all permits required by all laws, regulations or public authority having such jurisdiction. File drawings necessary to obtain permits.

B. The Electrical Contractor shall obtain and pay for all metering required by the Power Company for service.

1.03 OHIO ENERGY CODE

A. All motors used in Mechanical Systems must comply with the requirements of the State of Ohio "Model Code for Energy Conservation".

B. All motors rated greater than 1000 watts shall have a power factor of not less than 85% under rated load conditions. Power factor of less than 85% shall be corrected to at least 90% under rated load conditions.

C. For motors up to and including 50 horsepower, the manufacturer shall provide motors with a power factor of not less than 85%. If this is not possible, then the manufacturer shall furnish and install power factor corrective devices to comply with this Code.

D. Motors larger than 50 Horsepower with starters furnished by the Electrical Contractor shall have power factor corrective devices furnished and installed by the Electrical Contractor.

E. On all package equipment where starters are provided with the equipment such as chillers, heat pumps, rooftop units, etc., the manufacturer will be responsible for furnishing and installing power factor corrective devices to comply with this Code.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

Not Applicable

END OF SECTION 260020

SECTION 260025

TESTS AND INSPECTIONS

PART 1 GENERAL

1.01 INSPECTIONS

A. Obtain all inspections required by all laws, ordinances, rules, regulations or public authority having jurisdiction. Obtain certificates of such inspections and submit these to the A/E. Pay all fees, charges and other expenses in connection with inspections.

B. Before any electrical work is covered, the A/E will inspect the electrical work completed at that time.

C. When the Contractor determines all work is completed and working properly per the Contract Documents, he shall request a "Final" inspection by the A/E in writing. If more than one re-inspection is required after this final inspection, the Contractor shall bear all additional costs, including compensation for the A/E's additional necessary services. A final inspection will not be made until Operating and Maintenance Manuals and Test Reports are submitted and approved and all prior "Observation report" punch lists are completed, signed and returned to the A/E.

D. All work shall be inspected by the authority having jurisdiction and upon completion of the work, the Electrical Contractor shall furnish a certificate of inspection and approval before final payment on the Contract will be allowed. Fee for inspections shall be a part of this Contract.

1.02 OBSERVATION REPORTS

A. During the course of construction, the A/E will prepare "Observation Reports" with a list of items found to be in need of correction. The Contractor shall correct all items listed. A space is provided on the form for the Contractor to note the completion of each item. All prior "Observation Report" items must be completed and the lists signed and returned to the A/E prior to making the final inspection. After the final list is issued, the same procedure applies.

1.03 TESTS

A. When the A/E makes final inspection of all electrical work, he will order tests to be performed as deemed necessary. These tests may include operation of lights and equipment, continuity of conduit system, grounding and insulation resistances and various system operations. This Contractor shall provide such assistance as required, including manpower and tools, to perform these tests and simulate control sequences. The Contractor, not the A/E, is responsible to turn on the systems and demonstrate they are operating properly.

B. Submit data taken during such tests to the A/E. Pay all necessary professional fees involved in required testing of equipment.

C. All signaling systems, such as security system, TV system and fire alarm system shall be checked out and tested by a qualified field representative of equipment vendor. A report shall be submitted to A/E by vendor representative indicating results of such final checkout and tests. Final payment will not be approved until such reports are submitted.

D. If the A/E determines that any work requires special inspection, testing or approval which “Part 3: Execution” does not include, he will, upon written authorization from the Owner, instruct the Contractor to order such special inspection, testing or approval. The Contractor shall give timely notice so the A/E may observe these inspections, tests or approvals. If such special inspection or testing reveals a failure of the work to comply with the requirements of the Contract Documents, the Contractor shall bear all costs thereof, including compensation for the A/E's additional services made necessary by such failure. Otherwise the Owner shall bear such costs, and an appropriate Change Order shall be issued.

1.04 UNACCEPTABLE WORK

A. Work shall be unacceptable when found to be defective or contrary to the Plans, Specifications or Codes specified, or accepted standards of good workmanship.

B. The Contractor shall promptly correct all work found unacceptable by the A/E whether observed before or after substantial completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such unacceptable work, including compensation for the A/E's additional services made necessary thereby.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

3.01 PERFORMANCE

A. Contractor, subcontractor, vendors or manufacturer shall provide tests on the following equipment:

Lighting Control Equipment
Motor Controls and Interlocks
Emergency Power System
Emergency Lighting System
Switchboard Devices and Metering
Voice/Data and CATV Cabling
Fire Alarm System

Refer to the appropriate specification section for description of the tests.

3.02 LIGHTING

A. All lamps in all fixtures shall be installed new. The entire system shall be checked for satisfactory operation.

B. All lighting control automation shall pass functional performance testing.

3.03 PHASE ROTATION

A. Prove that the switchgear, panelboards, etc. are connected for clockwise (A-B-C) rotation as marked by the manufacturer.

B. Prove that all electrical equipment is connected for clockwise rotation (A-B-C).

3.04 NEUTRAL-GROUND SEPARATION

A. Prove that the neutral and ground are separated, except as required by the National Electrical Code, at service entrance and transformer secondaries.

3.05 RESISTANCE AND CONTINUITY

A. Provide insulation and grounding resistance and ground continuity tests of feeders, branch circuits, lightning protection system or equipment on demand.

3.06 CONNECTIONS

A. All bus duct and switchboard bus joints shall be bolted with a torque wrench and checked by the manufacturer.

B. Prove that mechanical connections are torqued to manufacturer's recommended UL and NEMA standards on demand.

3.07 CONTROL AND INTERLOCKING

A. Prove that motors and equipment operate as indicated in control and wiring diagrams and in sequence of operation.

B. Prove that lighting, switchboard and miscellaneous controls operate as indicated in control and wiring diagrams and in sequence of operation.

C. Prove that the Fire Alarm System interlocks operate as indicated in section 28 31 00.

3.08 EQUIPMENT

A. Provide necessary electrical personnel and testing instruments as required to assist in installation testing.

B. Provide testing as recommend by the manufacturer for access control, guest entry station, and video surveillance systems to confirm proper installation and equipment operation.

END OF SECTION 260025

SECTION 260120

OPERATION AND MAINTENANCE MANUALS

PART 1 GENERAL

1.01 OPERATION AND MAINTENANCE MANUALS

A. Submit three (3) bound copies of operation and maintenance manuals, 8-1/2 inch by 11 inch in 3-ring hardback binder. 23 inch X 25 inch and larger sheets shall be folded and indexed in rear of binder.

B. Format:

1) The Title page shall include the Title of the Project, Name of Owner, Address of the Project, Date of Submittals, Name and Address of Contractor, Name of Architect and Name of Engineer.
2) Second page shall be the Index for the manual contents.
3) The first section shall include a copy of each approved shop drawing and submittal with an index at the beginning of the section.
4) The second section shall include a list that is the same as the submittal drawings of all equipment used on the project. List shall include each suppliers name and address.
5) The third section shall include Operating and Maintenance Instructions for the Fire Alarm System (including interlocks), Generator and Transfer Switches, Lighting Control Equipment, Motor Starters, Meter Centers, Switchboards and Large Overcurrent Protection Devices, and Surge Protective Devices. Manufacturer's maintenance manuals for equipment furnished under this Contract shall include such items as parts lists, detailed lubrication instructions, procedures for performing normal maintenance functions, preliminary trouble shooting procedures and wiring diagrams.
6) The fourth section shall include complete wiring diagrams for the fire alarm system and generator system as actually wired, including control and interlocking wiring.
7) Include brief but complete instructions for start-up, shut-down and routine maintenance of each system.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 OWNER PERSONNEL INSTRUCTION

A. After placing systems in operation, thoroughly instruct designated Owner's personnel on operation and maintenance of all equipment and systems.

B. Provide a minimum of four (4) hours of total instruction. Instructions shall include:

1) Location of equipment and explanation of function.
2) Clarification and explanation of operating and maintenance manuals.
3) Coordination of written and verbal instructions so personnel understands each.

C. The Electrical Contractor shall be responsible for arranging for the instruction and supervision at a time convenient to the Owner or his representative and for notifying the A/E of the time at least 48 hours in advance.

3.02 ROUTINE INSTRUCTION

A. Frame under glass one (1) copy of brief start-up, shut-down and routine maintenance instructions, and complete system wiring diagrams. Mount framed copy on the Electrical Room wall.

END OF SECTION 260120

SECTION 260519

WIRE AND CABLE

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install all wiring required to connect complete power, lighting, grounding, control, and auxiliary systems.

PART 2 PRODUCTS

2.01 STANDARDS

A. All conductors shall be stranded and of the AWG size and type shown on the Drawings. Where no size or type is shown, conductors shall not be less than #12 type XHHW, THHN or THWN. All conductors shall be copper except where noted otherwise herein, and have 600 volt insulation, be UL listed and of an American manufacturer.

B. All conductors shall be stranded unless otherwise noted and conform to the latest edition of the Underwriters' Laboratories, Inc., "Standard for Thermoset-Insulated Wires and Cables" and the National Electrical Code.

C. No wire used for lighting or power shall be smaller than #12 AWG for common areas, #14 AWG for residential wiring where permitted by code and connected load.

D. No wire used for control circuits shall be smaller than #14 AWG.

E. Stranded #18 AWG copper or #18 solid two-conductor cable shall be the minimum used for fire protective signaling circuits. #18 AWG stranded shall be the minimum used for fire alarm remote annunciators. Limited energy cable shall have insulation labeled for fire alarm circuits and be used for fire alarm systems requiring limited energy cabling. All cabling types and sizes must be selected by the manufacturer's representative who prepares the sealed shop drawings.

F. No wire used for 48 volt DC shall be smaller than #10 AWG.

G. Each branch circuit requiring a neutral shall be furnished with a separate individual neutral conductor, unless noted otherwise. No shared neutrals will be accepted.

H. All wiring not concealed in conduit shall be plenum rated. Refer to Division 27 and Division 28 specifications for additional wiring requirements.

I. Type MC cable shall be a factory assembly of copper conductors, Type XHHW or THHN, rated 600 volts, 90 degrees C in dry locations and protected by a

flexible enclosure of galvanized steel interlocked armor. Cable assembly shall include full-size, copper grounding conductor, suitable fillers and binder tape.

J. Type MC cable for branch circuit shall be of the single circuit type with stranded #10 AWG and #12 AWG sizes only with green ground wire. MC Cable may be used between meter centers and apartment unit load centers, with feeder sizes as indicated on the drawings. MC Cable may only be used in stud walls and above accessible ceilings.

K. MC Cable terminations shall include plastic anti-short bushings and listed clamps.

L. Type NM cable may be used concealed in stud walls and above ceiling for lighting, receptacle, motor and fixed equipment branch circuits in #12 AWG and #10 AWG sizes only, sized as indicated on the drawings in areas of Type III, IV, and V construction only, and conforming with the requirements of Article 334 of the NEC.

PART 3 EXECUTION

3.01 INSTALLATION

A. All conductors shall be continuous from box to box. No joints shall be permitted in the circuit other than in junction boxes or fixtures.

B. All make up connections to lighting fixtures and all branch circuit conductors run in wiring channels of lighting fixtures shall be THHN, THHW or XHHW and rated 90°C.

C. Equipment ground conductors shall be of the same insulation type as the associated circuit conductors.

D. All conductors of a circuit shall follow the same path through any openings in metal partitions within the enclosure.

E. The ampacity of all conductors shall be at least as great as the rating of the fuse or circuit breaker on the line side of the conductors. Note the ampacity reduction required by Code when more than three conductors are placed in a raceway.

1. All conductors for distribution and control equipment terminations shall be based on full 75°C ampacity.

2. All conductors for appliance and utilization equipment terminations rated 100 amperes or less shall be based on 60°C ampacity.

F. Provide cable supports for vertical raceways per NEC Table 300.19 (A).

G. Wiring shall be installed in separate conduits for the following systems:

1. All emergency and exit lighting.

2. Control wiring.

3. Auxiliary systems wiring.

4. All fire alarm system signaling circuits.

H. Swab conduits free of moisture, dirt and grease before pulling wire. Care shall be exercised while installing wire in conduits so that conductor insulation will not be injured. No oils, grease or compounds other than Ideal "Wire Lube", "Yellow 77" or equal UL approved wire-pulling lubricants shall be used for pulling any conductors.

I. Fire Alarm System signaling circuits shall not be spliced. No parallel branching of wires is permitted. All wiring shall be run parallel and perpendicular to building lines.

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J. Type MC cable may be used for concealed branch circuit wiring in dry locations (in walls or above ceilings) between lighting fixtures or power outlets. Home runs, multi-wire branch circuits, and runs with multiple circuits shall occur in conduit. Conversion from MC cable to conduit shall occur at the first utilization device connected to circuit. This cable shall be installed in an organized manner that does not prohibit access, maintenance, or replacement of other trades' work.

K. Type MC cable shall be supported and secured at intervals not exceeding 6 feet with approved steel or malleable iron cable straps, clamps or hangers. Cables shall be run parallel and perpendicular to building column lines. Listed grommets shall be used where cables pass through framing members.

3.02 CONNECTIONS

A. All connections are to be made using pressure type terminals.

B. Where connections are to be made to devices or equipment under screw heads only, install insulated, crimp-type spade clips on the wire ends before the connections are made.

C. Devices shall not be used as through connection points. Where through circuits are involved, they shall be spliced in the box with a pigtail connected to the device.

D. Connectors shall contain only one wire unless they are listed for multiple conductors.

E. Joints in #10 and smaller wire shall be made using the following types of connectors: 3M "Scotchlok", Ideal Industries, Inc. "Wing Nut", or Thomas and Betts "PT". Connectors shall be used only within their range. Other threaded-on types of insulated connectors shall not be used.

F. Joints in #8 and larger wire or joints in any wires above the range of threaded-on connectors shall be made using pressure type mechanical connectors applied after wires are cleaned and then insulated using two (2) layers of "Scotchfil" brand electrical insulation putty and covered by two (2) half-lapped layers of

"Scotch 88", or Plymouth Slip-not gray vinyl-plastic electrical tape. Connectors shall be installed and sealed against moisture by installing Raychem "TCS" (indoor) or "WCSM" (exterior) sealant-coated heat shrink tubing.

G. All outdoor locations below grade must use gel filled wire nuts or Raychem gel splice packs (GHFC-1-90, GHFC-2-90, etc.) for all splice points.

3.03 WIRE COLOR CODE

A. The following color code shall be used:

	120/240 Volt
Phase A	Black
Phase B	Red
Neutral	White
Equipment Ground	Green

All control circuits shall be pink. On 3- and 4-way switches, the travelers shall be the same color as the phase used.

B. Conductors #10 AWG or smaller shall have insulation colored as noted above.

C. Conductors #8 AWG or larger shall have insulation colored as noted above or be identified with colored tape, minimum size ½", wrapped twice around at each terminal, at each conduit entrance and at intervals of not more than 12 inches apart in all boxes, panel tubs, switchboards, etc.

D. Equipment grounding conductors #8 AWG and larger shall be green or have green tape applied in a continuous wrap where visible at panels, junction boxes, etc.

E. All 48-volt DC conductors shall be black.

3.04 MARKING

A. All branch circuits shall be marked in the panelboard gutters. Markers shall indicate corresponding branch-circuit numbers.

B. All signal and control wires shall be marked at all termination points such as cabinets, terminal boxes, equipment racks, control panels, consoles, etc.

C. Fire Alarm System detector and station circuit wire shall be marked to indicate what zone they are attached to.

D. Wire markers shall be Thomas and Betts vinyl tape type WM wrapped once around the wire with the adhesive sides placed together to form a flag.

E. Wire markers shall be installed when wire is pulled.

3.05 EXIT AND EMERGENCY WIRING

A. All exit and emergency wiring shall be as shown on the Drawings and shall be run in a separate conduit from any other wiring. Branch circuit wiring shall be #10 THHN minimum.

B. Wire insulation shall be color coded the same as the respective voltage building wiring, and be identified with 1/2" wide red tape wrapped twice around at not more than 12" intervals at all access points. On conductors #8 AWG and larger with black insulation, red tape will be used in addition to other identification tape.

3.06 ALUMINUM WIRE

A. All conductor sizes shown or specified are based on copper with 600-volt insulation. At Contractor's option and in accordance with this Article, aluminum wire may be used, but must be sized for equivalent or greater current carrying capacity and installed in conduits of corresponding size.

B. Aluminum wire may be used anywhere authorized by the Owner, except where mechanical equipment lugs specifically call for copper conductors. Coordinate these requirements with all other Contractors supplying equipment prior to pulling wire.

C. All aluminum conductors shall terminate in a solderless hi-press crimp-type pressure connector. All pressure connectors shall be of the two-bolt type and shall be secured directly to the bus bars of switches or panelboards. Where it is impossible to secure directly to bus bars, copper wire spliced to aluminum with in-line aluminum-to-copper solderless hi-press crimp-type pressure connector and factory filled with non-oxide flux shall be used for final connection.

D. All hi-press connectors shall be insulated with 3M-PST or insulated and sealed against moisture by installing Raychem "TCS" (indoor only) or "WCSM" (exterior) sealant-coated heat shrink tubing.

E. All conductors shall be stripped the required distance, abraided to remove oxide and coated with non-oxide flux before inserting into connectors or splices. Factory non-oxide flux filed connectors and splices may be used.

F. No other methods of aluminum conductor termination will be acceptable unless authorized in writing.

END OF SECTION 260519

SECTION 260523

MOTOR AND EQUIPMENT WIRING

PART 1 GENERAL

1.01 SCOPE

A. Provide power to and connect all motors and motor driven equipment shown on the Plans.

B. Furnish, install and connect all over-current and disconnecting means as required by the NEC.

C. Motors and motor driven equipment shall be provided and installed by others. Motor starters, controllers and control devices, other than temperature control equipment and devices and starters for controllers, furnished as part of packaged equipment, shall be furnished and installed by the Electrical Contractor except as otherwise noted.

D. Variable frequency drives provided by others shall have integral means of simultaneously disconnecting all ungrounded conductors in accordance with the National Electrical Code. VFD-controlled equipment without disconnecting means shall have safety switches provided by this Contractor in accordance with Section 26 28 16, "Disconnect Switches".

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 INSTALLATION

A. Install and wire all motor control equipment per wiring diagrams and instructions furnished to him, including interlock wiring between equipment.

B. Motor and equipment locations shown on the Drawings are approximate. Obtain exact locations from the Contractor concerned.

C. Refer to the Mechanical Specifications for description of electrical equipment and controls furnished by them.

D. Verify all control sequences, etc. in accordance with Division 26 Section, “Tests and Inspections”.

E. Line and load side conductors for VFDs shall be installed in separate, dedicated conduits.

END OF SECTION 260523

SECTION 260526

GROUNDING

PART 1 GENERAL

1.01 SCOPE

A. Grounding of the service and service entrance equipment shall be in accordance with the National Electric Code.

B. All feeders and branch circuits over 100 volts shall include a Grounding Conductor sized in accordance with NEC Table 250.122, except not be smaller than #12 for power and lighting circuits and #14 for control circuits. All ground conductors shall be Green, or as specified under Section 26 05 19, "WIRE AND CABLE".

C. The Contractor shall be prepared to test, in the presence of the A/E, all system neutrals to prove they are free of grounds except at the source upn request.

D. Provide a telecommunications ground riser system as detailed herein

PART 2 PRODUCTS

2.01 GENERAL

A. All ground clamps shall be Penn-Union "GPL" type or similar by O.Z. or Burndy.

B. All cable connections to ground rods shall be by "Cadweld", "Thermoweld", or "Heliarc" welding process by using recommended molds, compound and correct gas mixtures.

C. Conduit grounding type bushing shall be T & B Series 3870 with appropriate size ground wire terminal.

D. Conduit for solitary ground conductors shall be rigid PVC non-metallic electrical conduit with U.L. label.

E. All panels shall be furnished with a copper ground bar similar to the neutral bar and having the same number, size and type of lugs. The ground bar shall be factory bonded to the panel tub above or below the neutral assembly, but shall not be in a gutter.

F. Enclosures, junction and pull boxes shall utilize a "panel" type ground bar or U.L. listed grounding lugs or screws, as the number of ground conductors dictates.

PART 3 EXECUTION

3.01 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and circuits.

C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.

D. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic power conductor raceways unless they are designated for telephone or data cables.

E. All conduits entering switchboards and substations shall be bonded together with # 3/0 AWG wire connected to a conduit grounding bushing. These shall then be bonded to the ground bus in the equipment item.

F. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

G. Install a separate equipment grounding conductor to each electric water heater. Bond conductor to heater units, piping, connected equipment, and components.

H. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

3.02 INSTALLATION

A. Neutral shall be bonded to ground at service entrance through a 1/4” x 1” bonding jumper. Run ground electrode conductor from the service entrance ground to the water service entrance and building steel via the main service ground bus bar as detailed on the drawings. In addition, from the service entrance ground run ground electrode conductor to a driven ground system as shown on the Drawings. All connections to ground rods shall be by specified welding process.

B. The ground conductor shall be connected to the neutral in only two locations - on the supply side of the service disconnect means per NEC 250.24 and on separately derived systems per NEC 250.30. For transformers and other

separately derived systems, provide a grounding conductor, minimum size per NEC Table 250.66, connecting the separately derived system secondary neutral point to the enclosure and to the metal water pipe or to building structure ground per NEC 250.52 (A) (1) & (2). Bond separately derived systems to metal water piping and building structure ground or common grounding electrode conductor per NEC 250.104 (D) (1) through (3).

C. All solitary ground conductors shall be run in rigid PVC non-metallic conduit except 500 KCMIL and larger insulated cables may be run exposed on walls or ceilings of Equipment Rooms. Solitary ground conductors shall not be placed through metallic sleeves or conduits and shall not be completely encircled by metallic hangers or supports.

D. All enclosures, boxes, fixtures, receptacles, etc., shall be grounded by being securely bonded to the grounding conductor. Boxes, conduit, etc., shall not be used as part of the grounding "conductor" system.

E. Enclosures not requiring a ground bar shall have all ground conductors connected together and a pigtail the size of the largest conductor bonded to the enclosure with a single ground connector used for no other purpose.

F. At each receptacle box, the ground conductor shall enter and connect, with normal wiring connector, to: 1) The ground pigtail to receptacle; 2) The ground pigtail to box ground screw; and 3) The outgoing ground conductor to next device, if not at end of run. Metal to metal contact between the device yoke and the outlet box is not acceptable as a bond for either surface mounted boxes or flush type boxes.

G. Motor terminal boxes shall be grounded by the use of manufacturer-supplied ground lug or by drilling and tapping a hole for a ground screw. Remove paint prior to making the connection.

H. Lighting fixtures shall be grounded by the use of a manufacturer-supplied ground lug or pigtail or by the use of ground clips fastened on bare metal that is free of paint.

I Conduit system shall be electrically continuous. All locknuts shall cut through enameled or painted surfaces on enclosures. Where enclosures and non-current carrying metals are isolated from the conduit system, use bonding jumpers with approved clamps. Where reducing washers are used and where concentric or excentric knockouts are not completely removed bonding bushings shall be required.

J. Provide a telecommunications grounding riser consisting of a #6 bare copper conductor from the main electrical service ground to the main telephone terminal boards in the main electrical room. Continue the #6 ground conductor up through each of the stacked electrical rooms containing telephone backboards. At each telephone terminal board, provide a ¼” x 3” x 12” copper bus bar mounted

vertically on insulated standoffs for termination of grounding riser and telecommunications equipment ground wires.

3.03 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.

2. Make connections with clean, bare metal at points of contact.

3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.

4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.

5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with grounding screw and pressure-type connectors.

C. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

D. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

E. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

F. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

END OF SECTION 260526

SECTION 260533

CONDUITS

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install all conduits, boxes, fittings, etc. for a complete raceway system.

B. See Division 26 Section, "Boxes and Plates".

PART 2 PRODUCTS

2.01 CONDUIT - Electrical Metallic Tubing (EMT)

A. All wiring in building interior including feeders, branch circuits and auxiliary wiring shall be run in thin wall (EMT) conduit.

B. See Wire and Cable, Section 26 05 19 for areas where MC Cable may be used in lieu of EMT conduit.

C. All steel conduits shall be galvanized and have the manufacturer's name and U.L. label attached to or stamped on each piece.

D. Each section of conduit shall be straight, free from blisters and other defects and in 10'-0" lengths. Galvanizing shall be of such nature and so applied that it will not crack or flake when conduit is bent.

E. All conduit sizes stated in Specifications or marked on the Drawings are minimum size and shall be no less than ¾", unless otherwise noted.

2.02 CONDUIT - Rigid Metallic (RMC)

A. All exposed interior conduits below 8 feet, or conduits on building exterior, shall be rigid or intermediate (IMC) steel.

B. Minimum size shall be no less than ¾".

2.03 CONDUIT - Flexible Metallic (FMC & LFMC)

A. Lighting fixtures may be supplied with short lengths of flexible metallic conduit with green ground wire.

B. Flexible galvanized steel conduit with PVC jacket (LFMC) shall be used for "make-up" connections to rotating machinery and heating elements.

C. Minimum size shall be ¾" trade size.

2.04 CONDUIT - Rigid Nonmetallic (RNC)

A. Nonmetallic conduit and fittings for concrete encasement shall be rigid Schedule 40 PVC, power and communication type EB and UL Listed.

B. Nonmetallic conduit and fittings for direct burial shall be rigid Schedule 80 PVC.

C. Nonmetallic conduit and fittings specified or shown on the drawings for interior applications shall be rigid Schedule 40 PVC.

D. Nonmetallic supports for grounding electrode conductor conduits shall be Burndy Nyloclip or by Clic.

2.05 CONDUIT FITTINGS - Metallic

A. All thinwall connectors shall be of the compression insulated-throat type, similar to Thomas and Betts No. 5223 (¾"). All fittings shall be steel. No die cast fittings will be allowed. Contractor may use Thomas and Betts, Raco, Steel City or Midwest fittings.

B. All rigid and IMC conduits shall have threaded connections.

C. Liquid-tight flexible metallic fittings shall be Midwest LTB-50. Flexible metallic fittings shall be Steel City XC-242.

D. "Minerallac" type clamp supports and "Unistrut" type one bolt supports with square ends shall not be used at any location. Utilize support straps.

PART 3 EXECUTION

3.01 INSTALLATION

A. All rigid (RMC) or intermediate (IMC) conduit entering cabinets, pull boxes, junction boxes or outlet boxes shall be secured with double lock nuts and bushed ends.

B. No more than four (4) 90° bends will be allowed in any one conduit run. Where more bends are necessary in any single run, a pull box shall be installed. Pull boxes shall also be installed in long runs at a maximum separation of 100'-0". All conduit, except in concrete slab or earth, shall be routed parallel or perpendicular to the lines of the building. No out-of-plumb or diagonal lines will be accepted.

C. Unless otherwise noted, all conduits shall be run concealed within the building construction when installed in finished interior or exterior areas. Conduit in equipment rooms and on roof may be run exposed.

D. All conduits shall be substantially supported by pipe straps, suitable clamps or hangers that are attached to the elements of the building structure to provide rigid installation. In no case shall conduit be attached to or supported from adjoining pipe, or installed in such a manner as to prevent the ready removal of other pipe for repairs.

E. Thomas and Betts "Ty-Rap" self-locking ties may be used to support conduits up to 1" which are running horizontally on top of small structural members or through bar joist.

F. Strap iron hangers and wire will not be approved as means of conduit support.

G. No conduit shall rest on or be supported from acoustical tile ceilings or the ceiling tile suspension system.

H. Exposed conduits rising from floor to surface panels or boxes shall have a 4" high concrete curb encasing the conduits at the floor line. Curb to have 45° chamfered edges.

I. No conduit shall be run in slab under heat producing equipment.

J. RNC conduit in poured concrete or buried beneath concrete slabs shall have a 1" minimum cover.

K. Where conduit runs across building expansion joints or where necessary to compensate for thermal expansion or contraction, expansion unions shall be provided.

L. Exercise necessary precautions to prevent accumulation of water, dirt or concrete in conduits during execution of electrical work. Conduit in which water or foreign material has been permitted to accumulate shall be thoroughly cleaned or replaced where such accumulations cannot be removed.

M. All conduits must be kept dry and free of water or debris with approved pipe plugs or caps. Care shall be given that plugs or caps are installed before pouring concrete.

N. Conduit sleeves through the floor shall be stubbed one inch above the finished floor.

O. Flexible conduit may only be used as follows:

1. Lighting fixtures may be supplied with short lengths not longer than 6'-0".

2. Make-up connections to transformers may be supplied with lengths not longer than 2'-0".

3. All expansion joints, flexible connections and vibration isolators shall be bridged with short lengths not longer than 2'-0".

P. All connections to rotating machinery and heating elements shall be made with short lengths, minimum 12", of liquid-tite conduit. Where motors are mounted on sliding bases, the flexible connection shall be long enough to allow full travel of the motor on the base, maximum 36".

Q. Pull Wires

1. A pull wire shall be installed in all empty conduits. In dry locations, pull wire shall be #14 gauge galvanized steel or nylon pull cord.

2. Both ends of all pull wires shall be identified by means of labels or tags, reading "PULL WIRE" and shall be numbered to refer to the same pull wire.

R. Conduits through roof shall be flashed with 6" high pitch pockets or equally effective means which the Architect approves.

S. Seal all conduits entering from outside the building water and moisture tight, and sloped away from the building to minimize the chance of water entry.

END OF SECTION 260533

SECTION 260534

BOXES AND PLATES

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install all outlet, junction and pullboxes as indicated on the Drawings and as necessary to install conduit and wiring in a neat and workmanlike manner.

B. Furnish and install all outlet and junction box covers and wiring device plates.

PART 2 PRODUCTS

2.01 STANDARDS

A. Pullboxes and junction boxes shall be galvanized and of the correct size and gauge in accordance with Code requirements and be U.L. listed.

2.02 BOXES FOR FLUSH WORK

A. Flush outlet, junction, and pullboxes shall be pressed steel galvanized or sherardized and shall be a minimum of 4" square or octagonal similar to Appleton #40. Steel boxes cast in concrete shall be designed for concrete installation.

B. Flush wall boxes in tile, marble, brick or other finished masonry walls shall be Steel City GW-135-C Series or Raco 695 Series.

C. Nonmetallic outlet boxes similar to Carlon Blue PVC series may be used in wood frame construction for flush mounted outlets and devices where installed per applicable NEC requirements.

D. Flush outlet boxes for ceiling-mounted and suspended light fixtures shall be 4 inch square with 1 ¾ inch round cover. Raco 756-759. Cover depth to be coordinated with ceiling thickness.

2.03 BOXES FOR EXTERIOR WORK

A. Boxes at exterior areas shall be watertight and dust-tight with gasketed covers.

2.04 BOXES FOR EXPOSED WORK

A. All boxes for exposed work in finished spaces shall be "FS" type with threaded hubs and rigid conduit riser.

B. No exposed work shall be provided in finished spaces without written Owner approval. Failure to coordinate rough-ins before surfaces are closed does not relieve the Contractor from recessing work as required.

C. All boxes for outlets and devices in unfinished spaces shall be steel 4-11/16".

2.05 PLATES AND COVERS

A. Switch plates on flush and cast boxes shall be Pass & Seymour Legrand (P&S) Nos. SP-1, SP-2, SP-3, etc., as required, and shall be made of white plastic in apartment units, and SS1, SS2, SS3 etc. brushed stainless steel in all other spaces. Confirm final color/material with Architect prior to ordering.

B. Duplex and double duplex receptacle plates on flush and cast boxes shall be P&S No. SP-8, SP-82, white plastic in apartment units, and SS-8, SS82, brushed stainless steel in all other spaces. Confirm final color/material with Architect prior to ordering.

C. Populated voice/data outlet plates shall be P&S WP3402-WH white plastic blank plates in apartment units, and WP3402-SS in all other spaces. Empty voice/data outlets shall have blank plates of same finish specified for that space.

D. Plates for exposed outlets in unfinished spaces shall have Steel City Series RS-4-11/16" galvanized surface covers for application required. Covers shall be raised ½" and edges shall fit flush with top of box.

E. Special or engraved plates, as indicated on the Drawings, shall be P&S white plastic for the application required. Letters shall be 3/16" high, engraved with black enamel fill.

F. Blank outlets, where required in finished areas, shall match wiring device covers in that area.

G. Where multiple switches are shown, gang under 1 common wall plate. Where receptacles are shown adjacent to switches and marked for 42” mounting height, gang switch and receptacle under common wall plate. Dimmers shall not be ganged.

H. Blank plates for ceiling outlets shall be decorative 4 inch round plastic covers with mounting brackets and concealed fasteners. Covers shall be raised (not flat) with rounded edges and textured white finish. Equal to Arlington Industries CP3540.

I. Plates as manufactured by Leviton, Cooper, Pass & Seymour/Legrand, or Hubbell may be furnished at this Contractor's option.

PART 3 EXECUTION

3.01 INSTALLATION

A. All boxes shall be rigidly supported from building structure independent of the conduit system. Boxes cast into masonry or concrete are considered to be rigidly supported.

B. Close all unused and open knockouts with plugs of the proper size.

C. Provide fire stop wrap on flush outlet boxes where required to maintain fire rating of wall.

D. Flush-mounted boxes for surface-mounted fixtures on the ceiling shall be provided with bar hangers. Hangers shall span 2 horizontal ceiling suspension members.

E. Flush-mounted boxes for apartment unit lights on the ceiling shall be provided with bar hangers. Bar hangers shall span 2 horizontal ceiling suspension members and shall have 1 ceiling support wire attached to the structural deck above. Ceiling support wire shall be straight and plumb.

END OF SECTION 260534

SECTION 260543

UNDERGROUND ELECTRICAL SERVICE

PART 1 GENERAL

1.01 SCOPE

A. Provide underground electric services as detailed on the one-lines for residential and retail lighting and power as supplied by the power company.

B. The Power Company, shall furnish and install primary cable, meter, transformer, transformer grounding and all transformer connections. The E.C. shall install secondary conductors and provide the meter trim per power company requirements.

C. Provide a dedicated CAT 6 communications cable from the meter base to the telecommunications service provider demarcation point. The Owner shall provide an analog phone service (POTS line) for remote reading of the indoor metering equipment.

D. The Electrical Contractor shall furnish and install the trenching, backfill, secondary ducts where shown on drawings and commercial secondary conductors with high-pressure, crimp-type cable lugs. The Contractor shall provide the meter trims to meet the requirements of the Power Company. The Contractor shall install the CT’s and provide a 2” rigid galvanized conduit from the CT cabinet or CT compartment of the transformer to the meter base. The transformer pad shall be provided by the E.C. per power company requirements.

E. Bond each meter base and CT cabinet to the switchboard equipment ground bar with a minimum of #6 solid copper conductor.

F. Switchboard CT compartments and CT cabinets shall be designed for one CT for each phase and neutral. Provide solder-less cable lugs for voltage sensing. Lugs shall be designed for #12 SIS meter control wiring and shall be positioned on the line side of the CT's.

PART 2 PRODUCTS

2.01 GENERAL

A. See Specification Sections pertaining to material and products used.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide PVC ducts from the secondary terminations of the Power Company's transformer to the secondary enclosure, and from the secondary enclosure to the main switchboard. Ducts shall be concrete encased (minimum 3" cover) when passing under streets and landscape beds or may be directionally bored with Schedule 40 HDPE at this Contractor’s option.

B. All conductors shall extend 5'-0” beyond the transformer termination point to facilitate connection by the Power Company. Coordinate work with the Power Company prior to installation.

C. The Electrical Contractor shall obtain and pay for all metering equipment as required by the Power Company.

D. Furnish and install conduit as required for Power Company metering.

E. Provide secondary voltage service lateral conductors and service terminations to the main switchboard.

END OF SECTION 260543

SECTION 260553

IDENTIFICATION

PART 1 GENERAL

1.01 SCOPE

A. Each piece of service equipment, all individual switches, circuit breakers, all disconnects, all starters, all exhaust fan starters, all power and lighting panels, all cabinets and pull boxes for auxiliary systems such as telephone, fire alarm system and emergency exit lights, receptacles connected to normal, critical or emergency power, etc., shall be identified on the front cover or trim with its name and/or designation number or letter as shown on the Drawings and with the voltage available within the panel.

PART 2 PRODUCTS

2.01 GENERAL

A. Identification shall be in the form of laminated plastic nameplates with black face and minimum ¼" high letters engraved into a white background. Plates shall be drilled on each end for sheet metal screw attachment. No tape-type labels will be allowed for equipment and enclosures.

B. Fire Alarm System and emergency equipment nameplates shall be red face with minimum ¼" high letters engraved into the plastic, letters white in color.

C. Label all emergency receptacles with panel identification and circuit number using Brady Label or Hospital-approved adhesive type label. Label shall be white with red letters and shall be attached to the top center of the receptacle cover plate, or side of cover where necessary to avoid overlapping attachment screws.

D. Label normal power receptacles with panel identification and circuit number using Brady Label or Hospital-approved, adhesive type label. Label shall be white with black letters and shall be attached to the top center of the receptacle cover plate, or side of cover where necessary to avoid overlapping attachment screws.

E. The following are examples of the nameplate layout and wording:

Main Center MC1
208/120 volt, 3 phase, 4-wire
Fed From: Utility Transformer

Panel N1
208/120 volt, 3 phase, 4-wire
Fed From: DP1

Exhaust Fan EF-1
1/2HP, 120 volt, 1 phase

Fed From: Panel N1

PART 3 EXECUTION

3.01 INSTALLATION

A. Plastic nameplates shall be attached to face of electrical device by sheet metal screws. Locate plate so wording reads horizontally and plate does not obstruct other identification plates, latches or operators.

B. Fire Alarm/Emergency boxes and enclosures shall be painted red and have appropriate system identification nameplate.

C. Install nameplate at power receptacles where the nominal voltage between any pair of contacts is greater than 150 volts.

D. Per NEC section 210.5(C), a phase color-code nameplate shall be mounted on the inside trim of the branch-circuit panelboards, adjacent to the manufacturer's nameplate. Refer to Specification section 260519, “Wire and Cable” for proper color code for voltage utilized.

E. Where circuit breakers or fuses are applied in compliance with the series combination ratings marked on the equipment by the manufacturer, the equipment enclosure(s) shall be legibly marked in the field to indicate the equipment has been applied with a series combination rating. The marking shall be readily visible and state: "Caution - Series Rated System." Note – series rating is not acceptable expect where specifically noted.

F. All outlet, and switch boxes shall have black permanent marker identification on the interior listing the circuit(s) contained within each box. Permanent marker ID on junction boxes above accessible ceilings and in unfinished utility spaces may be on the exterior of the cover plate.

G. Provide typewritten panel directories for all new panelboards. Panel schedules on drawings include abbreviated descriptions that should be elaborated on final panel directories. Include area/room numbers for all circuits. Use final room numbers to match room signage.

END OF SECTION 260553

SECTION 260923

LIGHTING CONTROL EQUIPMENT

PART 1 GENERAL

1.01 SCOPE

A. The Electrical Contractor shall furnish and install lighting control equipment as shown on the Drawings and specified herein.

B. Section Includes:
   a. Time switches.
   b. Photoelectric switches.
   c. Indoor occupancy and vacancy sensors.
   d. Switchbox-mounted occupancy sensors.
   e. Digital timer light switches.
   f. Outdoor motion sensors.
   g. Lighting contactors.
   h. Emergency shunt relays.

1.02 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:
   1. Interconnection diagrams showing field-installed wiring.
   2. Include diagrams for power, signal, and control wiring.

C. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.

1.03 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.
   1. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 PRODUCTS

2.01 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. General Electric, Square "D", Allen Bradley, Siemens-Allis or Cutler-Hammer.

B. The Contactors shall switch a load at 120 volts, 60 Hertz and shall have the minimum of 4 poles.

C. The contactors shall be continuously rated at 30 amperes.

D. Contactor coils shall be 120 volt, continuously rated and encapsulated.

E. Contactors shall have a NEMA 1 enclosure for surface mounting and shall be heavy-duty, industrial-duty rated.

F. All terminals and terminations shall be marked "75°C only" or "60/75°C" or listed for use of 75°C insulated wire at full 75°C ampacity.

G. Contactors shall be similar to Square D LC1D2510.

2.02 TIME SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper Industries, Inc.
2. Intermatic, Inc.
3. NSi Industries LLC.

B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.

C. Listed and labeled as defined in NFPA 70 and marked for intended location and application.

D. Contact Configuration: SPST.

E. Contact Rating: 30-A inductive or resistive, 120/240-V ac, 20-A magnetic, 120-277Vac.

F. Programs: Eight on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.

G. Astronomic Time.

H. Automatic daylight savings time changeover.

I. Backup Time: Not less than seven days reserve, to maintain schedules and time clock.

2.03 OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. NX Controls
2. Cooper Industries, Inc.
3. Leviton Manufacturing Co., Inc.
4. NSi Industries LLC

B. Description: Solid state, with SPST dry contacts rated for 1800 VA inductive, to operate connected relay, or contactor coils, complying with UL 773A, and compatible with ballasts and LED lamps.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lux), with an adjustment for turn-on and turn-off levels within that range.
3. Time Delay: Fifteen-second minimum, to prevent false operation.
4. Failure Mode: Luminaire stays ON.

2.04 INDOOR OCCUPANCYAND VACANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. NX Controls
2. Acuity Controls Sensor Switch
3. Cooper Industries, Inc.
4. Douglas Lighting Controls
5. Lutron Electronics Co., Ltd.
6. WattStopper; a Legrand® Group brand.

B. General Requirements for Sensors:
1. Wall or Ceiling-mounted, solid-state indoor occupancy sensors.
2. Passive infrared, Ultrasonic, or Dual technology.
3. Hardwired connection to switch.
4. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
5. Power: Line voltage.
6. Power Pack: Dry contacts rated for 20-A ballast or LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
7. Mounting:
   a. Sensor: Suitable for mounting in any position on a standard outlet box.
   b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.

C. PIR Type: Detect occupants in coverage area by their heat and movement.
1. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.
2. Detection Coverage: Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1,000 square feet when mounted 96” above finished floor.

D. Ultrasonic Type: Detect occupants in coverage area through pattern changes of reflected ultrasonic energy.

1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.

2. Detection Coverage: Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1,000 square feet when mounted 96 inches above finished floor.

E. Dual-Technology Type: Detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
3. Detection Coverage: Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 2,000 square feet when mounted 96 inches above finished floor.

2.05 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. NX Controls
2. Acuity Controls Sensor Switch
3. Cooper Industries, Inc.
4. Douglas Lighting Controls
5. Lutron Electronics Co., Ltd.
6. WattStopper; a Legrand® Group brand.

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
3. Switch Rating: Not less than 1200-VA ballast or LED load at 120/277V.

C. Wall-Switch Sensor:
1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft..
2. Sensing Technology: Dual technology.
3. Switch Type: SP, field-selectable automatic "on," or manual "on," automatic "off."
4. Capable of controlling load in three-way application.
5. Voltage: 120/277V.
6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
7. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

8. Color: White.
9. Faceplate: Color matched to switch.

2.06 DIGITAL TIMER LIGHT SWITCH

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. NX Controls
   2. Acuity Controls Sensor Switch
   3. Cooper Industries, Inc.
   4. Douglas Lighting Controls
   5. Lutron Electronics Co., Ltd.
   6. WattStopper; a Legrand® Group brand.

B. Description: Combination digital timer and conventional switch lighting control unit. Switchbox-mounted, backlit LCD display, with selectable time interval in 10 minute increments.

   1. Rated 10 A at 120/277V for ballast or LED, and 1/4 horsepower at 120-V ac.
   2. Voltage: 120/277V.
   3. Color: White.
   4. Faceplate: Color matched to switch.

2.07 OUTDOOR MOTION SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1. NX Controls
   2. Acuity Controls Sensor Switch
   3. Cooper Industries, Inc.
   4. Douglas Lighting Controls
   5. Lutron Electronics Co., Ltd.
   6. WattStopper; a Legrand® Group brand.

B. Description: Solid-state outdoor motion sensors.

   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. PIR type, weatherproof. Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm). Comply with UL 773A.
   3. Switch Rating:
      a. Luminaire-Mounted Sensor: 500-VA LED.
      b. Separately Mounted Sensor: Dry contacts rated for 20-A ballast or LED load at 120/277-V. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.

4. Switch Type: Single pole.
5. Voltage: 120/277V.
6. Detector Coverage:
    a. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft..
    b. Long Range: 180-degree field of view and 110-foot detection range.
7. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
8. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
9. Operating Ambient Conditions: Suitable for operation in ambient temperatures ranging from minus 40 to plus 130 deg F, rated as "raintight" according to UL 773A.

2.08 EMERGENCY SHUNT RELAY

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. NX Controls
2. Acuity Controls Sensor Switch
3. Cooper Industries, Inc.
4. Douglas Lighting Controls
5. Lutron Electronics Co., Ltd.
6. WattStopper; a Legrand® Group brand.

B. Description: NC, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts; complying with UL 924.

1. Coil Rating: 120/277V.

2.09 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 24 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 EXECUTION

3.01 INSTALLATION

A. Install as required and as shown on the drawings.

B. Wall sensor/switches shall be installed 42” AFF, unless noted otherwise.

C. Furnish and install a complete and operational system.

D. Low voltage wiring for lighting controls shall be installed perpendicular and parallel to building lines in conduit / J-hooks as shown on drawings and specified in Section 27 05 28.33 - Voice/Data Conduit System.

E. Furnish identification as specified in Specification Section 260553, “Identification”.

3.02 APPLICATION

A. Enclosed offices shall be manual on, auto off, & manual dim.

B. Open offices shall be auto on to 50%, auto off & manual override to 100%.

C. Conference, meeting, multipurpose, classroom, lecture, and training rooms shall be manual on, auto off, & manual dim.

D. Lobbies, corridors, and restrooms shall be auto on to 100%, auto off and shall include one readily accessible manual control.

E. All other spaces shall be manual on, auto off, unless noted/shown otherwise.

F. Automatic shutoff is not required for shop and laboratory classrooms, for lighting required for 24 hour operation, and for spaces where automatic shutoff would endanger the safety or security of the room or building occupants.

G. All switch controls and power packs shall be furnished and installed as required. A complete and functional branch circuit wiring & control system shall furnished and installed.

3.03 FIELD QUALITY CONTROL

A. System Start-up

Contractor shall test the system, and train the Owner’s Representative on proper operation and maintenance of the system. Before starting training, the installing contractor shall verify that:

1. The control system has been fully installed in accordance with manufacturer's installation instructions.
2. Low voltage wiring for overrides and sensors is completed.
3. Proper notification of the impending start-up has been provided to the Owner's Representative.

B. Provide two (2) sessions of on-site programming and training.

1. The first session shall take place after significant completion of instruction in the presence of the Contractor and the Owner's Representative.

C. After system start-up, the Owner's Representative shall be fully capable of reprogramming the lighting control equipment with no additional equipment, materials, training, or on-site manufacturer's visit. Technical support shall be available at no additional cost to the Owner.

D. Contractor shall return after 30 days of occupancy to check for proper operation of the occupancy sensors. After checking the system operation, the contractor shall re-aim and calibrate the settings for each sensor for proper operation. Contractor shall assume at least 3 days of labor to make these adjustments.

3.04 FUNCTIONAL TESTING

A. The Contractor shall engage a third-party Commissioning Authority (CxA), who is not directly involved in the design or construction of the project, to perform functional testing based on the Owner’s project requirements and the basis of design. These tests shall be completed for lighting and lighting control systems per ASHRAE 90.1 9.4.4 (2019) requirements.

B. All lighting control devices shall be tested to ensure that control hardware and software are programmed, calibrated, adjusted, and in proper working condition in accordance with the Construction Documents and the manufacturer’s installation instructions. At a minimum, the following procedures shall be performed:

1. Confirm that the placement, sensitivity, and time-out adjustments for sensors yield acceptable performance, lights turn off only after space is vacated, and do not turn on unless until the space is occupied.
2. Confirm that the time switches and programmable schedule controls are programmed to turn the light off.
3. Confirm that photosensor controls reduce electric light levels based on the amount of usable daylight in the space as specified.

C. The CxA shall provide documentation certifying that the installed lighting controls meet or exceed all documented performance criteria. Contractor shall submit this documentation to the AHJ.

END OF SECTION 260923

SECTION 262400

SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish and install Surge Protective Devices (SPDs) as shown on the Drawings and specified herein at each service entrance distribution panel.

B. Furnish and install SPDs at all emergency switchboards and panelboards per NEC 700.8, whether shown on the Drawings or not.

C. Furnish and install SPDs integral within all apartment load centers per NEC 215.18.

1.02 QUALITY ASSURANCE

A. SPD shall bear the UL Mark and shall be listed to most recent editions of UL 1449 and UL 1283. "Manufactured in accordance with" is not equivalent to UL listing and does not meet the intent of this specification. SPD and performance parameters shall be posted at www.UL.com under Category Code: VZCA.

B. SPD shall be tested to ANSI C62.41.1, C62.41.2, and C62.45 standards.

C. SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC.

1.03 MANUFACTURERS

A. Approved manufacturers for SPDs includes: Square D, Eaton, Siemens, Liebert Corporation and Current Technology.

PART 2 PRODUCTS

2.01 SURGE PROTECTIVE DEVICES

A. Surge Protective Devices (SPD) may be integral to switchboard or self-contained, wall mountable, solid-state device in a NEMA 12 enameled steel enclosure with hinged door and locking handle.

B. SPD shall be UL 1449 listed and labeled with 200kA Short Circuit Current Rating (SCCR). Fuse ratings shall not be considered in lieu of demonstrated withstand testing of SPD, per NEC 242.6.

C. SPD shall be UL 1449 labeled as Type 1 intended for use without need for external or supplemental overcurrent controls. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal overtemperature controls. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent of this specification.

D. SPD shall be UL 1449 labeled with 20kA I-nominal (L-N) (verifiable at UL.com) as recommended for UL 96A Lightning Protection Master Label and NFPA 780.

E. SPD shall provide surge current paths for all modes of protection: L-N, L-G, L-L, and N-G for Wye systems; L-L, L-G in Delta and impedance grounded Wye systems.

F. UL 1449 Listed Voltage Protection Ratings (VPRs) shall not exceed the following:

VOLTAGE	L-N	L-G	N-G
208Y/120V	700V	700V	700V

G. SPDs minimum surge current capability (single pulse rated) per phase and mode shall be

1. SPD located at Service Entrance Switchgear – 300kA per phase and 150kA per mode

2. SPD located at downstream panelboards – 100kA per phase and 50kA per mode

3. SPD located at apartment load centers – 50kA per phase and 25kA per mode

H. SPD shall include a serviceable, replaceable module.

I. Service Entrance SPD shall be complimentary UL 1283 listed for EMI/RFI filtering with minimum attenuation of -50dB at 100kHz.

J. Service Entrance SPDs shall be equipped with the following diagnostics:

1. Visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED.
2. Audible alarm with on/off silence function and diagnostic test function (excluding branch).
3. Form C dry contacts
4. Surge Counter
5. No other test equipment shall be required for SPD monitoring or testing before or after installation.

K. SPDs shall be integral to apartment load centers. Self-contained will not be acceptable.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install SPD where shown on the Drawings and in accordance with manufacturer’s written instructions.

B. If a dedicated breaker for the SPD is not provided in the switchboard, the service entrance SPD shall include an integral UL Recognized disconnect switch. Breaker shall be sized by manufacturer.

C. External units shall be installed as close as possible to the equipment being protected, preferably by closed nipple. Conductors and conduit shall be run horizontally directly from electrical equipment to surge suppressor enclosure.

D. The installation shall meet the following criteria:
1. Install per manufacturer's recommendations and contract documents.
2. Install units plumb, level and rigid without distortion.
3. One primary suppressor shall be installed external to the service entrance in accordance with manufacturer instructions.
4. Service Entrance SPD shall be installed on the line or load side of the main service disconnect.
5. Service Entrance SPD ground shall be bonded to the service entrance ground.
6. 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.
7. Installer may reasonably rearrange breaker locations to ensure short & straightest possible leads to SPDs, with prior Engineer approval.
8. Before energizing, installer shall verify service and separately derived system Neutral to Ground bonding jumpers per NEC.

3.02 TESTING

A. Check tightness of all accessible mechanical and electrical connections to assure they are torqued to the minimum acceptable manufacture's recommendations.

B. Check all installed panels for proper grounding, fastening and alignment.

3.03 EXTENDED WARRANTY/SPARE PARTS

A. SPD shall have a warranty for a period of ten (10) years, incorporating unlimited replacements of suppressor parts if they are destroyed by transients during the warranty period.

END OF SECTION 262400

SECTION 262414

PANELBOARDS

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install, as scheduled and shown on the Drawings, lighting and receptacle panels and distribution panels for operation on 240/120 volt, 1 phase, 3-wire service.

B. Each panel shall be connected with a feeder as sized on the Drawings.

PART 2 PRODUCTS

2.01 STANDARDS

A. Lighting and receptacle panels shall be Square D, type NQ for 240/120 volt panels unless otherwise noted, with branch breakers as scheduled on the Drawings.

B. Distribution panels shall be Square D, Type I-Line, unless otherwise noted, with branch breakers as scheduled on the Drawings.

C. General Electric, Siemens, or Cutler Hammer panels may be furnished at this Contractor's option.

D. All terminations shall be marked "75°C only", "60/75°C" or listed for use of 75°C insulated conductors at full 75°C ampacity.

E. All circuit breakers shall be fully rated for the available fault current at the panel. Series rating of devices will not be acceptable.

2.02 CONSTRUCTION

A. All bus bars shall be silver- or tin-plated aluminum. See plans for continuous rating and bracing. Minimum shall be as noted on the Drawings.

B. Cabinets shall be constructed of commercial galvanized sheet steel, Code gauge and size, and surface or flush mounted as called for on the Drawings. Flush panels shall be finished with prime coat only. Doors shall be fitted with chrome-plated combination lock and catch, and all shall be keyed alike. Lighting and receptacle panel tubs shall be approximately 20" wide, with quantity of breakers per tub as indicated on the panel schedules.

C. Enclosure shall have directory card and frame inside panel door.

D. Neutral assembly shall have individual anti-turn solderless terminals, similar to Square D type PK, for connection of ultimate number of neutral wires. Sheet metal terminal strips and connections will be rejected.

E. Panel shall have an aluminum ground bar similar to neutral bar in number, size and type of anti-turn solderless lugs. This ground bar shall be factory bonded to the panel tub. Sheet metal terminal strips and connections will be rejected.

F. All bus bars shall be rated for 100% capacity, including the neutral, unless noted otherwise.

2.03 CIRCUIT BREAKERS

A. The branch breakers shall be bolt-on type, molded case, temperature compensated, quick-make, quick-break, with thermal-magnetic trip and be permanently bolted to bus bars.

1. Lighting and receptacle panels – type QOB, rated 10,000 A.I.C. minimum for 240/120 volt unless noted otherwise on panel schedules.

2. Distribution panels – circuit breakers rated 100 amps and above shall have adjustable trip setting.

B. Breakers that feed heating, air conditioning and refrigeration equipment shall be listed as "HACR" type.

C. GFCI Circuit Breakers: Single- and two-pole configurations with 5 mA trip sensitivity for personnel protection; 30 mA trip sensitivity for equipment protection.

PART 3 EXECUTION

3.01 INSTALLATION

A. Panels shall be mounted with top of panel at 6'-0" above floor.

B. A directory frame and card shall be installed inside each panel interior door. Cards shall be correctly filled out by typewriter and correspond to the circuits as installed, before final payment is made. Handwritten directory cards will be rejected.

C. Flush panelboards shall have five (5) additional empty 1” conduits stubbed into the ceiling space for future use. Ream and bush ends.

D. Install over-current protective devices and set field adjustable circuit breaker trip ranges.

E. Additional identification shall be furnished as specified in Division 26 Section, “Identification.”

END OF SECTION 262414

SECTION 262416

LOAD CENTERS

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install, as scheduled and shown on the Drawings, panels for operation on 120/208 or 120/240 volt, 1 phase, 3-wire service.

B. Each panel shall be connected with a feeder as sized on the Drawings.

PART 2 PRODUCTS

2.01 STANDARDS

A. Panels shall be Square D, type Homeline load center for 1 phase, unless otherwise noted, with branch breakers as scheduled on the Drawings.

B. General Electric, Siemens Electrical Products, or Eaton panels may be furnished at this Contractor's option.

C. All terminations shall be marked "75°C only", "60/75°C" or listed for use of 75°C insulated conductors at full 75°C ampacity.

2.02 CONSTRUCTION

A. All bus bars shall be aluminum. See plans for continuous rating and bracing. Minimum shall be as noted on the Drawings.

B. Cabinets shall be constructed of commercial galvanized sheet steel, Code gauge and size, and flush mounted as called for on the Drawings.

C. Directory card and frame inside panel door.

D. Neutral assembly shall have individual anti-turn solderless terminals, similar to Square D type PK, for connection of ultimate number of neutral wires. Sheet metal terminal strips and connections will be rejected.

E. Panel shall have an aluminum ground bar similar to neutral bar in number, size and type of anti-turn solderless lugs. This ground bar shall be factory bonded to the panel tub. Sheet metal terminal strips and connections will be rejected.

F. All bus bars shall be rated for 100% capacity, including the neutral, unless noted otherwise.

2.03 CIRCUIT BREAKERS

A. The branch breakers shall be plug-on type for load centers, rated 10,000 A.I.C. minimum (unless noted otherwise), molded case, temperature compensated, quick-make, quick-break, with thermal-magnetic trip.

B. Breakers that feed heating, air conditioning and refrigeration equipment shall be listed as "HACR" type.

C. Breakers that serve all general use apartment circuits shall be listed as “ACR Fault” type.

D. Circuits that require ground fault protection at the breaker shall utilize “Combination Arc Fault/GFCI” type breakers.

PART 3 EXECUTION

3.01 INSTALLATION

A. Panels shall be mounted with top of panel at 6'-0" above floor.

B. A directory frame and card shall be installed inside each panel interior door. Cards shall be correctly filled out by typewriter and correspond to the circuits as installed, before final payment is made.

C. Additional identification shall be furnished as specified in Specification Section 26 05 53, “Identification.”

END OF SECTION 262416

SECTION 262713
METER CENTERS

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install, as scheduled and shown on the Drawings, Meter Centers for operation on 120/240 volt, 1 phase, 3-wire input service and 120/240 volt, 1 phase, 3 wire metered outputs unless otherwise noted on the plans.

B. Each panel shall be connected with a feeder as sized on the Drawings.

PART 2 PRODUCTS

2.01 STANDARDS

A. Meter Centers shall be Square D, type EZ Meter-Pak Meter Centers, unless otherwise noted.

B. General Electric, Siemens Electrical Products or Cutler Hammer meter centers may be furnished at this Contractor's option.

C. All terminations shall be marked "75°C only", "60/75°C" or listed for use of 75°C insulated conductors at full 75°C ampacity.

2.02 CONSTRUCTION

A. Meter Centers shall be NEMA 1 units, fully rated, with ampacities as noted on the Drawings. Meter Centers shall consist of multiple stackable sections with 5 meter positions and feeder breaker sizes of 100 amp, 125 amp, 150 amp, or 175 amp, 2 pole output circuit breakers per section as shown on the Drawings.

B. All bus bars shall be silver- or tin-plated aluminum.

C. Provide ring and jaw configurations as required by 3rd party metering company or utility company.

D. Meter Centers shall be rated for 65,000 AIC, minimum, or as specifically noted on the drawings.

E. Provide incoming lugs suitable for copper or aluminum conductors, quantities and sizes as noted on the Drawings.

2.03 CIRCUIT BREAKERS

A. The branch breakers shall be bolt-on type QO-VH, rated 42,000 A.I.C. minimum, molded case, temperature compensated, quick-make, quick-break, with thermal-magnetic trip and be permanently bolted to bus bars.

PART 3 EXECUTION

3.01 INSTALLATION

A. Meter Centers shall be mounted with top meter and circuit breaker at 6'-0" above floor.

B. Additional identification shall be furnished as specified in Specification Section 260553, “Identification.”

END OF SECTION

SECTION 262726

WIRING DEVICES

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install all wiring devices where shown on the Drawings.

B. Wiring devices shall be furnished in strict accordance with the catalog numbers and manufacturers listed in the Schedule that follows. Other special purpose devices shall be provided as specified on the Drawings.

C. All device colors other than the emergency shall be selected by the Architect.

PART 2 PRODUCTS

2.01 STANDARDS

A. Duplex Grounding Type Receptacle - 20 amp, 125 volt - NEMA 5-20R

Hubbell - HBL5362

B. Single pole Switches - 20 amp, 120/277 volt

Hubbell - HBL1221

C. Double Pole Switches - 20 amp, 120/277 volt

Hubbell - HBL1222

D. 3-Way Switches - 20 amp, 120/277 volt

Hubbell - HBL1223

E. 4-Way Switches - 20 amp, 120/277 volt

Hubbell - HBL1224

F. Weatherproof Receptacles - 20 Amp, 125 Volt - NEMA 5-20R with weather resistant rating and "WR" stamp on device

Hubbell – GF5362W with Intermatic Guardian I Series, NEMA 3R cover.

Receptacles designated as weatherproof in damp locations per NEC 406.9(A) may have flip style covers similar to Hubbell WP26.

G. Dryer Receptacle - 30 amp, 125/250 volt, 4 wire, ground type - NEMA 14-30R

Hubbell - HBL9430 with 9432 angle plug

H. G.F.C.I. Receptacle - 20 Amp, 125 Volt - NEMA 5-20R

Hubbell - HBLGF5362-I

I. Duplex Grounding Tamper Resistant Receptacle - 20 amp, 125 volt - NEMA 5-20R

Hubbell – HBLBR20TR

J. G.F.C.I. Duplex Grounding Tamper Resistant Receptacle - 20 amp, 125 volt - NEMA 5-20R

Hubbell – HBLGFTR20

2.02 APPROVED MANUFACTURERS

A. The Electrical Contractor may at his option furnish equal devices by Hubbell, Pass & Seymour/Legrand, General Electric, Leviton, or Cooper.

2.03 FINISHES

A. Wiring devices connected to normal power shall be white unless otherwise indicated or required by NEC. Confirm finish with Architect for each space at the shop drawing phase.

B. Wiring devices connected to emergency/critical power shall be red.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install wiring devices in a neat and workmanlike manner.

B. Ground all receptacles in accordance with Article 250.146 of NEC and as indicated in the Grounding Section of this Specification.

C. To eliminate noise pass through, outlets or devices shall not be mounted back to back.

D. Wiring devices specified are side and back wired type and shall be back wired.

E. General use duplex receptacles shall be grounding type, 20 ampere, and 125 volt.

F. Label emergency/critical receptacles with panel identification and circuit number using Brady Label or equivalent. Label shall be white with red letters and shall be attached to the top center of the receptacle cover plate.

G. Install floor box devices per manufacturer's instructions. Boxes shall be coordinated with new concrete floor for cast-in-place installation. Spacings shall be in accordance with UL requirements. Locations shall be dimensioned by the Architect.

END OF SECTION 262726

SECTION 262813

FUSES

PART 1 GENERAL

1.01 SCOPE

A. Provisions of this Section shall apply to all fuses and fused equipment of 600 volts or less as shown on the Drawings.

B. Furnish and install all fuses as described below.

PART 2 PRODUCTS

2.01 STANDARDS

A. All fuses above 600 amperes shall be U.L. listed Class L by Bussman "Hi-Cap" Type KRP-C, Mersen Type A4BY, or Littelfuse Type KLP-C, unless otherwise noted.

B. All fuses 600 amperes and below shall be U.L. listed Class RK-1 by Bussman "Lo-Peak" Type LPN/S-RK, Mersen Type TR-R, or Littelfuse Type LLN/S-RK, unless otherwise noted.

C. Spare fuse cabinet shall be Bussman Type SFC and installed in the main Electrical Room adjacent to the Main Switchboard.

PART 3 EXECUTION

3.01 SPARE FUSES

A. Furnish one set of three spare fuses for each size and type used. Spare fuses shall be mounted in spare fuse cabinet.

3.02 VOLTAGE RATING

A. All fuses shall have proper voltage rating for the system voltage in which they are fused.

END OF SECTION 262813

SECTION 262816

DISCONNECT SWITCHES

PART 1 GENERAL

1.01 SCOPE

A. Provide heavy duty fusible or non-fusible disconnect switches where shown on the Drawings, in conformance with NEC requirements for each unit of equipment.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Square D, General Electric, Siemens, or Cutler Hammer disconnect switches may be furnished at this contractor's option.

B. Switches shall be wall mounted in general purpose enclosure unless otherwise noted. They shall be NEMA heavy-duty type and shall have the rating, capacity and number of poles for the service concerned.

C. Switches in exterior locations shall be NEMA 3R, unless otherwise noted.

D. Switch handle shall be pad lockable.

E. Fusible switches shall have Class R fuse clips.

F. Switches for use on motor circuits shall be horsepower rated.

G. Switches for elevator controllers shall be Bussmann Power Module Switch, Mersen ES Fusible Shunt Trip Switch, or equal with the following features:

1. Fusible disconnect switch
2. Mechanical interlock handle microswitch
3. Lockable
4. 120-volt shunt-trip control
5. Control power terminal block
6. Ground lug
7. 208~120 volt control power transformer
8. Key test switch
9. Fire alarm voltage monitor relay
10. 2 NO and 2 NC auxiliary contacts

Switch shall not trigger fire alarm trouble signal upon manually disconnecting the elevator for routine maintenance. Verify final ampere rating and fuse size with elevator manufacturer prior to ordering.

H. Disconnect switches for apartment unit water heaters (where required) shall be DPST, toggle style switches with on/off indication, or pad-lockable breaker lock.

I. Condensing unit disconnect switches shall be light-duty, weatherproof, non-fused sized as shown on drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Switches shall be installed to provide Code required clearance and shall be generally wall mounted with top at 6'-0", maximum. Where necessary, disconnect switches may be stacked beneath maximum height.

B. Disconnects mounted on equipment shall be field coordinated and located to clear any access openings or paths.

C. Provide free standing Unistrut support frame for switches that cannot be wall or equipment mounted. Frame shall be full height and attached at the floor and ceiling, and angle braced to floor or poured into concrete equipment pad to provide rigid structure. Minimum height to top of floor-mounted switches shall be 3’-0".

D. Switches shall have identification plates in accordance with Specification Section 26 05 53, “Identification”.

END OF SECTION 262816

SECTION 262913

MOTOR STARTERS AND CONTROLS

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install all magnetic and manual motor starters and controls as shown on the Drawings and specified herein.

PART 2 PRODUCTS

2.01 GENERAL

A. Square D, Allen Bradley, General Electric, Siemens or Cutler-Hammer starters and controls may be furnished at this Contractor's option.

B. All control transformers shall have a 120 volt fused secondary, with properly sized fuses in both primary legs. Control transformers shall be mounted within the starter enclosure and shall have 100 watts of extra capacity.

C. All starters shall have a manual reset overload relay in each phase conductor. Adjustable overload relay shall be dip switch selectable for motor running overload protection with NEMA ICS2, class 20 tripping characteristic, and selected to protect motor against voltage and current unbalance and single phasing. Provide relay with class II ground fault protection, with start and run delays to prevent nuisance tripping on starting. Electrical contractor shall use actual motor nameplate data to properly set overloads.

D. All terminations shall be marked "75°C only", "60/75°C" or listed for use of 75°C insulated wire at full 75°C ampacity.

2.02 MAGNETIC STARTERS

A. Magnetic starters shall be Square D Class 8536 in a NEMA 1 enclosure. Size and type shall be as scheduled on the Drawings.

2.03 COMBINATION STARTERS

A. Combination starters shall be Square D Class 8538, non-fusible disconnect switch type in NEMA 1 enclosure, unless otherwise noted.

B. Disconnect shall be furnished with factory-mounted electrical interlocks wired to open all hot legs of the control circuit from an external source.

2.04 MANUAL STARTERS

A. Manual starting switches for fractional-horsepower, single-phase motor loads shall be Square D Class 2510. Flush units shall have stainless steel covers. Surface units shall be oversized in NEMA 1 enclosures.

B. Lighting type toggle switches for equipment disconnects will not be accepted.

2.05 CONTROL RELAYS

A. Control relays shall be similar to Square D Class 8501 with 600 volt, 15 amp convertible contacts. Furnish in NEMA 1 enclosure with coils and contacts as indicated on the Drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install starters and controls at locations shown on Drawings.

B. Top of starter, relay or contactor shall be installed 6'-0" above floor unless otherwise noted on the Drawings.

C. All starters and controls shall be identified in accordance with Division 26 Section, “Identification”.

D. Furnish control wiring as indicated on the Drawings. Refer to Division 26 Section, "Motor and Equipment Wiring".

END OF SECTION 262913

SECTION 265113

LIGHTING FIXTURES

PART 1 GENERAL

1.01 SCOPE

A. Contractor shall furnish and install lighting fixtures and lamps as indicated in the Fixture Schedule shown on the Drawings and Specified herein.

B. All lighting fixtures are indicated on the Drawings with an identifying letter and number, i.e., S1, CL2, R3, etc. Refer to the Fixture Schedule on the Drawings, which identifies the fixture in accordance with these letters and numbers and indicates the type of mounting of the fixture in accordance with the Legend Section of the Schedule.

PART 2 PRODUCTS

2.01 STANDARDS

A. Lighting fixtures scheduled on the Drawings are specified as standards for design, quality and appearance. For general use / commodity fixture, the Architect will consider fixtures of other manufacturers provided they are equal to or better than the standard. Decorative fixtures are limited to the specified manufacturer(s).

B. Fixture materials given with the standard fixtures shall be maintained if alternate manufacturers are used, i.e., metal sides for metal sides, acrylic plastic louvers for acrylic plastic louvers, etc.

C. This Contractor shall verify compatibility of LED fixtures and LED retrofit lamps with the control type used. Fixtures, lamps, and controls specified for this project are to convey performance, quality, and functional requirements only, and do not relieve the Contractor from verification of compatibility.

2.02 GENERAL

A. Lay-in grid fixtures may be furnished clips for use in supporting fixtures in accordance with NEC Article 410.36(B).

B. Flush fixtures may be furnished with prewired feature provided they are UL approved for 75°C. wiring and the junction box capacity is sufficient for the circuit wiring requirements.

C. Clearances for recessed portions of fixtures from combustible material and thermal insulation shall be in accordance with NEC Article 410.166.

2.03 DRIVERS AND LIGHT ENGINES

A. All LED light fixtures shall have integral 0-10V dimming, universal 120-277V power supplies, and shall be U.L. approved. Color temperature shall be as noted on the Light Fixture Schedule. Where specified color temperature is not available as either a standard or custom feature, closest color temperature shall be submitted for explicit approval.

B. All LED light fixtures shall be fully serviceable with upgradeable LED light engine, rated for 50,000 hour life, and be covered by a 5-year warranty.

C. All LED light fixtures shall be 80 CRI minimum, unless noted otherwise.

2.05 LAMPS

A. Lamps in exit signs shall be LED extended life type as indicated by the fixture manufacturer.

PART 3 EXECUTION

3.01 GENERAL

A. This Contractor shall inform the General Contractor of location and framing details necessary for the installation of flush ceiling fixtures and deliver to the General Contractor all frames of these fixtures so that they become a part of the ceiling construction. This Contractor shall verify the actual suspension system to be used and make all adjustments in fixture installation provisions required thereby.

B. Flush fixtures that have light leaks between the frame and ceiling shall have a gasket installed by this Contractor between the trim and the ceiling.

C. Furnish all mounting straps, frames, rings and other accessories required for a complete lighting installation. Refer to architectural room treatment schedule. Should any conflict occur with the building structure that will not allow proper installation of fixtures, the Architect shall be contacted before proceeding.

D. No fixtures shall be installed until painting is completed. Fixtures with paint marks on them shall be replaced.

E. All light fixtures shall be installed with centerlines symmetrical to the building, or at angles so designated by the plans. Fixtures not set thus shall be removed and reinstalled at this Contractor’s expense.

F. Any fixtures scratched, bent, cracked or in any way damaged before acceptance by Owner shall be replaced at this Contractor's expense.

G. All lamps shall be in working order at the time of final acceptance of the work by the Owner and Architect.

H. All lighting fixtures are to be grounded on the interior of the fixture housing, on clean bare metal that is free of paint, by use of a pigtail and fastened by a screw used for no other purpose.

3.02 INSTALLATION

A. Wherever lighting systems are supported and fastened to a ceiling suspension system of the grid type, the following method shall be followed:

1) On suspended fixtures, an additional wire is to be added at each stem location from the structural floor above, providing there are no wires within 6" of the stem clip. NOTE: these wires cannot be suspended from the lathe and plaster but must be anchored into the structural floor.

2) Surface mounted fixtures shall be fastened at each of the four corners and fit tight to the ceiling suspension system.

3) Each fixture shall have a support wire at each corner of each recessed fixture. Each fixture shall be fastened to the grid system in accordance with NEC Article 410.36(B) using suitable clips.

4) Surface or flush fixtures in ceilings of the suspended lay-in type shall be installed so that the long dimension of the fixture is supported on the main support members of the ceiling system. All surface or flush fixtures for lay-in ceilings shall be equipped with at least two galvanized steel safety support wires, or chains, attached from the fixture housing to the structure independent of the ceiling system. Wire or chain shall withstand a 50-pound drop test.

5) If fixtures are located other than on a main T-bar, additional T-bar or channel shall be added above the ceiling and fixture supported as directed, or fixture shall be supported independent of the ceiling suspension system.

6) The T-bar shall not be cut out to provide room for the junction box.

7) A few of the first fixtures shall be checked as soon as they are suspended, to determine if any sagging or twisting of the ceiling system exists, and if fixtures are firm and hang straight.

8) After all fixtures and lamps have been installed, the ceiling shall be rechecked for sagging, and any correction shall be the responsibility of the Electrical Contractor.

B. Provide concrete anchor inserts, boxes, fixture studs and all Unistrut framing required for fixture installation.

END OF SECTION 265113

SECTION 270528

PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SCOPE

A. Unless otherwise noted, refer to low voltage drawings for detail on the communication systems.

B. Furnish and install complete pathway system, including terminal boards, junction boxes, outlet boxes/device rings, grounding, j-hooks, conduits, and sleeves as shown on the Drawings and specified herein.

C. All low voltage cabling, outlet jacks, and associated equipment will be installed by others, unless noted otherwise, during construction prior to closure of walls and ceilings. Coordinate all final outlet locations and requirements with Low Voltage Contractor in field.

PART 2 PRODUCTS

2.01 STANDARDS

A. Conduit for voice/data wall outlet shall be minimum of 1” unless shown otherwise.

B. Voice/data outlet boxes shall be a minimum of 4" square with single-adapter. Plates shall be blank and match receptacle plates. See Division 26 Section, "Boxes and Plates".

C. Voice/data and television outlet boxes in apartment units of Type 3 Construction may be single gang plaster ring at this Contractor’s option, similar to Caddy MP1S low voltage Class 2 mounting plate.

D. Terminal boards shall be 4’-0” by 8’-0” by ¾” plywood sheets and located as shown on the Drawings. Terminal boards will be combined communications, security and CATV.

E. The plywood boards shall be securely attached to the building walls to support relay panels, terminals, power equipment and other hardware weighing approximately 10 pounds per square foot.

F. Provide dedicated, grounded, duplex or double duplex receptacles rated 20 amp, 120 volt, separately protected, in the locations shown on the drawings.

G. The full area of the backboard shall be kept free of all pipes, water meters, conduits, switchgear, etc., with 36" minimum clearance area in front extending 8’-0” high above finished floor.

H. Prime and paint the plywood backboard both sides and edges with two (2) coats of gray flameproof paint.

PART 3 EXECUTION

3.01 INSTALLATION

A. Low voltage cables inside apartment units in areas of Type 3 construction may be free-wired without conduit, unless noted or requested otherwise. Conduits for all other low voltage outlets shall be EMT, minimum size 3/4" with pull string, and installed as detailed in section 26 05 33, Conduits.

B. Provide intermediate distribution conduits to the MDF, and between the MDF and IDFs, as noted on the drawings.

C. No more than two (2) 90 degree bends in telephone conduit without a pull box or slip sleeve per Low Voltage Contractor's requirements. LB type fittings shall not be used in lieu of conduit bends.

D. Pull boxes where required shall be a minimum size of 24” by 24” by 8” with screw cover, and sized by this Contractor per the NEC requirements.

E. Bends in conduits, and in particular conduits larger than 2", shall be long sweep bends.

F. Where no wiring is specified in the communications conduit system, provide #14 steel pull wires or nylon pull cord.

G. Conduit system shall be continuous from all outlets to above lay-in ceiling. Where pathway back to MDF passes inaccessible ceiling areas, resume conduit installation for all applicable outlets.

H. Terminal boards shall have four (4) additional empty 2" conduits stubbed into adjacent corridor ceiling space for future use.

I. Provide (3) 4” sleeves through the floor below each telephone terminal board on each floor, and within intermediate stacked rooms connecting telephone board locations, as noted on the drawings. Sleeves shall be properly firestopped to maintain floor fire rating.

J. Provide dwelling unit telecommunication wiring as identified on the drawings.

K. Ream and bush all conduit ends.

END OF SECTION 270528

EMERGENCY RESPONDER RADIO COVERAGE SURVEY

PART 1 GENERAL

1.01 SCOPE

A. Provide a complete building radio coverage signal strength survey for the Emergency Responder Radio Coverage System (ERRCS) throughout the newly constructed building. The survey will be based upon the existing emergency radio signal levels of the public safety communication system at the exterior of the building. This section shall not require improvement of the existing public safety communication systems.

B. Provide a Certified ERRCS signal strength and coverage report confirming the new building's Bi-Direction Amplifier (BDA) and Distributed Antenna System (DAS) are compliant with all the requirements of National Fire Protection Association (NFPA) and International Fire Code (IFC).

PART 2 PRODUCTS

2.01 STANDARDS

A. Documentation of the ERRCS signal strength survey shall be performed in accordance with International Fire Code Section 510 Standards by a certified technician. The technician shall have the following qualifications:

1. A valid FCC-issued general radio operator's license.
2. Certification of in-building system training issued by a nationally recognized organization, school, or a certificate issued by the manufacturer of the installed equipment.

B. Radio Coverage Signal Strength Survey to document compliance of the installed ERRCS shall meet requirements of International Fire Code Chapter 5, Fire Service Features, Section 510, Emergency Responder Radio Coverage.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide qualified technicians and equipment to perform the survey and document survey results.

B. A minimum signal strength of -95 dBm shall be receivable within the building. A minimum signal strength of -100 dBm shall be received by the agency's radio system when transmitted from within the building.

C. Radio coverage survey shall be performed after building structure, fenestration, and interior walls have been completed an initial radio signal strength (Spectrum Analysis) and clarity study is performed. The survey should separate each floor into 20 equally sized test areas per floor. Signal strength readings shall be taken near the center of each of the test areas.

D. Once the radio coverage survey is complete, provide a complete and detailed list of all equipment and labor required to make the facility compliant.

E. The contractor shall communicate any deficiencies in ERRCS signal strength to the ERRCS installer for corrective actions to be planned. Upon completion of corrective actions by the ERRCS installer, a new survey shall be provided in those areas of the building to confirm compliant signal levels.

F. At the completion of the project, furnish six (6) complete bound sets of signal strength survey showing compliance with the standards listed within this specification section.

END OF SECTION 282600

SECTION 283100

FIRE ALARM SYSTEM

PART 1 GENERAL

1.01 SCOPE

A. A microprocessor based Class B, electrically operated and supervised, closed circuit fire alarm system will be provided by the Owner's fire alarm vendor. The Electrical Contractor will provide power for the fire alarm system components and a raceway system with device boxes and pull wire for the fire alarm system.

B. The fire alarm layout on the drawings is schematic in design to indicate anticipated pathways and power. The Electrical Contractor shall furnish a complete design, developed by a NICET Level III (minimum) Ohio Certified Fire Alarm Designer. Any additional materials and/or labor that is required for compliance with all governing laws, Codes, rules and regulations shall be provided. Nothing in these specifications or on the drawings shall be deemed as authority to violate any laws, codes, or regulations.

PART 2 PRODUCTS

2.01 STANDARDS

A. The materials, wiring and equipment shall be designed and built in accordance with the best practices of the electrical industry and shall conform to the standards of:

1) National Electrical Code
2) The National Electrical Safety Code
3) Applicable State and Local Regulations
4) National Fire Protection Association
5) UL listed or Associated Factory Mutual Insurance Company listed

B. Fire alarm system shall be manufactured by Edwards, Mircom, Gamewell, Notifier, or Simplex.

2.02 GENERAL SYSTEM DESCRIPTION

A. The supervised, coded, closed-circuit type system shall be so arranged that by pulling a manual pull station or from operation of one of the automatic detecting devices will register an alarm at the Fire Alarm Control Panel. This will cause immediate and continuous operation of all the building alarm signals to sound the general alarm signal, until the alarm has been acknowledged at the control panel.

B. The general alarm signal shall be the ANSI S3.41.3 pulse temporal low pattern. Strobes shall continue to flash until the initiating device has been restored to normal and the system reset.

C. The system shall sense smoke in each return and supply air plenum of each air handling system and shall annunciate, on detection, the address and zone in

which the detector is located and sound the alarm. The system shall, during general alarm, shut down all major fans supplying the building. An actuating smoke detector, waterflow device or manual pull station will sound the general alarm and also shut down the air handling systems. Provide addressable module at each fan powered box, VAV unit, and air handling unit for unit shutdown.

D. Duct mounted smoke dampers shall close by a signal from the auxiliary relays of the local duct mounted smoke detector.

E. Fire alarm control panel shall send all alarm and trouble signals to the Municipal Fire Department or remote monitoring service organization.

F. The detectors in all elevator lobbies, at the top of the elevator shafts and in the elevator machine room upon actuation shall report to the fire alarm controller and sound a general alarm, shut down air handling systems, and send a signal(s) to the elevator controller(s) that initiates the elevator return to the first floor. The detector in the first floor elevator lobby shall report independently to the fire alarm controller to return the elevator to the alternate level.

G. Signals to elevator controllers shall be from addressable control modules located in the elevator machine room. Provide addressable control modules for primary recall, secondary recall, shut trip activation, and firefighter hat signal.

H. Each of the heat detectors in the machine room and at top of elevator shaft initiate an addressable control module in the elevator machine room to open the elevator disconnect power module to de-energize the elevator controller.

I. Sprinkler waterflow and tamper switches shall be supervised for alarm and trouble conditions. Devices are shown schematically on drawing. Coordinate exact location with Sprinkler Contractor in field.

J. Fire alarm control panel shall release magnetic door holder and magnetic door locks upon initiating a general alarm condition.

K. Carbon monoxide detectors shall provide a supervisory alarm at the fire alarm control panel.

L. Apartment unit smoke alarms shall not be connected to the building fire alarm system.

M. Dwelling units shall be provided with fire alarm horns connected to the building fire alarm panel.

N. ADAAG type A dwelling units shall have speaker-strobe units in the living room, bathroom and bedrooms connected to the building fire alarm panel. Type A units shall also have a visible strobe actuated by the multi-station smoke detectors. The strobes shall be located adjacent to each speaker in the unit, or be UL listed combination device.

2.03 HORN/STROBE

A. All power supplies shall be sized for 30% additional capacity to handle future installation of devices.

B. All initial horn and strobe circuits shall be loaded to 70% capacity.

C. Horns shall be installed to provide 15 dba above ambient noise level.

D. Equipment manufacturer shall select the intensity rating for each visual appliance to provide an equivalent illumination for the space/installation to comply with ADA and NFPA 72.

2.04 FIRE ALARM CONTROL PANEL

A. Fire Alarm Control Panel (FACP) shall detect operation of any signal initiating device by alpha numeric display, have a remote annunciator indicating the area of fire alarm condition, operate all general alarm devices, and function as indicated:

1. Be microprocessor based.
2. Have 80 character English readout with dynamic LCD display.
3. Have standard RS-232-C output to control remote printer.
4. Provided with equipment for active zones, spare zones and future zones.
5. Provide for remote annunciators.
6. Provide for selective manual actuation of emergency signals.
7. Be programmed for 10% additional points with coded alarm.
8. Provide smoke detector alarm verification.
9. Program shall be stored in non-volatile memory.

B. General Alarm Circuits: Positive non-interfering type so that a second zone can be annunciated simultaneously or closely following first zone.

C. Convert main 120 volt AC power to low voltage direct current for 24 volt DC system.

1. Incorporate transformer, rectifier fuses and other power supply components in fire alarm control panel, or separate panel if approved for application.

2. Power supply shall provide sufficient power to operate annunciator(s) and all devices furnished by others.

D. Provide approved battery type and charger/transformer system for emergency backup power during period of power supply failure to control panel.

1. Minimum battery capacity shall be 24-hour operation and supervisory mode plus 15-minute alarm mode.

E. Provide the following output contacts:

1. System Alarm – two contacts
2. System Trouble – two contacts

F. FACP shall be a semi-flush mounted red cabinet with glass window and locking door.

G. Notification Appliance Circuit Expander panels, if deemed required by the Certified Designer, shall have a minimum of (4) four class B outputs, and shall be provided in electrical closets.

2.05 REMOTE ANNUNCIATOR PANEL

A. Remote Annunciator Panel shall be in red painted flush mounted box. Each zone and system trouble shall annunciate at the 2 line by 40 character LCD display. An audible trouble signal shall be mounted inside the annunciator panel. Remote annunciator in vestibule shall acknowledge alarms.

B. Panel shall be equipped with default mode feature, so that when communication is lost with FACP, an alarm in the respective building will initiate the evacuation signal.

C. Panel shall be equipped with power supplies and amplifiers sized for the respective building core areas.

D. Panel shall be equipped with alarm verification module for smoke detectors.

E. Contractor to verify final locations and quantities with local Fire Department prior to system design and submittal.

2.06 PERIPHERAL DEVICES

A. Visual Indicating Strobe

Visual devices shall be a minimum of 75 Candela, 24 VDC powered Xenon flash unit with clear polycarbonate lens. Device shall be red semi-flush base with white "FIRE" lettering. The manufacturer shall select the proper Candela model per the occupancy, location and proper applications of all applicable codes. Strobes shall be synchronized for 1 Hz flash rate to reduce the probability of photo-sensitive reactions. Devices shall be UL 1971 listed.

B. Combination Audible/Visual Indicating Appliance

Combination audible/visual devices shall be wall mounted with vertical strobe orientation. Audible device shall, be mechanical horn-type, 87dB minimum at 10 feet. The visual device shall have a minimum of 75 Candela, 24 VDC powered Xenon flash unit with clear polycarbonate lens. Device shall be red semi-flush base with white "FIRE" lettering. The manufacturer shall select the proper Candela model per the occupancy, location and proper applications of all

applicable codes. Strobes shall be synchronized for 1 Hz flash rate to reduce the probability of photo-sensitive reactions. Devices shall be UL 1971 listed.

C. Photoelectric Smoke Detector Head

Photoelectric type detectors shall be a plug-in analog unit that mounts to a twist-lock, addressable base with integral LED status indication and locking, anti-tamper design. Device shall be UL listed.

D. Thermal Heat Detector Head

Thermal type detectors shall be combination rate-of-rise with fixed temperature (135ºF) and automatically restorable. Provide dedicated contacts for elevator shunt trip control. Device shall be UL listed.

E. Photoelectric Smoke Alarms in Apartments

Photoelectric type alarms in apartment units shall be multi-station with 120 volt DC primary source and battery back-up, equipped with sounder base for local annunciation of smoke detection. Dwelling unit smoke and combination smoke/CO alarms shall be interconnected to sound all alarms within the apartment unit upon detection of smoke. Apartment unit smoke alarms shall not send an alarm signal to the local fire station.

F. Mini Audible Indicating Appliances in Apartments

Devices shall be white in color, flush wall mounted. Audible devices shall be mechanical horn type, 85dB minimum at 10 feet. Devices shall be UL 1971 listed.

G. Sprinkler Waterflow and Valve Tamper Switches

Sprinkler water and valve tamper switches will be provided by the Fire Protection Contractor, and wired by the Electrical Contractor. Provide zone addressable monitor module with each waterflow switch and supervise each tamper switch.

H. Addressable Manual Pull Stations

Pull stations shall be addressable, semi-flush mounted, single action device made of red lexan with a recessed pull handle. Each device shall have a unique address on the system and require a key to reset.

I. Addressable Duct Detector

Duct Detector shall house built-in photoelectrical smoke sensor. Device shall have a sampling tube as required to span HVAC duct width and a remote mounted test station with key operated test switch and alarm light. Test station shall be located where shown on the drawings.

J. Zone Addressable Module

Zone Adaptor Modules shall be used for the monitoring of waterflow, valve tamper and suppression system control panels.

K. Control Device

Zone addressable control modules shall have relays with isolated contacts for controlling mechanical equipment.

L. Magnetic Door Holders

Door holders shall be electro-mechanical for 24 volt DC operation. Device mounting (flush, semi-flush, surface wall, single door floor, double door floor, etc.) shall be coordinated with Architectural Drawings.

M. Remote Alarm Lamp

Remote alarm lamps shall have red LED alarm indicator.

N. Fire alarm bell will be provided by the Fire Protection Contractor and wired by the Electrical Contractor.

PART 3 EXECUTION

3.01 SHOP DRAWINGS

A. Shop drawings shall be prepared, stamped, and signed by persons trained and certified by the manufacturer in fire alarm design and fire alarm certified by NICET, minimum Level III. Designer shall be Ohio Certified Fire Alarm System Designer, who shall be responsible for the complete fire alarm system design.

B. Shop Drawings submittal shall include complete building fire alarm system wiring diagram showing control panels, all devices, number and size of wire, conduit size, and conduit runs, in the system, as it is to be wired. Diagram shall be on a 24” x 36” sheet and shall be in the form of a floor plan so as to show zone identification and devices clearly. Identify device locations by description, zone and address numbers.

C. Submit zone, code and address schedule along with other fire alarm Drawings.

D. Submit fire alarm control panel and wiring diagrams clearly indicating field connections, device wiring and mounting details.

E. Submit wiring diagrams indicating identification at all terminal points and at junction boxes according to the provisions of Division 26 Section, “Identification” and Division 26 Section, Wire and Cable”, and as it is to be wired in the field.

F. Submit brochures with catalog cuts and specifications on the following:

1. Control Panels and Modules

2. Power Supplies
3. Batteries and Charger
4. Transponders
5. Modules/Transmitters
6. Annunciators
7. Smoke Detectors
8. Duct Detectors
9. Heat Detectors
10. Manual Pull Stations
11. Horn/Strobes
12. Strobes
13. Door Holders

G. The Manufacturer shall provide calculations and shop drawings, with identification of individual responsible for system design, based on the layout as shown on the Drawings. These are to be available for review by the Engineer, the inspector/approval authorities and the insuring agency. Documentation is to be as specified in the Ohio Building Code, sections 106 and 907.

H. At the completion of the project, furnish six (6) complete bound sets of “As-Built” Drawings and Wiring Diagrams to the Architect. These shall show all devices as they are installed in the system as a part of the system. Parts and service manuals shall also be included.

3.02 INSTALLATION

A. All wiring shall be installed in strict accordance with the equipment manufacturer’s recommendations. The Contractor shall provide for the services of the equipment manufacturer’s representative to assist in final connection, adjustments and tests.

B. Wire and cable shall be sized and installed per Division 26 Section, “Wire and Cable”. Requirements for use of power limited or non-power limited wiring shall be as directed by equipment manufacturer.

C. All fire alarm wiring and low voltage cabling shall be in a Class B configuration and shall be installed continually from junction box to the control panel in 3/4” EMT conduit per Division 26 Sections "Conduits" and "Boxes and Plates" where located in inaccessible areas.

D. Plenum rated fire alarm cabling shall be used above accessible ceilings when not in conduit. Extend conduits from fire alarm device boxes to above nearest accessible ceiling. Provide J-hooks or bridle rings for support of wiring above accessible ceilings.

E. Smoke detectors shall be mounted in accessible locations. Smoke detectors shall be considered accessible if:

1. Visible from floor.

2. Installed in an area on the ceiling or slab that is free from obstructions for a minimum of 18” on all sides.
3. Located such that it can be reached from floor by use of ladder or remote removal/replacement tool.

F. Verify quantity and location of flow switches, low air pressure switches and valve supervisory switches furnished by the Fire Protection Contractor and wired by the Electrical Contractor, from final approved Fire Protection Drawings.

G. Location of duct detectors shall be field coordinated with Mechanical Contractor but must be mounted within 5'-0” of damper. Any duct work modifications necessary to install detectors in accessible locations shall be the responsibility of the Electrical Contractor. Furnish mounting hardware as required.

H. Remote alarm lamps/test stations are to be mounted in visible locations. Provide a lamicoid nameplate at each remote lamp location indicating the location of the detector served. See Division 26 Section, “Identification”.

I. Provide an addressable fire alarm module at each secured door to release the lock upon general alarm.

J. Provide smoke detector at FACP, remote annunciator, and all transponder/extender panels.

K. Provide carbon monoxide detectors in mechanical rooms containing gas fired water heaters, gas fired furnaces, and in guestrooms, public spaces, and any location with gas fired fireplaces or other gas appliances.

3.03 SPARE PARTS

A. Furnish spare peripheral devices in a quantity of 5 percent of the total used in the project with a minimum of 2 of each type.

B. The Electrical Contractor shall include in his bid an allowance for furnishing and installing ten (10) additional audio/visual signaling devices at the end of the project as directed by the Architect. All wiring and conduit shall be included per a typical installation. All unused devices shall be turned over to the Owner as additional spare parts.

C. Furnish seven (7) keys to open panels, pull stations and annunciators.

3.04 SYSTEM CHECKOUT AND TEST

A. The Contractor and the manufacturer representative shall demonstrate and review the system operations with the Owner or his representative in the presence of the Architect to assure their complete understanding of the system.

B. Prior to the demonstration test above, the final fire alarm system shall be completely checked out for operation, zone indication, alarm signal, fan shutdown, etc., and tested by a qualified Field Representative of equipment

vendor, in accordance with NFPA-72, in the presence of the Contractor, the Architect and the Owner's Representative. The sensitivity and related air velocity of each air duct smoke detector shall be measured and recorded. A report shall be submitted to the Architect by the vendor's representative indicating the recorded data and the results of such final checkout and test. Final payment will not be approved until such report is submitted.

3.05 ACCEPTANCE TESTS

A. The Owner will accept the system when it has been proven by a mutually agreeable performance test and when all specified requirements have been met. These tests shall verify a proper system response over the full operational range of sensors being monitored. The tests shall also verify that the system software is operating in accordance with the Specifications.

B. All system equipment shall be tested to make sure that the equipment and installation performs correctly. Such testing shall include as a minimum:

1. Processing of all status information.
2. Performance of all built-in data manipulation.
3. Continuation of FACP operation following the loss of the FACP, and/or the loss of the normal power supply.
4. Performance of all peripherals and communicating with the FACP.
5. All records demonstrated and acceptable.
6. All messages demonstrated and acceptable.
7. All key-in functions demonstrated and acceptable.

3.06 TRAINING

A. The Electrical Contractor shall furnish and install printed, simplified operational instructions at the control unit and all remote annunciator panel locations which describes actions to be taken by operational personnel upon alarm or trouble annunciation.

3.07 GUARANTEE

A. All materials and installation shall be guaranteed to be free from defects for one (1) year from the date of Owner's acceptance.

3.08 ADJUSTING

A. Occupancy Adjustments: After the Life Safety Test is complete the system shall be adjusted to suit the actual occupied conditions.

END OF SECTION 283100

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section includes the following:
1. Excavate subsoil and stockpile for later reuse.
2. Grade and contour site to elevations indicated on Drawings.
3. Remove from site excess topsoil and subsoil.
4. Preparing subgrade and filling under slabs on grade, foundations, sidewalks, and paving.
5. Excavation.
6. Fill materials and compaction.
7. Building perimeter backfilling.
8. Subgrade stabilization for pavement subgrade.
9. Excavating and backfilling trenches and structures.
10. Bedding materials.
11. Fill for over-excavation.
12. Finish grade subsoil.
13. Place, level, and compact topsoil.

1.02 RELATED SECTIONS

A. Work under this section is subject to the requirements of the Contract Documents including General Conditions, Supplementary Conditions, Drawings, and sections under Division 01 General Requirements.

B. Section 31 10 00 - Site Clearing

C. Section 31 23 33 - Piped Utilities - Basic Methods

D. Section 31 25 00 - Erosion and Sedimentation Control

E. Section 32 12 00 – Flexible Pavement

F. Section 32 13 00 - Rigid Pavement

G. Section 33 11 00 – Water Distribution

H. Section 33 30 00 - Sanitary Sewerage

I. Section 33 40 00 - Storm Drainage

1.03 REFERENCED STANDARDS

A. American Society of Testing and Materials (ASTM).
1. C 136 — Method for Sieve Analysis for Fine and Coarse Aggregates.
2. D 422 — Particle Size Analysis of Soils.
3. D 698 — Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb. (2.49 kg) Rammer and 12-inch (304.8 mm) Drop.
4. D 1556 — Test Method for Density of Soil in Place by the Sand-Cone Method.

5. D 1557 — Test Methods for Moisture-Density Relatives of Soils and Soil Aggregate Mixtures Using 120 lb. (4.54 kg) Rammer and 18-inch (457 mm) Drop.
6. D 2487 — Classification of Soils for Engineering Purposes (Unified Soil Classification System).
7. D 2488 — Description and Identification of Soils (Visual — Manual Procedure).
8. D 2922 — Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth).
9. D 3017 — Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
10. D 4318 — Liquid Limit, Plastic Limit and Plastic Index of Soils.

B. Occupation Safety and Health Administration (OSHA), 29 Code of Federal Regulations (CFC) Part 1926.650 to .657, Subpart P Construction Standard for Excavations.

C. City of Columbus; Construction and Materials Specifications (CMSC).
1. The Terms “Engineer,” “Director,” “City,” and other similar terms shall be interpreted as the Owner.
2. In the event of any conflicts between CMSC and the Contract Documents, the most stringent shall apply
3. Local municipality having jurisdiction.

D. Preliminary Geotechnical Exploration Report prepared by INTERTEK PSI dated August 23, 2022.

1.04 SUBMITTALS

A. Comply with requirements of Division 1 for submittals. Submit two copies of the following items:
1. Material qualification tests for each fill material used and field density test reports directly from Testing Agency.
2. Testing Agency certificate of inspection and compliance with specifications for the following:
   a. Bearing capacity for all footing/foundation subgrades.
   b. Acceptability for both on-site and borrow fill materials, prior to use.
   c. Acceptability of subgrade prior to fill and pavement base placement.
   d. Acceptability of fill placement.
3. Shoring or underpinning plans, signed and sealed by a structural engineer licensed in Ohio.
4. Submit 1-foot square samples of geotechnical fabric and filter fabric.

B. Submit to the testing agency in accordance with Division 1 of the project specifications, one week prior to fill placement in order to perform qualification tests.
1. 10 lb. sample of each type of fill to the Testing Agency in airtight containers.

1.05 QUALITY ASSURANCE

A. Unless otherwise specified, the Contractor shall pay for a Testing Agency to perform the following required qualification tests. The Contractor shall coordinate all activities with the Testing Agency and provide the Testing Agency with an accurate schedule and provide notice of field operations.
1. Qualification tests on each different fill material (both on-site and imported).

2. Fill Materials: Provide the following information and qualifications tests for each fill material, including select on-site materials, prior to use on project site.
   a. Location of sources for each required imported materials prior to delivery to site.
   b. Analysis of fine and coarse aggregate ASTM C 136.
   c. Particle size analysis of soils ASTM D 422.
   d. Liquid Limit, Plastic Limit and Plasticity Index, ASTM D 4318 — cohesive materials only.
   e. Proctor density or relative density information according to test method identified in the Compaction Requirements Schedule at the end of this section.

B. Fill material shall not be used until qualification tests have been completed and the Testing Agency has approved the fill material.

1.06 DEFINITIONS

A. Stripping: Removal of existing surficial unsuitable materials (see definition) to their entire depth or as indicated.

B. Excavation: Cutting, digging, removing, and wasting materials of every description, including soils, foundations, rock, and whatever substance encountered to dimensions, limits, elevations, and contours as indicated or required by either the Drawings or these Specifications.

C. Rock: Dolomite, granite, trap, quartzite, limestone, hard sandstone, slate, or other hard materials, in natural ledges 6 inches or more in thickness, or displaced masses which cannot be excavated or removed by use of: (A) dozer or dozer ripper with a minimum of 250 H.P.; (B) backhoe or shovel with bucket capacity of a minimum of 1.5 C.Y. Removal requires line drilling, blasting, pre-slitting, rock wedging, jack-hammering, hydro-hammering and/or the use of other power tools. A ledge shall be considered to be a continuous deposit of any one of the above materials which may or may not include interbedded seams of soft material that can be measured for thickness, either horizontally or vertically. If vertical thickness of soft material between layers is less than 12 inches, then this material shall be included and measured as rock excavation. If the horizontal thickness of soft material between rock pinnacles measures less than 30 inches, then this material shall be included and measured as rock excavation. Excavation in any material meeting the description of rock will be paid for at a previously established unit price as "rock excavation." Contractor shall notify the Geotechnical Engineer when rock is encountered. The contractor shall make arrangements to have the area surveyed before and after rock removal in order to establish the pay quantity.

D. Unsuitable Materials: Topsoil, loam, gumbo, mud, muck, silt, expansive clay, peat, soils with an organic content greater than 3% by weight, rubbish, debris, foundation and slab materials, paving materials, soil meeting ASTM D 2481 soil classification group ML, MH, CH, OL, OH and PT, rock greater than four (4) inches in diameter, soils with a maximum dry weight of less than 100 pounds per cubic foot, vegetation and frozen or dry lumps. Expansive clay is any clay with a liquid limit in excess of 50 and/or Plasticity Index of 30 or greater.

E. Unstable Materials: Materials which are not classified as unsuitable materials, but due to their condition of being wet, dry, or frozen, are unacceptable for use in fills.

F. Imported Fill Material or Borrow: Approved soil materials from sources other than those made available by required excavation of Project. Imported fill shall be free of unsuitable and unstable materials and shall be approved by the Testing Agency and have a proctor test to be utilized prior to placement.

G. Filling/Backfilling: Placing of approved soil materials in accordance with specified procedures and materials and in conformity with lines, grades, contours, cross-sections and elevations shown on Drawings or required by these Specifications.

H. Subgrade: Undisturbed soil or compacted fill material upon which additional fill, sub-base or base course, footing, foundation, or slab cushion is placed.

I. Engineered Fill: An acceptable soil, aggregate, or man-made material that is placed in a controlled manner to satisfy a defined compaction Specification. The defined compaction Specification would include a maximum lift thickness, acceptable moisture content, and minimum required compaction percentage based on a moisture/density relationship (proctor or relative density).

J. Hydrated Lime: A dry powder obtained by treating quicklime with water enough to satisfy its chemical affinity for water under the conditions of its hydration. It consists essentially of calcium hydroxide or a mixture of calcium hydroxide and magnesium oxide or magnesium hydroxide, or both.

K. Quicklime: A calcined limestone, the major part of which is calcium oxide or calcium oxide in association with magnesium oxide, capable of slaking with water.

L. Pond Liner Material: Cohesive, on-site soils, USCS Classification CL or CL-ML. Soils shall be free of any unsuitable materials with greater than 70% passing the No. 200 sieve. Soils shall have a moisture content at or slightly above maximum of 4% optimum.

M. Stabilized Subgrade: Pavement subgrade soil stabilized in accordance with the Testing Agency recommendations and as generally described in Section 3.04.E.

N. Unauthorized Excavation: consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Owner/Engineer. Unauthorized excavation, as well as remedial work directed by Owner/Engineer shall be at Contractor's expense.

1. Under footings, foundation bases or retaining walls, backfill unauthorized excavation with lean concrete or extend indicated bottom elevation of footing or base to excavation bottom without altering required top elevation.
2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by the Engineer or Testing Agency.

O. Additional excavation: When excavation has reached required subgrade elevations, notify Testing Agency, who will make an evaluation of the conditions. If the Testing Agency determines that bearing materials at required subgrade elevations are unsuitable or unstable, continue excavation until suitable bearing materials are encountered and backfill the excavated area as directed by the Testing Agency based on these specifications. The contract sum may be adjusted by an appropriate contract modification.

1.07 DELIVERY, STORAGE, AND HANDLNG

A. Store and handle all materials to prevent their deterioration from weather.

B. Provide sediment and erosion control around all stockpiles in accordance with Section 31 25 00

C. Sequence work and stockpiles to minimize contamination or mixing of materials.

1.08 PROJECT RECORD DOCUMENTS

A. Accurately record location of existing utilities, their disposition (abandon or active), rerouted utilities, new utilities by horizontal dimensions, elevations or inverts, and slope gradients.

B. Verify finished grade spot elevations at locations shown on the grading plans.

C. Provide verification surveys for underground and surface storm water detention facilities as described in the general notes included on the plans.

1.09 LAYOUT

A. Employ a Professional Surveyor, registered in State of Ohio, to lay out and establish all lines and grades, including centerline of all structural columns.

B. Erect control points prior to excavation. Protect existing control points.

C. All surveying costs to be paid by the Contractor performing the work.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Type A – **CMSC** Item 411 - Stabilized Crushed Aggregate.

B. Type B – Pea Gravel: Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ANSI/ASTM C136, to the following:
1. Minimum Size: 1/4 inch.
2. Maximum Size: 5/8 inch.

C. Type C – Sand: Natural river or bank sand, washed: free of silt, clay, loam, friable or soluble materials, or organic matter graded in accordance with ANSI/ASTM C136, within the following limits.

Sieve Size	Percent Passing
No. 4	100
No. 14	10 to 100
No. 50	5 to 90
No. 100	4 to 30
No. 200	0

D. Type D - Subsoil–Reused, select onsite or borrow soil materials conforming to the following:
   1. ASTM D2487 Soil Classification Groups GW, GC, GM, SW, SC, SM, CL, and ML.
   2. Less than 3% organic material by weight.
   3. Free of unstable or unsuitable material or construction debris.
   4. Conform with CMSC item 203.02.R

E. Type E – CMSC Item 703, size no. 57 aggregate.

F. Type F – CMSC Item 653.02 Topsoil: Fertile, friable, fine sandy clay loam, uniform in composition, capable of sustaining vigorous plant growth and free of subsoil, stones, lumps, clods of hard earth, plants, plant roots, sticks, noxious weeds, slag, cinders, demolition debris or other extraneous matter over 1 inch in the largest dimension.

G. Type G - Concrete: Structural concrete conforming to Section 03 30 00, "Cast-in-Place Concrete" with a compressive strength of 4500 psi.

H. Type H - Drainage Fill: CMSC Item 703, Size No. 8 aggregate.

I. Type I – Low Strength Mortar Backfill: CMSC Item 613

J. Type J - Aggregate Base: CMSC Item 304.

K. Type K – Bank Run Gravel: The material shall consist of bank run sand and gravel, free of frozen materials, wood, rubbish, and unsuitable or unstable material. It shall have no more than 20% passing the No. 200 sieve and no particle size larger than 3 inches. Sources of borrow shall be designated well in advance of construction and the material shall be approved by the Testing Agency prior to beginning work.

2.02 CONSTRUCTION FENCE

A. Plastic construction fence, orange in color, with the following properties:
   1. Material - Co-polymer
   2. Typical Aperture Size - 1.3 inches x 1.3 inches
   3. Minimum Tensile Strength:
      a. MD 850 lbs./ft. width
      b. TD 1050 lbs./ft. width
      c. MD 4850 psi
      d. TD 5810 psi
   4. Junction Strength - 90% of rib strength (minimum) Nominal Porosity – 75%
   5. Ultraviolet Resistance - Fully stabilized
   6. Temperature Range - -22 degrees F to 150 degrees F
   7. Manufacturer - Tensar Safety Grid or approved equal

PART 3 EXECUTION

3.01 GENERAL

A. The following Specification shall be considered as general criteria for earthwork operations. In those instances where field conditions arise which are not adequately covered by these criteria, instructions for that specific condition will be issued by the Architect/Engineer.

B. Dust Control:
1. Use all means necessary to control dust on and near the work and on and near all off-site borrow areas if such dust is caused by the Contractor's operations during performance of the work or if resulting from the condition in which the Contractor leaves the site.
2. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors, and concurrent performance of other work on the site.

C. Grading operations shall be performed in such a manner as to direct and control storm water runoff so that no damage or erosion occurs. Saturation of cut and fill areas shall be prevented by directing storm water runoff and not allowing ponding to occur. Fills are to be crowned as required to maintain drainage at the end of each work day. Existing drainage routes shall not be choked or obstructed until new ones are available. Temporary culverts, pumps or other equipment shall be used to facilitate drainage of fills during construction, failure to drain storm water shall not be grounds for delay of this contract due to saturated site conditions. The Contractor shall remove and dispose of saturated materials in excess of allowable moisture content at compaction and shall maintain the project schedule at all times.

D. Dewatering: All excavation, construction, and backfill of pipes or other facilities to be constructed under this Contract shall be constructed under dry conditions. The Contractor shall constantly maintain all excavations in a dewatered, workable condition, and shall be responsible for installing, operating, maintaining and removing such dewatering systems as are required.

E. Site Grading:
1. Existing Conditions: Visit site and verify earthwork requirements prior to commencing work.
    a. Existing Grades: Existing grades and contours are indicated on Drawings and represent the best information available on actual existing site conditions. Verify existing grades prior to commencing work. Commencement of work is construed as acceptance of grades and/or contours as correct.
    b. Subsurface Conditions: Results of explorations are for use in estimating work quantities and design parameters, and for the information of the Bidders only, and neither the Owner nor the Associate/Engineer will be responsible for variations in subsoil deposition and quality or for changes which may have occurred after the investigations were made.
    c. See logs of explorations for indication of existing soil and rock boundaries.
2. Required contours and elevations are indicated and noted on the Drawings. Should indicated figures conflict with actual conditions and contours, notify the Engineer and await their direction before proceeding.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Identify known below grade utilities. Stake and flag locations.

C. Identify and flag above grade utilities.

D. Maintain and protect existing utilities remaining which pass through work area.

E. Notify utility company to remove and relocate utilities.

F. Upon discovery of unknown utility or concealed conditions, discontinue affected work; notify Engineer.

3.03 ROUGH GRADING AND EMBANKMENT CONSTRUCTION

A. Rough Grading:
   1. Site clearing and grubbing shall be done prior to any rough grading in accordance with Section 31 10 00. All debris and deleterious material shall be removed from areas to be filled or backfilled in accordance with this specification.
   2. Dispose of excess excavated material or supply additional suitable material as necessary to complete the rough grading to the required elevations.
   3. The finished subgrade surface shall be reasonably smooth and free from irregular surface changes and shall be no more than 0.05 feet above or below the approved subgrade elevation.
   4. Newly graded areas shall be protected from the action of the elements. Any damage that may occur as a result of natural causes or any construction activities, prior to the acceptance of the work, shall be repaired and grades re-established to the required elevations and slopes.
   5. During the performance of rough grading operations, the subgrade shall be proof-rolled under the direction of the testing agency. The proof-roll shall be performed by heavy equipment (minimum 30-ton dual axle dump truck). Any areas discovered which are soft and unstable or exhibit other conditions (pumping or rutting), shall be stabilized immediately as directed by the Testing Agency using one of the following options:
      a. Scarifying, aerating and recompacting.
      b. Over-excavating and replacing with acceptable fill material.
      c. Using lime or lime/fly ash modification techniques.
   6. Removal of unsuitable material and its replacement as directed shall be paid on basis of contract conditions relative to changes in work.
   7. In general, subgrade shall be established at the following levels:
      a. For Pavement Areas: Finish grade less the thickness of pavement and base material.
      b. For Structures: Finish floor elevation less the thickness of the slab and aggregate backfill per Section 3.07.C.
      c. For Lawn Areas: Finish grade less topsoil thickness.
      d. Sidewalks and Plazas: Finish grade less sidewalk and aggregate base thickness.
      e. Landscape Area: Finish grade less topsoil and mulch.

B. Subgrade Preparation:
   1. Proof Rolling:
      a. All subgrade surfaces shall be proof rolled by means of heavy equipment (minimum 30-ton dual axle dump truck) to locate and permit timely correction of the subgrade deficiencies. Proof rolling shall be witnessed by the Testing Agency and approved by Testing Agency prior to continuing work.

b. In cut sections, proof rolling of the subgrade surface shall be done to determine the location and extent of areas below subgrade surface that may require subgrade undercutting. Should any portion of the cut subgrade surface fail to provide satisfactory support for the proof-rolling operation, the Testing Agency may order corrective undercut and backfill work done. Refer to Section 3.03, Paragraph A.5 and A.6 for corrective measures.

c. In embankment sections, prior to placing the embankment, proof rolling on the subgrade surface shall be done to determine the uniformity of the compaction below the subgrade and any deficiencies requiring corrective work. Any deficiencies discovered during proof rolling operations shall be corrected in a manner satisfactory to the Testing Agency. Refer to Section 3.03 Paragraph A.5 and A.6 for corrective measures. After all corrective work has been completed, the surface shall be proof rolled again. Corrective work shall not be considered complete and acceptable until the embankment shows satisfactory and uniform response to the proof rolling operations.

2. Construction:
   a. Subgrade shall be shaped to line, grade, and cross section, and compacted as specified. This operation shall include plowing, disking, and any moistening or aerating required to obtain specified compaction. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material as directed. Rock encountered in the cut section shall be excavated to a depth of 6 inches below subgrade. Low areas resulting from removal of unsatisfactory material or excavation of rock shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade and cross section and compacted as specified. After rolling, the surface of the subgrade for roadways shall not show deviations greater than 1/2 inch when tested with a 12-foot straightedge applied both parallel and at right angles to the centerline of the area. The elevation of the finish subgrade shall not vary more than 0.05 foot from the established grade and cross section.
3. Compaction:
   a. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Except for paved areas and railroads, each layer of the embankment shall be compacted to a maximum density in accordance with the Compaction Requirements Schedule at this end of this specification.

C. Embankment:
1. Initial Lift: After proof rolling of the existing subgrade has been completed, the surface of the area to be filled shall be scarified to a depth of 6 inches. An initial 3-inch layer of fill material shall then be spread over the scarified surface and the entire area compacted as specified.
2. Fill Lift Thickness: Areas requiring fill shall be filled and backfilled using suitable materials compacted in layers not to exceed the following (all thicknesses are loose thicknesses):
   a. Within building areas - 8 inches.
   b. Under pavements, sidewalks or plazas - 8 inches.
   c. General site fill - 12 inches.

3. Moisture Content: Placed material shall not deviate from the optimum by more than two percent (+/-2%). Moisture content of any material which displays pronounced deformation under construction equipment shall not exceed the optimum. Drying of wet soil shall be performed with the use of plows, discs, harrows, or other approved methods. If additional water is required, it should be uniformly distributed through the use of approved water wagons and shall be thoroughly incorporated into the material by means of discs or other suitable mixing equipment. Care shall be taken to avoid trapping water within the fill.
4. Amount of Compaction: After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted to not less than the percent shown under the Compaction Requirements Schedule in accordance with ASTM Method D-698.
5. Compaction of Embankment Layers: Compaction equipment shall be of such design that it will be able to compact the fill to the specified density. Compaction of each layer shall be continuous over its entire area and the compaction equipment shall make sufficient trips to ensure that the required density has been obtained.
6. Density Tests: Field density tests shall be made by the Testing Agency per the Compaction Requirements Schedule. Density tests shall be taken in compacted material below the disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below the required density, the particular layer or portion shall be reworked until the required density has been obtained.
7. Seasonal Limits: No fill material shall be placed, spread, or rolled while it is frozen or thawing or during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not resume until the Testing Agency indicates that the moisture content and density of the previously placed fill are as specified.
8. Drainage: The embankment and borrow areas should be maintained in a freely draining condition at all times. Proper drainage should be provided for any water or springs which may be encountered.
9. Existing Slopes: When the embankment meets the natural grade of a slope, a bench shall be cut in the existing slope. These cuts are to serve as keys to connect the existing grade with the newly placed fill.
10. Unacceptable Fill Subgrade Material: Frozen fill material or any suitable fill shall not be placed on frozen or snow-covered surfaces.
11. Soft and Wet Soils: If soft, yielding material is encountered in embankments as a result of trapping water, and cannot be satisfactorily stabilized by moisture control and compaction, the unstable material shall be excavated to the depth required by the Testing Agency. The excavation shall then be filled with suitable material and compacted in accordance with the requirements outlined above.
12. Rock: When fill material includes rock, the maximum rock size acceptable shall be 4 inches. No large rocks shall be allowed to nest and all voids must be carefully filled with small stones or earth, properly compacted. No large rocks will be permitted within 12 inches of the finished grade.
13. Shale and Siltstone: Shale and siltstone which consist predominately of fine particles which can be readily tested for compaction shall be placed and compacted in accordance with requirements for soil. Shale and siltstone containing sufficient amounts of large particles to make testing of the compaction impracticable shall be broken down in placing until the voids between the particles are filled insofar as is practicable. When necessary, water shall be used to aid in breaking down the shale. Watering of the shale should be performed by means of tank trucks equipped with suitable sprinkling devices and shall be thoroughly incorporated into the material which is to be mixed by means of discs or other equipment

Shale and siltstone embankment materials shall be sprinkled to bring the moisture content to within a range of optimum minus 3% to optimum plus 3%. Compaction shall be accomplished with a vibratory sheepsfoot roller in conjunction with a static sheepsfoot roller. The minimum weight for the static sheepsfoot roller shall be 60,000 lbs. The minimum total compactive effort for the vibratory tamping foot roller shall be 50,000 lbs. in accordance with the manufacturer's Specifications. Larger rollers will be permitted as required to obtain density. At the decision of the Geotechnical Engineer, vibration may not be used on fill materials that are predominately cohesive in nature. Each embankment lift shall receive a minimum of three (3) passes with the static roller and a minimum of two (2) passes with a vibratory roller. The rollers should not exceed three (3) miles per hour during these passes.

Mixtures of shale and siltstone and rock shall be placed in accordance with the above noted provisions for shale and siltstone. Rock in such mixtures shall be reduced in size not to exceed 8 inches or separated from the mixture and placed as rock fill.

14. New Embankment on Existing Slopes: When embankment is to be placed and compacted on hillsides or where new embankment is to be compacted against existing embankments, slopes that are steeper than 8:1 shall be continuously benched over those areas where it is required as the work is brought up in layers. Benching shall be of sufficient width to permit operations of placing and compacting equipment. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous cuts. Material thus cut out shall be recompacted along with the new embankment.

D. Ponds:
   1. Perform cut/fill operations to the above Specifications.
   2. Establish pond elevations to 2 feet below finished grade elevations as noted on Drawings.
   3. The Testing Agency shall observe the soils at this elevation and indicate any apparent sand and gravel seams to be removed. Excavate sand and gravel seams until suitable pond liner material is encountered. Backfill excavation with suitable pond liner material. Corrective undercut and backfill of sand and gravel seams will be paid for as specified in paragraph 3.03, A.5 and A.6 above. The area of soils to be observed shall extend to 1 foot above the high-water elevation, as noted on the Drawings.
   4. Establish finished pond elevations by placing a minimum of two (2) 8-inch lifts (loose thickness) of suitable pond liner material. Each lift shall be compacted with a sheepsfoot roller making a minimum of two (2) passes in perpendicular directions. The pond liner material shall be compacted to 98% Standard Proctor Density and the moisture content shall be at or above optimum moisture content.
   5. The 2-foot-thick pond liner material shall be installed on the bottom of the pond and along the pond embankment to a height of 1 foot above the high-water elevation noted on the Drawings.
   6. After finished grades have been established, the surface shall be rolled with a vibratory steel drum roller or a fully loaded 30-ton truck or similar pneumatic tired vehicle to smooth the surface.

E. Stabilized Subgrade:
   1. Once the Contractor has selected a chemical stabilization, said Contractor shall provide the Testing Agency a sample of significant size for testing.
   2. The Testing Agency will perform soils tests and determine the acceptability of the Mixture.

3. The Contractor may be required to prepare alternative additives for testing until a suitable additive is selected.
4. The Testing Agency shall observe and test all subgrade stabilization to confirm acceptance as pavement subgrade.

3.04 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, re-landscaped, or regraded and stockpile in area designated on site.

B. Seed stockpile in accordance with Section 31 25 00, "Erosion and Sediment Control."

3.05 EXCAVATION

A. Underpin adjacent structures which may be damaged by excavation work, including utilities and pipe chases.

B. Excavate subsoil and whatever material encountered required to accommodate building foundations, slabs-on-grade, paving and site structures, and construction operations.

C. Machine slope banks.

D. Excavation cut not to interfere with normal 45 degree bearing splay of foundation.

E. Grade top perimeter of excavation to prevent surface water from draining into excavation.

F. Hand trim excavation. Remove loose matter. Compact bottoms of excavations with a plate vibrator if directed by the Testing Agency. All excavations to be protected as work progresses.

G. Remove lumped subsoil, boulders, and rock greater than 1/3 cubic yard measured by volume.

H. Notify Testing Agency or Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

I. Correct unauthorized excavation at no extra cost to Owner.

J. Correct areas over-excavated by error at no extra cost to the Owner.

K. Remove all excavated material from within building area.

L. Contractor solely responsible for means and methods employed to excavate materials encountered on site.

M. It is intent of Contract Documents that excavation cuts be used as forms for vertical surfaces of footings and column pads. Soil conditions which prevent vertical cuts, or excavation characteristics which require forming concrete are responsibility of General Trades Contractor.

N. Prior to placing concrete for the footings, all foundation excavations shall be inspected and approved by the Testing Agency, for the bearing capacity indicated on the Drawings.

3.06 BUILDING FILL AND BACKFILL

A. Remove any accumulated debris from excavations before backfilling.

B. Backfill on interior side of perimeter footings and foundation walls and on both sides of interior footings and foundation walls with Type A or Type H fill. Place in 8-inch layers, compact with vibratory compaction equipment to a maximum dry unit weight as shown in the compaction requirements schedule at the end of this section.

C. Construct gravel base under floor slab of Type A, Type E, or Type H fill within building area to provide a layer of minimum 4-inch thickness. Shape subgrade and gravel base for floor slab construction per Drawings.

D. Within all areas to receive asphalt or concrete pavement immediately adjacent to exterior walls, backfill on exterior of foundation walls with Type A, Type H, Type J, or Type K fill. Place in 8-inch layers, compact with vibratory compaction equipment to a maximum dry unit weight as shown in the compaction requirements schedule at the end of this section.

E. Backfill at all other exterior foundation walls with suitable excavated material. Place material in 8-inch layers and compact to 98% of the maximum dry unit weight. Backfill to level slightly above grade at building exterior to drain water away from building. At walls with foundation drains and/or weep holes, provide Type A or Type H material for extent indicated on structural drawings. Place material in 8-inch layers and compact to a maximum dry unit weight as shown in the compaction requirements schedule at the end of this section.

F. Exercise caution to avoid damage to foundation damp-proofing during backfill and compaction operations.

3.07 SUBSOIL PREPARATION FOR PLACING TOPSOIL

A. Eliminate uneven areas and low spots. Remove debris, roots, branches, stones, in excess of 2 inches in size. Remove subsoil contaminated with petroleum products.

B. Scarify subgrade to depth of 6 inches where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.08 PLACING TOPSOIL

A. Place topsoil in areas where seeding, sodding, and planting is scheduled.

B. Use topsoil in relatively dry state.

C. Place during dry weather.

D. Fine grade topsoil eliminating rough or low areas. Maintain levels, profiles, and contours of subgrade.

E. Remove stone, roots, grass, weeds, debris, and foreign material while spreading.

F. Manually spread topsoil around trees, plants, building and curbs to prevent damage.

G. Roll placed topsoil.

H. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.09 SCHEDULE OF LOCATIONS

A. The following paragraphs identify compacted topsoil thicknesses for various locations.
1. Seeded Areas: 6 inches minimum
2. Sod: 6 inches minimum
3. Shrub Beds: 18 inches minimum
4. Flower Beds: 12 inches minimum
5. Planter Boxes: To within 3 inches of box rim

3.10 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed by an independent Testing Agency.

B. Tests and analysis of fill material will be performed in accordance with ANSI/ASTM C136 and with Division 1.

C. Compaction testing will be performed in accordance with ANSI/ASTM D2922 and D3017 and with Division 1.

D. Field density test reports shall clearly identify the following information for each test:
1. Horizontal and vertical location of test
2. Material type being tested
3. Proctor test method
4. Maximum proctor density
5. Specified density
6. Optimum moisture content
7. Field test method
8. Actual moisture content
9. Tested density
10. Pass/fail indication

E. Do not submit reports of failing tests without follow-up report of reworked area and passing retest. Submitted test reports without specified information will be returned for revisions and resubmittal.

F. Submit rough draft of daily Field Observation Report to the Engineer via facsimile the day of the field visit. Follow up with formal report.

G. Excavate, replace at near optimum moisture, recompact and retest all areas failing to meet compaction requirements at no additional cost.

3.11 ACCEPTANCE

A. Top Surface of Backfilling: Under Paved Areas: Plus, or minus 0.05 feet from required elevations.

B. Top Surface of General Backfilling: Plus, or minus 0.05 feet from required elevations.

3.12 SCHEDULE OF FILL MATERIAL AND COMPACTION REQUIREMENTS SCHEDULE

A. Compact fill materials to meet the following minimum Standard Modified Proctor Density, ASTM D698.

LOCATIONS	**MATERIAL TYPES**												**COMPACTION REQUIREMENTS**	
	A ITEM 411	**B PEA GRAVEL**	**C SAND**	**D SUB SOIL**	**E ITEM 703 57**	**F TOP SOIL**	**G CONCRETE**	**H ITEM 703 8**	**I CDF**	**J ITEM 304**	**K BANK RUN GRAVEL**	**L NSDB**	**% COMPACTION**	**MINIMUM TEST** / **UNIT AREA / LIFT**
Aggregate base under exterior concrete slabs, sidewalks, and plaza areas.	X									X		X	98%	1/1000 SY
Foundation wall backfill as defined in "Building Fill & Backfill."	X							X					98%	1/100 SY
Areas to receive asphalt or concrete pavement or walks immediately adjacent to exterior walls.	X							X		X	X		100%	1/500 SY
Aggregate base beneath interior floor slab.	X				X			X					100%	1/500 SY
General site fill, both paved and non-paved areas, utility trenches outside paved areas, utility trenches under pavement in excess of 48 inch depth, corrective backfill, areas to receive lawns immediately adjacent to exterior walls.				X									98%	1/1000 SY
Sewer bedding.					X								N/A	N/A
Underdrains, french drains, aggregate drainage material behind site retaining walls.					X			X					N/A	N/A
Abandoned utilities, trench backfill where shown on drawings.									X				N/A	N/A
Utility trenches less than or equal to 48 inch depth under pavement.	X									X			100%	1/300 LF
Aggregate base beneath asphalt roads.										X			100%	1/500 SY
Fill beneath floor slabs and aggregate base or foundations, corrective backfill for over excavation, or fill for removed foundations.	X			X						X	X	X	100%	1/500 SY
Finish slopes, lawn areas, planters.						X							N/A	N/A
Sewer Encasement							X							

3.13 PROTECTION OF PERSONS AND PROPERTY

A. Barricade open excavations occurring and post with warning lights from dusk to dawn each day and as otherwise required.

B. Erect construction barriers to prevent public access to the area of the Work. Maintain in place throughout the new construction operations. Erection, maintenance, alterations, and removal of the barriers shall be the responsibility of the Contractor.

C. Do not close or obstruct streets or sidewalks without the proper permit. Conduct operations with minimum traffic interference.

D. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

E. Protect public and private property adjacent to and on the job site, including vents, utility lines, roadways, sidewalks, light standards, hydrants, and trees not indicated for removal. Repair damage to the property at no cost to the Owner.

F. Notify local authorities having jurisdiction of existing damage in adjacent streets or improvements such as paving, curbs, gutters, sidewalks and alley surfacing, prior to start of demolition work. If damage to streets and improvements is discovered after work has commenced, and such damage was not reported before start of work, the Contractor will perform and pay for the necessary repairs.

G. Maintain and preserve utilities transversing premises as long as they are required. Backfill and compact all excavation made for removal of utilities.

H. Seal or cap all utility lines leading from demolished structures in accordance with regulations of authorities having jurisdiction.

I. Before starting work related to existing utilities such as electrical, sewer, water, heat, gas and fire lines that will temporarily discontinue or disrupt service to any existing building, notify the utility companies 72 hours in advance and obtain approval in writing before proceeding with this phase of work.

J. Earthwork:
   1. Stability of temporary excavations:
      a. All excavations shall be in accordance with OSHA requirements.
      b. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
      c. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
   2. Shoring:
      a. Except as specified elsewhere, provide all shoring required for earthwork or required as a result of earthwork for safety of workers, existing structures, public or adjacent properties.
      b. Provide materials for shoring and bracing in good serviceable condition.
      c. Establish requirements for shoring and bracing to comply with local codes and authorities having jurisdiction.

d. Maintain shoring and bracing in excavations regardless of time period excavations will be open.

K. The Engineer has designed a project which will be safe after full completion. The Engineer has no expertise in, and takes no responsibility for, construction means and methods or job site safety during construction, which are exclusively the Contractor's responsibility. Processing and/or approving submittals made by the Contractor which may contain information related to construction methods or safety issues, or participation in meetings where such issues might be discussed, shall not be construed as voluntary assumption by the Engineer of any responsibility for safety procedures.

END OF SECTION

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PART 1 GENERAL

1.01 DESCRIPTION

A. This section includes the following:
1. Remove surface debris.
2. Clear site of vegetation.
3. Remove trees and shrubs.
4. Remove stumps and root system of trees and shrubs.
5. Remove construction debris.

1.02 RELATED SECTIONS

A. Work under this section is subject to the requirements of the Contract Documents including General Conditions, Supplementary Conditions, Drawings, and sections under Division 01 General Requirements.

B. Section 31 00 00 – Earthwork

C. Section 31 25 00 – Erosion and Sedimentation Control

1.03 QUALITY ASSURANCE

A. Conform to applicable code for disposal of debris.

B. Coordinate clearing Work with utility companies.

C. Contractor to dispose of removed trees and shrubs off site in accordance with local codes.

1.04 DEFINITIONS - The following definitions govern site preparation, clearing, and demolition operations.

A. Clearing: Removal and disposal of all site vegetation.

B. Demolition: Removal and disposal of an existing constructed site element in its entirety both above and below grade or unless otherwise indicated on the Drawings.

C. Trees: Plant material having a trunk diameter of 3 inches or larger measured 1 foot above the ground. Multi-stemmed trees are considered as one tree.

D. Bush and/or Vegetation: Plant material having a stem diameter less than 3 inches at any point between grade and 1 foot above grade.

E. Debris: Any material such as rubbish, concrete, bricks, fencing, culverts, windfalls, decaying matter, ash, etc., including materials generated from the demolition of existing structures, surface materials, utilities and brush and tree removal.

F. Structure: All connected parts of a constructed object to its full extent both above and below grade.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that existing plant life and features designated to remain are tagged and identified.

3.02 GENERAL

A. Clear areas shown on Drawings for access to site and execution of work.

B. Remove trees and shrubs indicated. Remove stumps and root system to a depth of 24 inches.

C. Clear undergrowth and deadwood without disturbing subsoil.

3.03 PROTECTION

A. Protection of Existing Trees, Landscaping and Natural Features:
   1. General Requirements: The Contractor shall protect, throughout the course of construction, all such trees as are shown on the Drawing or marked by the Owner's agent as save.
      a. The Contractor shall also protect throughout the course of construction all landscaping, vegetation, and natural features on public and private property. The Contractor shall use every precaution to prevent injury, damage, pollution, erosion or destruction of existing landscaping, vegetation, and natural features, including drainage ways, ponds, lakes, swamps, woods, and fields.
   2. The limits of clearing shall be located outside the drip line of any tree to be retained, and in no case closer than 5 feet to the trunk of such a tree.
   3. Marking: Prior to construction and before the preconstruction conference, individual trees and stands of trees to be retained within the limits of clearing shall be visibly marked with a bright color paint or surveyor's ribbon applied in a band circling the tree at a height visible to equipment operators.
   4. Pre-Construction Conference: During any preconstruction conference, tree preservation and protection measures should be reviewed with the Contractor as they apply to that specific project.
   5. Equipment Operation and Storage: Heavy equipment, vehicular traffic, or stockpiles of any construction materials including topsoil shall not be permitted within the drip line of any tree to be retained. Trees being removed shall not be felled, pushed, or pulled into trees being retained. Equipment operators shall not clean any part of their equipment by slamming it against the trunks of trees to be retained.
   6. Fires: Fires shall not be permitted within 100 feet from the drip line of any trees to be retained.
   7. Storage and Disposal of Toxic Materials: No toxic materials shall be stored closer than 100 feet to the drip line of any trees to be retained. Paint, acid, nails, gypsum board, wire, chemicals, fuels, and lubricants shall not be disposed of in such a way as to injure vegetation.

8. Fencing and Armoring: Refer to the drawings for the location and details of Protection Authority. Trees to be retained within 40 feet of a proposed building or excavation shall be protected by fencing. Personnel must be instructed to honor protective devices. The devices described below are suggested only and are not intended to exclude the use of other devices which will protect the trees to be retained.
    a. Snow Fence - Standard 40-inch-high snow fence shall be placed at the limits of clearing on standard steel posts set 6 feet apart.
    b. Board Fence - Board fencing consisting of 4-inch square posts set securely in the ground and protruding at least 4 feet above the ground shall be placed at the limits of clearing with a minimum of two (2) horizontal boards between posts. If it is not practical to erect a fence at the drip line, construct a triangular fence nearer the trunk. The limits of clearing will still be located at the drip line, since the root zone within the drip line will still require protection.
    c. Cord Fence - Posts with a minimum size of 2 inches square or 2 inches in diameter set securely in the ground and protruding at least 4 feet above the ground shall be placed at the limits of clearing with two (2) rows of cord 1/4 inch or thicker at least 2 feet apart running between posts with strips of colored surveyor's flagging tied securely to the string at intervals no greater than 3 feet.
    d. Earth Berms - Temporary earth beams shall be constructed according to Specifications for a TEMPORARY DIVERSION DIKE (Specification 31 25 00, Paragraph 3.08) with the base of the berm on the tree side located along the limits of clearing. Earth berms may not be used for this purpose if their presence will conflict with drainage patterns.
    e. Additional Trees - Additional trees may be left standing as protection between the trunks of the trees to be retained and the limits of clearing. However, for this alternative to be used, the trunks of the trees in the buffer must be no more than 6 feet apart to prevent passage of equipment and material through the buffer. These additional trees shall be reexamined prior to the completion of construction and either given sufficient treatment to ensure survival or removed.
    f. Trunk Armoring - As a last resort, a tree trunk can be armored with burlap wrapping and 2-inch studs wired vertically no more than 2 inches apart to a height of 5 feet encircling the trunk. If this alternative is used, the root zone within the drip line will still require protection. Nothing should ever be nailed to a tree.
9. Fencing and armoring devices shall be in place before excavation or grading is begun, shall be kept in good repair for the duration of construction activities, and shall be the last items removed during the final cleanup after the completion of the project.
10. Grading and/or Filling Around Trees: Grading and/or filling operation within the protective fencing shall be carried on with extreme care only under the direct supervision of the Architect. If the soil over the root area of the trees has been compacted, it shall be restored by proper cultivation to permit entrance of water and proper aeration of roots.
11. Cutting of Tree Roots and Limbs: Roots and limbs of trees are not to be cut unless authorized by the Owner's agent. Should it become necessary to do so, the Contractor shall treat the remaining exposed portion of roots and/or limbs to prevent damage, loss, or injury to the tree. This treatment shall be done in accordance with accepted horticulture practice and by personnel experienced in that field of work.

B. Protect utilities, structures, and site features to remain, from damage.

C. Protect bench marks and existing structures from damage or displacement.

D. Repair damage to the satisfaction of the owner.

3.04 REMOVAL

A. Remove debris, rock, and extracted vegetation from site.

3.05 BACKFILLING

A. Backfill any excavations associated with clearing in accordance with Specification Section 31 00 00.

3.06 EROSION AND SEDIMENT CONTROL

A. Comply with all requirements of Section 31 25 00, “Erosion and Sediment Control.”

B. Execute all appropriate indicated or otherwise required erosion and sediment control items prior to clearing and/or demolition activities.

C. Execute any remaining erosion/sediment items as soon as practical after clearing operations.

D. Conform to the requirements of the local authority.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. This section includes the following:
1. Excavate trenches for utilities from outside building to municipal utilities or as shown on Drawings.
2. Backfilling and compaction.
3. Compacted bedding for utilities.
4. Compaction.

1.02 RELATED SECTIONS

A. Work under this section is subject to the requirements of the Contract Documents including General Conditions, Supplementary Conditions, Drawings, and sections under Division 01 General Requirements.

B. Section 31 00 00 - Earthwork

C. Section 33 11 00 - Water Distribution

D. Section 33 30 00 - Sanitary Sewerage

E. Section 33 40 00 - Storm Drainage

1.03 REFERENCE STANDARDS

A. American Society of Testing and Materials (ASTM).
1. C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
2. D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb. (2.49 kg) Rammer and 12-inch (3.04.8 mm) Drop.
3. D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
4. D1557 - Test Methods for Moisture-Density Relations of Soils and Soil -Aggregate Mixtures using 10 lb. (4.54 kg.) Rammer and 18-inch (457 mm) Drop.
5. D2922 - Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth).
6. D3017 - Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

B. City of Columbus; Construction and Materials Specifications (CMSC).
1. The Terms “Engineer,” “Director,” “City,” and other similar terms shall be interpreted as the Owner.
2. In the event of any conflicts between CMSC and the Contract Documents, the most stringent shall apply
3. Local municipality having jurisdiction.

1.04 SUBMITTALS

A. Comply with the requirements of Division 1 for sumittals and specification section 31 00 00 for bedding and backfill, testing, and sampling requirements.

1.05 QUALITY ASSURANCE

A. The Testing Agency shall provide compaction testing for bedding and backfill and document any necessary over excavation and stabilization in utility trenches in accordance with Specification Section 31 00 00, "Earthwork."

B. Coordinate schedule with Testing Agency.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store and grade all materials to prevent their deterioration from weather.

B. Provide sedimentation and erosion control around stockpiles in accordance with Section 31 25 00, “Erosion and Sediment Control”.

C. Separate work and stockpiles to minimize contamination or mixing of materials.

1.07 PROJECT RECORD DOCUMENTS

A. Accurately record location of pipe runs, connections, inlets, manholes, valves, fittings, elevations, inverts, and slope gradient.

B. Provide locations and disposition (active/abandoned) of any utilities encountered during trenching activities.

1.08 LAYOUT

A. Employ a Professional Surveyor, registered in State of Ohio, to lay out and establish all lines and grades, including centerline of all structural columns.

B. Erect control points prior to excavation. Protect existing control points.

C. All surveying costs to be paid by the Contractor performing the work.

PART 2 PRODUCTS

2.01 BACKFILL MATERIALS

A. As specified in Section 31 00 00, "Earthwork."

2.02 BEDDING MATERIALS

A. Type B, C, E or G Material: As specified in Section 31 00 00, "Earthwork."

2.03 GEOTEXTILE FABRIC

A. Fabric: Mirafi Geotextile, 160 N or equal for use with underdrain.

PART 3 EXECUTION

3.01 GENERAL

A. Provided trenches, bedding and backfill in accordance with specification Section 31 00 00.

B. Hand trim excavations to required elevations. Correct over excavation with compacted fill material per Section 31 00 00.

C. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling and compaction.

3.02 EXAMINATION

A. Site Information: Verify existing utility locations within construction limits.

B. Locate existing structures and piping to be closed and abandoned.

C. Identify required lines, levels, contours, and datum.

D. Maintain and protect existing utilities remaining, which pass through work area. Repair damaged utilities to the satisfaction of the Owner of the utility and the Associate Engineer.

3.03 PROTECTION OF PERSONS AND PROPERTY

A. The Engineer has designed a project which will be safe after full completion. The Engineer has no expertise in, and takes no responsibility for, construction means and methods or job site safety during construction, which are exclusively the Contractor's responsibility. Processing and/or approving submittals made by the Contractor which may contain information related to construction methods or safety issues, or participation in meetings where such issues might be discussed, shall not be construed as voluntary assumption by the Engineer of any responsibility for safety procedures.

B. Earthwork:
   1. Stability of temporary excavations:
      a. All excavations shall be in accordance with OSHA requirements.
      b. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
      c. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
   2. Shoring:
      a. Except as specified elsewhere, provide all shoring required for earthwork or required as a result of earthwork for safety of workers, existing structures, public or adjacent properties.
      b. Provide materials for shoring and bracing in good serviceable condition.

c. Establish requirements for shoring and bracing to comply with local codes and authorities having jurisdiction.
d. Maintain shoring and bracing in excavations regardless of time period excavations will be open.

C. Protect plant life, lawns, and other features remaining as a portion of final landscaping.

D. Protect benchmarks, existing structures, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

E. Protect above and below grade utilities to be removed, abandoned, or remain.

3.04 EXCAVATION

A. Excavate subsoil and whatever material encountered including rock, required for storm sewers, sanitary sewers, water, and gas piping. See rock definition in Earthwork Section. Rock excavation will be paid on a unit price basis.

B. Cut trenches sufficiently wide to enable installation of utilities and allow inspection and as shown on details provided on Drawings.

C. Excavations shall not interfere with normal 45 degree bearing splay of foundations.

D. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

E. Remove lumped subsoil, boulders, and rock greater than 1/3 cu. yd. measured by volume.

F. Correct unauthorized excavation in accordance with Section 31 00 00 at no cost to Owner.

G. Correct areas over-excavated by error in accordance with Section 31 00 00 at no cost to Owner.

H. Stockpile excavated material in area designated on site and remove excess material not being used, from site.

I. Cut out soft areas of subgrade not capable of insitu compaction. Backfill with Type D fill and compact to density equal to or greater than requirements for subsequent backfill materials. Corrective undercut and backfill will be paid for per Earthwork Section, Paragraph 3.03, A.6.

J. Dewatering: All excavation, construction and backfill of pipes or other facilities to be constructed under this Contract shall be constructed under dry conditions. The Contractor shall constantly maintain all excavations in a dewatered, workable condition, and shall be responsible for installing, operating, maintaining, and removing such dewatering systems as are required. The evaluation of the sufficiency of the condition shall be made by the Testing Agency and his/her decision shall be binding upon the Contractor. If the Testing Agency determines that dewatering is inadequate, the Contractor shall modify his/her methods until such time as the Testing Agency then agrees with the adequacy of the operating condition.

3.05 BEDDING

A. Support pipe and conduit during placement and compaction of bedding fill.

B. Bed per Standard Details provided on Drawings and Schedule at the end of this Section.

3.06 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Granular Fill: Place and compact materials in continuous layers not exceeding 8 inches compacted depth.

D. Soil Fill: Place and compact material in continuous layers not exceeding 8 inches compacted depth.

E. Employ a placement method that does not disturb or damage conduit in trench.

F. Maintain optimum moisture content of backfill materials to attain required compaction density.

G. Leave fill material stockpile areas completely free of excess fill materials.

3.07 MATERIAL SCHEDULE

A. Storm and Sanitary Piping:
1. Bedding Fill: Type E, per Standard Detail, compacted to 95%.
2. Backfill with Type D in 8-inch lifts, compacted to 98%.
3. Under roadways, parking lots, sidewalks, and plaza areas, backfill with Type J in 8-inch lifts compacted to 100%.
4. Under roadways, parking lots, sidewalks, and plaza areas where cover from top of subgrade to top of pipe is 30 inches or less, provide concrete encasement per Standard Detail.

B. Waterlines:
1. Bedding Fill: Type E under roadways, parking lots, sidewalks, and plaza areas. Type D in lawn areas, washed, rounded stone (crushed stone not acceptable).
2. In lawn areas, backfill with Type D in 8-inch lifts, compacted to 98%.
3. Under roadways, parking lots, sidewalks, and plaza areas, backfill with Type A or Type J in 8-inch lifts, compacted to 100%.

C. Gas Lines:
1. Bedding Fill: Not required. Provide 6 inches of Type C all around gas line.
2. In lawn areas, backfill with Type D in 8-inch lifts, compacted to 98%.
3. Under roadways, parking lots, sidewalks, and plaza areas, backfill with Type A or Type C in 8-inch lifts, compacted to 100%.

D. Force Main Piping:
1. Bedding Fill Type E, washed, rounded stone (crushed stone not acceptable).
2. In lawn areas, backfill with Type D in 8-inch lifts, compacted to 98%.
3. Under roadway, parking lots, sidewalks, and plaza areas, backfill with Type A or J in 8-inch lifts, compacted to 100%.

3.08 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 1 and Section 31 00 00.

B. Tests and analysis of fill material will be performed in accordance with ANSI/ASTM C136 and with Division 1.

C. Compaction testing will be performed in accordance with ASTM D2922 and ASTM D3017 and with Division 1.

D. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest, and repeat until a passing test is achieved at no cost to Owner.

E. Frequency of Tests: Every 100 feet and every lift.

3.09 ACCEPTANCE

A. Top Surface of Backfilling: Under Paved Areas: Plus, or minus 0.05 feet from required elevations.

B. Top Surface of General Backfilling: Plus, or minus 0.05 feet from required elevations.

3.10 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Division 1.

B. Recompact fills subjected to vehicular traffic.

END OF SECTION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Temporary and permanent erosion and sediment control.

B. Comply with OEPA requirements and Stormwater Pollution Prevention Plan prepared for this project.

1.02 RELATED WORK

A. Section 31 00 00, "Earthwork"

B. Section 32 92 00, "Turfs and Grasses"

1.03 SUBMITTALS

A. Comply with requirements of Division 0 and 1. Submit material qualification tests and certificates of compliance as indicated.

B. In accordance with the Stormwater Pollution Prevention Plan (SWPPP) prepared for the project, all stormwater BMPs shall be inspected once every seven (7) days and within 24 hours of a 0.5 inch or greater rainfall. Inspection logs (included herein) shall be kept and shall be submitted to the Owner or Ohio EPA upon request.

C. At project completion (when all seeding and landscaping is well established), Contractor shall complete and submit to the Ohio EPA the included Notice of Termination (NOT) to terminate coverage from the NPDES General Permit. A copy of the NOT and transmittal shall be provided to the Owner and the Engineer.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil: Type F Material - Section 31 00 00, "Earthwork."

B. Filter Barrier Geotextile: The geotextile shall be of either woven or nonwoven construction and consist of long chain polymeric filaments or fibers composed of polypropylene, polyethylene or polymide. The filament and fibers shall be oriented into a stable network whereby they retain their positions relative with each other. The geotextile shall be ultraviolet stabilized and shall be inert to chemicals commonly found in soil. The geotextile shall meet or exceed physical properties of Supac 5NPUV or Supac G WMUV.
   1. Grab Tensile Strength: 90 lb. minimum as measured per test method ASTM D 1682.
   2. Mullen Burst Strength: 190 psi minimum as measured per test method ASTM D 3786.
   3. Slurry Flow Rate: 0.3 gal./min./ft2 maximum.
   4. Equivalent Opening Size: 40-80 as measured per test method US Std. Sieve CW-02215.
   5. Ultraviolet Radiation Stability: 70% minimum as measured per test method ASTM D 4355.

C. Filter Barrier Stakes: 2" x 2" x 3'-0" wooden stakes.

D. Rock Channel Protection: Quarried stone meeting the requirements of ODOT Item 601.09 Rock Channel Protection, Type A, B, C, or D with filter, as noted on Drawings.

E. Seed and Soil Supplements for Temporary Seeding: Provide seed mixture with 20% by weight of perennial ryegrass, 30% red fescue and 50% Kentucky Blue Grass. Provide pulverized agricultural limestone and commercial fertilizer, 10-20-20 or approved substitute.

F. Mulch: Unrotted straw free from weeds and course material or other approved product suitable for required application.

G. Mulch Binder: Cutback or emulsified asphalt or synthetic binder such as Petroset, Terratack or Aerospray.

H. Jute Matting: Cloth or Plain weave, undyed and unbleached single jute yarn, 47 to 49 inches wide, averaging 1.15 to 1.26 lbs., per lin. yard loosely twisted construction of not less than 1.6 turns per inch, 78 warp ends per width of cloth and 41 weft ends per lin. yard, meeting the requirements of CC Item 671.

I. Matting Staples; No. 8 plain wire, 6-10 inches long.

J. Commercial Matting Products: Erosionet, Holdgro, Weedcheck, Curlex or approved equal. Product must cover minimum of 30% of soil surface and meeting the requirements of CC Item 671 ODOT Item 671.

PART 3 EXECUTION

3.01 GENERAL

A. Provide temporary and permanent erosion and sediment control items as required by governing agency, as required by permit, as indicated on the plans, as noted in this Specification, and as noted in the Stormwater Pollution Prevention Plan.

3.02 INSTALLATION

A. Install temporary erosion and sediment control items prior to clearing and commencing earthwork or as soon as practical as sitework progresses.

B. Install required permanent erosion and sediment control items as soon as no damage or deterioration will result to those items due to construction activities.

3.03 TEMPORARY ACCESS ROAD AND CONTRACTOR USE AREA

A. Locate access road where indicated or as approved by Owner and local authority having jurisdiction over public roads in vicinity of site. Locate use areas where indicated or as convenient.

B. Access road shall be at least 20 feet wide. All cuts and fill shall be 3:1 or flatter to the extent possible. Drainage ditches shall be provided as needed. The roadbed and use areas surface shall be cleared of all vegetation, roots, and other objectionable material.

C. The entrance shall be maintained in a condition which will prevent tracking or flow of mud onto public rights-of-way. This may require periodic top dressing with stone, as conditions demand, and repair and/or cleanout of any structures used to trap sediment. All materials spilled, dropped, washed, or tracked from vehicles onto roadways or into storm drains must be removed immediately.

D. All roadside ditches, cuts, fills and disturbed areas adjacent to use areas and access road shall be stabilized with appropriate temporary vegetation immediately after grading.

E. Both road and use areas may require periodic top dressing with new stone. Seeded areas should be checked periodically to ensure that a vigorous stand of vegetation is maintained. Ditches and other drainage structures should be checked regularly to ensure that they do not become clogged with silt or other debris.

3.04 FILTER FABRIC BARRIERS

A. Construct where indicated or otherwise required by grading operations to reduce sediment content or runoff.

B. The height of a filter barrier shall be a minimum of 15 inches and shall not exceed 18 inches.

C. Filter barrier geotextile shall be purchased in a continuous roll and cut to the length of the barrier to avoid the use of joints.

D. The stakes shall be spaced a maximum of 3 feet apart at the barrier location and driven securely into the ground (minimum of 8 inches).

E. A trench shall be excavated approximately 4 inches wide and 4 inches deep along the line of stakes and upslope from the barrier.

F. The filter material shall be stapled to the wooden stakes, and 8 inches of the fabric shall be extended into the trench. Heavy duty wire staples at least 1/2 inch long shall be used. Filter materials shall not be stapled to existing trees.

G. The trench shall be backfilled, and the soil compacted over the filter material.

H. If a filter is to be constructed across a ditch line or swale, the barrier shall be of sufficient length to eliminate end flow, and the plan configuration shall resemble an arc or horseshoe with the ends-oriented upslope.

I. Filter barrier shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.

J. Filter barrier shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.

K. Should the fabric on the filter barrier become ineffective prior to the end of its need, the fabric shall be replaced promptly.

L. Sediment deposits should be removed after each rainfall. They shall be removed when deposits reach approximately one-half the height of the barrier.

M. Any sediment deposits remaining in place after the silt fence or filter barrier is no longer required shall be dressed to conform with the existing grade, prepared, and seeded.

3.05 ROCK CHANNEL PROTECTION (RCP) PLACEMENT

A. Place RCP on bedding layer, where indicated, to produce a well graded mass of rock with minimum practical percentage of voids.

3.06 TOPSOIL STORAGE AND APPLICATION

A. Stockpile acceptable topsoil generally where indicated and in such a manner that natural drainage is not obstructed, and no off-site sediment damage shall result. Side slopes of the stockpile shall not exceed 2:1.

B. A perimeter dike with gravel outlet, silt fence, or straw bale barrier shall surround all topsoil stockpiles.

C. Temporary seeding of stockpiles shall be completed within seven (7) days of the formation of the stockpile.

D. Before topsoiling, establish indicated and needed erosion and sediment control items such as diversions, berms, dikes, waterways, sediment basin, etc. Previously established grades on the areas to be topsoiled shall be maintained according to the Drawings.

E. After the areas to be topsoiled have been brought to grade, and immediately prior to dumping and spreading the topsoil, the subgrade shall be loosened by discing or scarifying to a depth of at least 2 inches to insure bonding of the topsoil and subsoil.

F. Topsoil shall not be placed while in a frozen or muddy condition, when the subgrade is excessively wet, or in a condition that may otherwise be detrimental to proper grading or proposed sodding or seeding. The topsoil shall be uniformly distributed to a minimum compacted depth of 3 inches on 3:1 or steeper slopes and 4 inches on flatter slopes. Any irregularities in the surface, resulting from topsoiling or other operations, shall be corrected in order to prevent the formation of depressions or water pockets. Avoid undue compaction.

3.07 TEMPORARY FILL DIVERSION

A. The diversion shall be constructed at the top of the fill at the end of each workday as needed.

B. The diversion shall be located at least 2 feet inside the top edge of the fill.

C. The supporting ridge of the lower side shall be constructed with a uniform height along its entire length.

D. Since the practice is temporary and under most situations will be covered the next workday, the maintenance required should be low. If the practice is to remain in use for more than one day, an inspection will be made at the end of each workday and repairs made to the measure if needed. The Contractor should avoid the placement of any material over the structure while it is in use. Construction traffic should not be permitted to cross the diversion.

3.08 TEMPORARY DIVERSION DIKE

A. Whenever feasible, the dike should be built before construction begins on the project.

B. The dike should be adequately compacted to prevent failure.

C. Temporary or permanent seeding and mulch shall be applied to the dike within fifteen (15) days of construction.

D. The dike should be located to minimize damages by construction operations and traffic.

E. The measure shall be inspected after every storm and repairs made to the dike, flow channel, and outlet, as necessary. Approximately once every week, whether a storm has occurred or not, the measure shall be inspected, and repairs made if needed. Damages caused by construction traffic or other activity must be repaired before the end of each working day.

3.09 SEEDING

A. Incorporate lime and 10-20-20 fertilizer into soil prior to seeding. Apply lime at 900 lbs./1000 S.Y. Apply fertilizer at 200 lbs./1000 S.Y. Apply seed at 25 lbs./1000 S.Y. Within 48 hours after any given area is seeded, straw or hay shall be evenly placed over all seeded areas at the rate of approximately 2 tons per acre for straw, or 3 tons per acre for hay, when seeding is performed between the dates of March 15 and October 15, and the approximate rate of 3 tons per acre straw, or 4 1/2 tons per acre for hay, when seeding is performed between the dates of October 15 and March 15 of the succeeding year. Provide matting where required to establish seed growth.

B. Areas which fail to establish vegetative cover adequate to prevent rill erosion will be re-seeded as soon as such areas are identified.

3.10 MAINTENANCE

A. Maintain all erosion and sediment control items until final project acceptance. Repair breaches and replace deteriorated or missing items immediately after discovery.

B. In accordance with the Stormwater Pollution Plan (SWPPP) prepared for the project, all stormwater BMPs shall be inspected once every seven (7) days and within 24 hours of a 0.5 inch or greater rainfall. Inspection logs (included herein) shall be kept and shall be submitted to the Owner or Ohio EPA upon request.

C. Clean sedimentation basins and catch basins as required to maintain effectiveness or as otherwise directed.

D. Removal: Remove temporary erosion control items as directed and prior to Project close-out.

END OF SECTION

CONSTRUCTION POLLUTION PREVENTION PLAN

<table>
<tr><th colspan="4">SITE DESCRIPTION</th></tr>
<tr><td>Project Name and Location: (Latitude, Longitude, or Address)</td><td>Latitude:
Longitude:</td><td>Owner Name and Address:</td><td></td></tr>
<tr><td>Description: (Purpose and Types of Soil Disturbing Activities)</td><td colspan="3">This project consists of _____.

Soil disturbing activities will include:
• Clearing and grubbing
• Installing stabilized construction entrance
• Perimeter and other erosion and sediment controls
• Grading including detention ponds
• Storm sewers including detention pond outlet with temporary sediment controls
• Construction roads, buildings, etc.
• Final preparation including plantings and seeding</td></tr>
<tr><td>Runoff Coefficient:</td><td colspan="3">The final coefficient for the area of the site will be C = ___. The existing coefficient is C = ___.</td></tr>
<tr><td>Site Area:</td><td colspan="3">The site is approximately ___ acres of which approximately ___ acres will be disturbed by construction.</td></tr>
<tr><td colspan="4">Sequence of Major Activities (Unless otherwise noted, all activities are the responsibility of the General Contractor.)</td></tr>
<tr><td colspan="2">1. Install stabilized construction entrance.
2. Install perimeter erosion control measures where required.
3. Clear and grub.
4. Strip and stock pile topsoil. Seed stock piles.
5. Begin rough grading.
6. Construct detention/sediment basins with outlet protection.
7. Complete rough grading.</td><td colspan="2">8. Install storm sewers and bale inlet filters.
9. Install pavement aggregate base.
10. Construct curb, islands and walks.
11. Complete final paving.
12. Complete fine grading of seeded areas and install permanent seeding and mulching.
13. Remove temporary erosion control measures. Clean sediment from detention basins.</td></tr>
<tr><td>Name of Receiving Waters:</td><td colspan="3">The area tributary to the site flows into _____ which eventually flows to _____.</td></tr>
</table>

CONTROLS

Erosion and Sediment Controls

Stabilization Practices

Area requiring temporary stabilization	Time frame to apply erosion controls
Any disturbed areas within 50 feet of a stream and not at final grade.	Within two days of the most recent disturbance if the area will Remain idle for more than 21 days.
For all construction activities, any disturbed areas that will be Dormant for more than 21 days but less than one year, and not Within 50 feet of a stream.	Within seven days of the most recent disturbance within the area.
Disturbed areas that will be idle over winter.	Prior to the onset of winter weather.

Temporary Stabilization – Topsoil stock piles will be stabilized with temporary seed and mulch no later than 7 days from the last construction activity in that area. Temporary stabilization must also be applied to any area which will lie idle over the winter. The temporary seed shall be Rye (grass) applied at a rate of 25 lbs. per 1000 S.Y. Prior to seeding, 900 pounds of ground agricultural limestone and 200 pounds of 10-20-20 fertilizer shall be applied to every 1000 S.Y. stabilized. Within 48 hours after any given area is seeded, straw or hay shall be evenly placed over all seeded areas at the rate of approximately 2 tons per acre for straw, or 3 tons per acre straw, or 4-1/2 tons per acre for hay, when seeding is performed between the dates of October 15 and March 15 of the succeeding year. Acres to be paved will be temporarily stabilized by applying stone subbase until bituminous pavement can be applied.

Area requiring permanent stabilization	Time frame to apply erosion controls
Any areas that will lie dormant for one year or more.	Within seven days of the most recent disturbance.
Any areas within 50 feet of a stream and at final grade.	Within two days of reaching final grade.
Any other areas at final grade.	Within seven days of reaching final grade within that area.

Permanent Stabilization –Permanent seed mix shall consist of 260 lbs/acre of turf Tall Fescue. Prior to seeding, apply commercial fertilizer at the rate of 1 pound actual Nitrogen per 1000 square feet. Fertilizer to have 20:22:14 analysis. After seeding, each area shall be mulched using Turfiber (or equivalent) at a rate of 2000 lbs. per acre with 50 pounds of Turfiber added per 100 gallons of machine capacity. Keep Hydromulch from non-target areas including pavement, plant materials, curbing, and structures. If these surfaces are hit during Hydromulching operations, wash the surface immediately.

Structural Practices

Detention Basin: A detention basin will be constructed for this project. It will collect runoff from approximately ___ acres of the project and discharge into _____. The _____ will carry flow to _____.

Storm Water Management

When construction is complete, stormwater drainage for the developed areas will be provided by a series of inlets connected by storm sewers that will outlet into the detention basin. Storm water will be released at a controlled rate by the outlet structure. The rate was determined by the Local Authority Having Jurisdiction. The areas disturbed, which are not paved, will be permanently seeded.

OTHER CONTROLS

Offsite Vehicle Tracking:

A stabilized construction entrance will be provided to help reduce vehicle tracking of sediments. The paved road adjacent to the site entrance will be swept daily to remove any excess mud, dirt, or rock tracked from the site. Dump trucks hauling material to or from the construction site will be covered with a tarpaulin.

TIMING OF CONTROLS/MEASURES

Areas where construction activity temporarily ceases for more than 21 days will be stabilized with a temporary seed and mulch as soon as possible or within 7 days of the last disturbance. Once construction activity ceases permanently in an area, that area will be stabilized within 7 days with permanent seed and mulch. Stripped and stockpiled topsoil should be within 7 days using temporary stabilization seed mix, as described above. After all topsoil has been used the remaining stockpiled topsoil should be seeded using the permanent stabilization method as noted.

CERTIFICATION OF COMPLIANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS

The storm water pollution prevention plan reflects Federal and State Requirements for storm water management and erosion and sediment control. To ensure compliance, this plan was prepared in accordance with the Storm Water Management for Construction Activities published by the EPA.

MAINTENANCE/INSPECTION PROCEDURES

Erosion and Sediment Control Inspection and Maintenance Practices

These are the inspection and maintenance practices that will be used to maintain erosion and sediment controls.

- All control measures will be inspected at least once each week and following any storm event of 0.5 inches or greater.
- All measures will be maintained in good working order, if a repair is necessary, it will be initiated within 24 hours of report.
- Built up sediment will be removed from silt fence when it has reached one-third of height of fence.
- Silt fence will be inspected for depth of sediment tears, to see if fabric is securely attached to the fence posts and to see that the fence post be firmly in the ground.
- Temporary and permanent seeding and planting will be inspected for bare spots, washouts, and healthy growth.
- A maintenance inspection report will be made after each inspection.
- Personnel selected for inspection and maintenance responsibilities will receive training from the Site Superintendent. They will be trained in all inspection and maintenance practices necessary for keeping the erosion and sediment controls used onsite in good working order.

Non-Storm Water Discharges

It is expected that the following non-storm water discharges will occur from the site during the construction period:

- Water from water line flushings.
- Pavement wash waters (where no spills or leaks of toxic or hazardous materials have occurred).
- Uncontaminated groundwater (from dewatering excavation). All dewatering discharges shall be effectively treated prior to release. No turbid discharges are permitted.

INVENTORY FOR POLLUTION PREVENTION PLAN

The materials or substances listed below are expected to be present onsite during construction.

- Concrete
- Detergents
- Paints (enamel and latex)
- Metal Studs
- Concrete
- Tar
- Fertilizers
- Petroleum Based Products
- Cleaning Solvents
- Wood
- Masonry Block

SPILL PREVENTION

Material Management Practices

The following are the material management practices that will be used for reducing the risk of spills or other accidental exposure of materials and substances to storm water runoff.

Good Housekeeping

The following good housekeeping practices will be followed onsite during the construction project:

- An effort will be made to store only enough product required to do the job.
- All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
- Products will be kept in their original containers with the original manufacturer's label.
- Substances will not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, all of a product will be used up before disposing of the container.
- Manufacturer's recommendations for proper use and disposal will be followed.
- The site superintendent will inspect daily to ensure proper use and disposal of materials onsite.

Hazardous Products:

These practices are used to reduce the risks associated with hazardous materials.

- Products will be kept in original containers unless they are not resealable.
- Original labels and material safety data will be retained; they contain important product information.

If surplus product must be disposed of, manufacturers or local and State recommended methods for proper disposal will be followed.

Product Specific Practices

The following product specific practices will be followed onsite:

Petroleum Products:

All onsite vehicles will be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers, which are clearly labeled. Any asphaltic substances used onsite will be applied according to the manufacturer's recommendations.

Fertilizers:

Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to storm water. Storage will be in a covered shed. The contents of any partially used bags of fertilizers will be transferred to a sealable plastic bin to avoid spills.

Paints:

All containers will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewer system but will be properly disposed of according to manufacturer's instructions or State and local regulations.

SPILL PREVENTION (Continued)

Spill Control Practices

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup:

- Manufacturer's recommended methods of spill cleanup will be clearly posted and site personnel will be aware of the procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite. Equipment and materials will include but not be limited to brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.
- All spills will be cleaned up immediately after discovery.
- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
- Spills of toxic or hazardous material will be reported to the appropriate State or local government agency, regardless of size.
- The spill prevention plan will be adjusted to include measures to prevent this type of spill from reoccurring and how to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures will also be included.

POLLUTION PREVENTION PLAN CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are sufficient penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Owners Representative

Name (Print): _____

Title: _____

Signature: _____

Date: _____

CONTRACTOR'S CERTIFICATION

I certify under penalty of law that I understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) permit that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this certification.

Signature	For	Responsible for
Date: _____ Print Name: _____		

PART 1 GENERAL

1.01 WORK INCLUDED

Temporary and permanent erosion and sediment control.

Comply with OEPA requirements and Stormwater Pollution Prevention Plan prepared for this project.

1.02 RELATED WORK

Section 31 00 00, "Earthwork"

Section 32 92 00, "Turfs and Grasses"

1.03 SUBMITTALS

Comply with requirements of Division 0 and 1. Submit material qualification tests and certificates of compliance as indicated.

In accordance with the Stormwater Pollution Prevention Plan (SWPPP) prepared for the project, all stormwater BMPs shall be inspected once every seven (7) days and within 24 hours of a 0.5 inch or greater rainfall. Inspection logs (included herein) shall be kept and shall be submitted to the Owner or Ohio EPA upon request.

At project completion (when all seeding and landscaping is well established), Contractor shall complete and submit to the Ohio EPA the included Notice of Termination (NOT) to terminate coverage from the NPDES General Permit. A copy of the NOT and transmittal shall be provided to the Owner and the Engineer.

PART 2 PRODUCTS

2.01 MATERIALS

Topsoil: Type F Material - Section 31 00 00, "Earthwork."

Filter Barrier Geotextile: The geotextile shall be of either woven or nonwoven construction and consist of long chain polymeric filaments or fibers composed of polypropylene, polyethylene or polymide. The filament and fibers shall be oriented into a stable network whereby they retain their positions relative with each other. The geotextile shall be ultraviolet stabilized and shall be inert to chemicals commonly found in soil. The geotextile shall meet or exceed physical properties of Supac 5NPUV or Supac G WMUV.

Grab Tensile Strength: 90 lb. minimum as measured per test method ASTM D 1682.

Mullen Burst Strength: 190 psi minimum as measured per test method ASTM D 3786.

Slurry Flow Rate: 0.3 gal./min./ft2 maximum.

Equivalent Opening Size: 40-80 as measured per test method US Std. Sieve CW-02215.

Ultraviolet Radiation Stability: 70% minimum as measured per test method ASTM D 4355.

Filter Barrier Stakes: 2" x 2" x 3'-0" wooden stakes.

Rock Channel Protection: Quarried stone meeting the requirements of CMSC Item 601.09 Rock Channel Protection, Type A, B, C, or D with filter, as noted on Drawings.

Seed and Soil Supplements for Temporary Seeding: Provide seed mixture with 20% by weight of perennial ryegrass, 30% red fescue and 50% Kentucky Blue Grass. Provide pulverized agricultural limestone and commercial fertilizer, 10-20-20 or approved substitute.

Mulch: Unrotted straw free from weeds and course material or other approved product suitable for required application.

Mulch Binder: Cutback or emulsified asphalt or synthetic binder such as Petroset, Terratack or Aerospray.

Construction Site Inspection Checklist for OHC000005

By making use of some simple Best Management Practices (BMPs) a construction site operator can do his or her share to protect Ohio's water resources from the harmful effects of sediment. The topography of the site and the extent of the construction activities will determine which of these practices are applicable to any given site, but the BMPs listed here are applicable to most construction sites. For details on the installation and maintenance of these BMPs, please refer to the current ***Rainwater and Land Development****, Ohio EPA's Standards for Storm Water Management Land Development and Urban Stream Protection*. The manual is available at http://epa.ohio.gov/dsw/storm/technical_guidance.

Temporary Stabilization

This is the most effective BMP. All disturbed areas that will lie dormant for over 14 days must be stabilized within 7 days of the date the area becomes inactive. The goal of temporary stabilization is to provide cover, quickly. Areas within 50 feet of a stream must be stabilized within 2 days of inactivity. This is accomplished by seeding with fast-growing grasses then covering with straw mulch. Apply only mulch between November 1 and March 31. To minimize your costs of temporary stabilization, leave natural cover in place for as long as possible. Only disturb areas you intend to work within the next 14 days.

Construction Entrances

Construction entrances are installed to minimize off-site tracking of sediments. A stone access drive should be installed at every point where vehicles enter or exit the site. Every individual lot should also have its own drive once construction on the lot begins.

Sediment Ponds

Sediment ponds are required for construction areas with concentrated runoff or when the design capacity of silt fence or inlet protection is exceeded. There are two types of sediment ponds: sediment basins and sediment traps. A sediment trap is appropriate where the contributing drainage area is 5 acres or less. The outlet is an earthen embankment with a simple stone spillway. A sediment basin is appropriate for drainage areas larger than 10 acres. The outlet is an engineered riser pipe with a skimmer or similar device used to dewater the pond at the surface. Often a permanent storm water management pond, such as a retention or detention basin, can be modified to act as a sediment basin during construction. All sediment ponds must be installed within 7 days of first grubbing the area they control, provide a minimum dewatering zone of 67 cubic yards per acre of total contributing drainage area and a sediment settling zone of
34 cubic yards per disturbed acre below the level of the outlet. Sediment basins must be designed to drain the dewatering zone over a 48-hour period.

Sediment Barriers

This is typically used at the perimeter of a disturbed area. It's only for small drainage areas on relatively flat slopes or around small soil storage piles. Not suitable where runoff is concentrated in a ditch, pipe or through streams. For large drainage areas where flow is concentrated, collect runoff in diversion berms or channels and pass it through a sediment pond prior to discharging it from the site. Combination barriers constructed of silt fence supported by straw bales or silt fence embedded within rock check dams may be effective within small channels. As with all sediment controls, sediment barriers must be capable of pooling runoff so that sediment can settle out of suspension. Sediment barriers must be installed within 7 days of first grubbing the area it controls.

Inlet Protection

This must be installed on all yard drains and curb drains when these inlets do not drain to a sediment trap or basin. Even if there is a sediment trap or basin, inlet protection is still recommended, as it will increase the overall sediment removal efficiency. These are best used on roads with little or no traffic. If working properly, inlet protection will cause water to pond. If used on curb inlets, streets will flood temporarily during heavy storms. Check with your municipality before installing curb inlet protection. They may prefer an alternate means of sediment control such as silt fence or ponds.

Permanent Stabilization

All areas at final grade must be permanently stabilized within 7 days of reaching final grade. This is usually accomplished by using seed and mulch, but special measures are sometimes required. This is particularly true in drainage ditches or on steep slopes. These measures include the addition of topsoil, erosion control matting, rock rip-rap or retaining walls. Permanent seeding should be done March 1 to May 31 and August 1 to September 30. Dormant seeding can be done from November 20 to March 15. At all other times of the year, the area should be temporarily stabilized until a permanent seeding can be applied.

Non-Sediment Pollution Control

Although sediment is the pollutant of greatest concern on most construction sites, there are other sources of pollution. Most of these BMPs are easy to implement with a little bit of planning and go a long way toward keeping your site clean and organized. Please be sure to inform all contractors how these BMPs affect their operations on the site, particularly those that will be working near a stream.

Inspection Sheet

INSPECTIONS MUST BE CONDUCTED ONCE EVERY 7 DAYS AND WITHIN 24 HOURS OF A 0.5" OR GREATER RAINFALL. ALL SEDIMENT CONTROLS MUST BE INSTALLED PRIOR TO GRADING AND WITHIN 7 DAYS OF FIRST GRUBBING

GENERAL INSPECTION INFORMATION

Construction Site Inspection Date:_____ Inspector Name: _____

Inspector Title:_____ Qualifications/Certifications:_____

Storm Events of the Last 7 Days

Storm Event Date	Storm Event Time	Storm Event Duration	Total Rainfall Amount	Discharge Occur? (Y/N)
			(inches)	
			(inches)	
			(inches)	
			(inches)	

Weather Information at the Time of Inspection

Sketch or Small Site Map

Along with a narrative inspection log, Ohio EPA recommends the inspector use a sketch or a reduced photocopy of the site plan showing the location of storm water outfalls and storm drain inlets as well as the location and types of control measures. Problems observed at these locations, or at other locations on the construction site, should be highlighted and any corrective measures undertaken should be drawn in and noted in detail on the front side of the sketch. This method will also be helpful as the permittee is required to update the SWP3 to reflect current site conditions.

CONSTRUCTION ENTRANCES

Key things to look for ...

	Yes	No
1. Has the drive been constructed by placing geotextile fabric under the stone?	☐	☐
2. Is the stone 2-inch diameter?	☐	☐
3. Has the stone been placed to a depth of 6 inches, with a width of 10 feet and a length of at least 50 feet (30 feet for entrances onto individual sublots)?	☐	☐
4. If the drive is placed on a slope, has a diversion berm been constructed across the drive to divert runoff away from the street or water resource?	☐	☐
5. If drive is placed across a ditch, was a culvert pipe used to allow runoff to flow across the drive?	☐	☐

Note areas where repairs or maintenance is needed or where this practice needs to be applied:

SEDIMENT PONDS

Key things to look for ...

		Yes	No
1.	Are concentrated flows of runoff directed to a sediment pond?	☐	☐
2.	Is sheet-flow runoff from drainage areas that exceed the design capacity of silt fence (generally 0.25 acre or larger) directed to a sediment pond?	☐	☐
3.	Is runoff being collected and directed to the sediment pond via the storm sewer system or via a network of diversion berms and channels?	☐	☐
4.	Is the sediment pond dewatering zone appropriately sized (67 cubic yards per acre of total drainage area)?	☐	☐
5.	Is the sediment pond sediment settling zone appropriately sized (34 cubic yards per acre of disturbed area)?	☐	☐
6.	Is the sediment basin designed to be dewatered at the surface through the use of a skimmer or another similar surface water dewatering device?	☐	☐
7.	Is the sediment basin designed so that the dewatering zone will drain in no less time than 48 hours?	☐	☐
8.	Have the embankments of the sediment pond and the areas that lie downstream of the pond been stabilized?	☐	☐
9.	For sediment traps, is there geotextile under the stone spillway and is the spillway saddle-shaped?	☐	☐
10.	For sediment traps, which dewater 100% between storms, is the dewatering pipe end-capped, no larger than 6 inches in diameter, perforated and double-wrapped in geotextile?	☐	☐
11.	Is the length-to-width ratio between inlet(s) and outlet at least 2:1? **NOTE**: If not, a baffle should be added to lengthen the distance.	☐	☐
12.	Is the depth from the bottom of the basin to the top of the primary spillway no more than 3 to 5 feet?	☐	☐
13.	For a modified storm water pond being used as a sediment pond, is the connection between the riser pipe and the permanent outlet water-tight?	☐	☐
14.	Was the basin installed prior to grading the site?	☐	☐
15.	Is it time to clean-out the sediment pond to restore its original capacity? Generally, sediment should be removed from the sediment settling zone once it's half-full. Stabilize the dredged sediments with seed and mulch.	☐	☐

Note areas where repairs or maintenance is needed or where this practice needs to be applied:

SEDIMENT BARRIERS

Key things to look for ...

	Yes	No
1. Is the silt fence at least 4" to 6" into the ground?	☐	☐
2. Is the silt fence trench backfilled to prevent runoff from cutting underneath the fence?	☐	☐
3. Is the silt fence pulled tight so it won't sag when water builds up behind it?	☐	☐
4. Are the ends brought upslope of the rest of the silt fence so as to prevent runoff from going around the ends?	☐	☐
5. Is the silt fence placed on a level contour? If not, the fence will only act as a diversion.	☐	☐
6. Have all the gaps and tears in the silt fence been eliminated.	☐	☐
7. Is the sediment barrier controlling an appropriate drainage area? Refer to Chapter 6 of ***Rainwater*** manual. **RULE OF THUMB**: Design capacity for 100 linear feet of sediment barrier is 0.5 acres for slopes < 2%, 0.25 acres for slopes 2% to 20%, & 0.125 acres for slopes 20% or more. Generally, no more than 0.25 acres should lie behind 100 feet of sediment barrier at 2% to 20% slope, i.e., the distance between the barrier and the top of the slope behind it should be no more than 125 feet. The allowable distance increases on flatter slopes and decreases for steeper slopes. **All non-silt fence sediment barriers must be at least 12-inches in diameter.**	☐	☐

Note areas where repairs or maintenance is needed or where this practice needs to be applied:

INLET PROTECTION

Key things to look for ...

	Yes	No
1. Does water pond around the inlet when it rains?	☐	☐
2. Has the fabric been replaced when it develops tears or sags?	☐	☐
3. For curb inlet protection, does the fabric cover the entire grate, including the curb window?	☐	☐
4. For yard inlet protection, does the structure encircle the entire grate?	☐	☐
5. Is the fabric properly entrenched or anchored so that water passes through it and not under it?	☐	☐
6. For yard inlet protection, is the fabric properly supported to withstand the weight of water and prevent sagging? The fabric should be supported by a wood frame with cross braces, or straw bales.	☐	☐
7. Is sediment that has accumulated around the inlet removed on a regular basis?	☐	☐

Note areas where repairs or maintenance is needed or where this practice needs to be applied:

TEMPORARY STABILIZATION

Key things to look for ...

	Yes	No
1. Are there any areas of the site that are disturbed, but will likely lie dormant for over 14 days?	☐	☐
2. Have all dormant, disturbed areas been temporarily stabilized in their entireties?	☐	☐
3. Have disturbed areas outside the silt fence been seeded or mulched?	☐	☐
4. Have soil stockpiles that will sit for over 14 days been stabilized?	☐	☐
5. Has seed and mulch been applied at the proper rate? In general, seed is applied at 3 to 5 lbs per 1000 sq ft and straw mulch is applied at 2-3 bales per 1000 sq ft.	☐	☐
6. Has seed or mulch blown away? If so, repair.	☐	☐

Note areas where repairs or maintenance is needed or where this practice needs to be applied:

PERMANENT STABILIZATION

Key things to look for ...

	Yes	No
1. Are any areas at final grade?	☐	☐
2. Has the soil been properly prepared to accept permanent seeding?	☐	☐
3. Has seed and mulch been applied at the appropriate rate (see Chapter 7 of the ***Rainwater*** manual)?	☐	☐
4. If rainfall has been inadequate, are seeded areas being watered?	☐	☐
5. For drainage ditches where flow velocity exceeds 3.5 ft/s from a 10-year, 24-hour storm has matting been applied to the ditch bottom?	☐	☐
6. If the flow velocity exceeds 5.0 ft/s, has the ditch bottom been stabilized with rock rip-rap? **NOTE**: Rock check dams may be needed to slow the flow of runoff.	☐	☐
7. Has rock rip-rap been placed under all storm water outfall pipes to prevent scouring in the receiving stream or erosion of the receiving channel?	☐	☐
8. For sites with steep slopes or fill areas, is runoff from the top of the site conveyed to the bottom of the slope or fill area in a controlled manner so as not to cause erosion?	☐	☐

Note areas where repairs or maintenance is needed or where this practice needs to be applied:

NON-SEDIMENT POLLUTION CONTROL

Key things to look for ...

	Yes	No
1. Has an area been designated for washing out concrete trucks? Washings must be contained on site within a bermed area until they harden. The washings should never be directed toward a watercourse, ditch or storm drain.	☐	☐
2. Is waste and packaging disposed of in a dumpster? Do not burn them on site.	☐	☐
3. Are fuel tanks and drums of toxic and hazardous materials stored within a diked area or trailer and away from any watercourse, ditch or storm drain?	☐	☐
4. Are streets swept as often as necessary to keep them clean and free from sediment? NOTE: Sediment should be swept back onto the lot - not down the storm sewers.	☐	☐
5. Are stockpiles of soil or other materials stored away from any watercourse, ditch or storm drain?	☐	☐
6. Have stream crossings been constructed entirely of non-erodible material?	☐	☐
7. If an area of the site is being dewatered, is it being pumped from a sump pit or is the discharge directed to a sediment pond? **NOTE**: if you must lower ground water, the water may be discharged to the receiving stream as long as the water remains clean. Be sure not to co-mingle the clean ground water with sediment-laden water or to discharge it off-site by passing it over disturbed ground.	☐	☐

Note areas where repairs or maintenance is needed or where this practice needs to be applied:

Division of Surface Water - *Notice of Termination (NOT) of Coverage Under Ohio Environmental Protection Agency General NPDES Permit*

(Read accompanying instructions carefully before completing this form.)

Submission of this NOT constitutes notice that the party identified in Section II of this form is no longer authorized to discharge into state waters under the NPDES general permit program. NOTE: All necessary information must be provided on this form. Do not use correction fluid on this form. Forms transmitted by fax will not be accepted. There is no fee associated with submitting this form.

I. Permit Information

NPDES General Permit Number: OH

Facility General Permit Number:

II. Owner/Applicant Information/Mailing Address:

Company (Applicant) Name:

Mailing (Applicant) Address:

City:	**State:**	**Zip Code:**
Contact Person:	**Phone:**	**Fax:**

Contact E-mail Address:

III. Facility/Site Location Information

Facility Name:

Facility Address/Location:

City:	**State:**	**Zip Code:**
County:	**Township:**	**Section:**
Facility Contact Person:	**Phone:**	**Fax:**

Contact E-mail Address:

IV. Reason for Termination

Transfer of Ownership ☐	**Cease to Discharge** ☐	**Facility Closed** ☐
Project Completed ☐	**Obtained Individual Permit** ☐	

V. Certifications

Standard Certification:

I certify under penalty of law that all discharges authorized by the NPDES general permit have been eliminated or that I am no longer the operator of the facility. I understand that by submitting this NOT, I am no longer authorized to discharge under this general permit and that discharging pollutants to waters of the state without an NPDES permit is unlawful under ORC 6111.

Name *(typed)*:	**Title:**
Signature:	**Date:**

Industrial Storm Water and Coal Mining Activity Certification Only:

I certify under penalty of law that all discharges associated with the identified facility that are authorized by the above referenced NPDES general permit have been eliminated, that I am no longer the operator of the facility, or in the case of a coal mine that the SMCRA bond has been released by ODNR-Division of Reclamation. I understand that by submitting this NOT, I am no longer authorized to discharge storm water associated with industrial activity under this general permit, and that discharging pollutants in storm water associated with industrial activity to waters of the state is unlawful under ORC 6111 where the discharge is not authorized by an NPDES permit.

Name *(typed)*:	**Title:**
Signature:	**Date:**

Storm Water Construction Activity Certification Only:

I certify under penalty of law that all elements of the storm water pollution prevention plan have been completed, the disturbed soil at the identified facility have been stabilized and temporary erosion and sediment control measures have been removed at the appropriate time, or that all storm water discharges associated with construction activity from the identified facility that are authorized by the above referenced NPDES general permit have otherwise been eliminated. I understand that, by submitting this NOT, I am no longer authorized to discharge storm water associated with construction activity by the general permit, and that discharging pollutants in storm water associated with construction activity to waters of the state is unlawful under ORC 6111 where the discharge is not authorized by an NPDES permit.

Name *(typed)*:	**Title:**
Signature:	**Date:**

Notice of Termination (NOT) Form Instructions For Ohio EPA General Permits

Where to file NOT form

NOTs must be sent to the following address:

Ohio Environmental Protection Agency
General Permit Program
P.O. Box 1049
Columbus, OH 43216-1049

Completing the Form

Please complete the fill-in form on-line at www.epa.ohio.gov/dsw/storm/stormform.aspx or print legibly in the appropriate areas only. Forms transmitted by FAX will not be accepted. Complete all sections of the NOT form. Incomplete forms will be returned to the applicant for resubmittal.

Please place each character slightly above the appropriate line. Abbreviate if necessary to stay within the space allowed for each item.

Section I - Permit Information

Enter the existing Ohio NPDES general permit number assigned to the facility or site for which you are submitting this NOT. If you do not know the permit number, contact the Ohio EPA Storm Water Section at (614) 644-2001.

Section II - Owner/Applicant Information/Mailing Address

This information should appear on the NOT form as it appears on the original Notice of Intent (NOI) form.

Give the legal name of the person, firm, public organization, or any other entity that operates the facility or site described in the application. The name of the operator may or may not be the same as the facility. The operator of the facility is the legal entity which controls the facility's operation rather than the plant or site manager. For construction activities, the responsible party is the owner or the developer of the property. Do not use a colloquial name. Give the name and phone number of a contact person who is responsible for addressing NPDES permit requirements. Enter the complete address and telephone number of the operator (provide phone number as: area code exchange number).

Section III - Facility/Site Location Information

This information should appear on the NOT form as it appears on the original Notice of Intent (NOI) form.

Enter the facility's or site's official or legal name and complete address, including city, state, zip code, county, township, and section. If the facility lacks a street address, indicate the street name and approximate address number.

Section IV - Reason for Termination

Indicate your reason for submitting this NOT by placing an "x" on the appropriate space. You may indicate more than one reason.

Standard Certification

The standard certification should be completed except where a specific certification (listed below) is required.

Industrial Storm Water and Coal Mining Activity Certification Only

This certification should be completed only if you are submitting this NOT to terminate permit coverage under the storm water general permit associated with industrial activity or the general permit associated with coal mining activity.

Construction Certification Only

This certification should be completed only if you are submitting this NOT to terminate permit coverage under the storm water general permit associated with construction activity.

Note for all certifications: provide date as month day year using 2 digits for each space.

Signatory Requirements

Federal statutes provide for severe penalties for submitting false information on this application form. Federal regulations require this application to be signed as follows.

For a corporation: by a responsible corporate officer, which means: (1) a president, secretary, treasurer or vice-president of the corporation in charge of a principal business function or any other person who performs similar policy or decision-making functions for the corporation; or (2) the manager of one or more manufacturing, production or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

For a partnership or sole proprietorship: by a general partner or the proprietor; or

For a municipality, state, federal, or other public facility: by either a principal executive officer or ranking elected official

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PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Asphalt concrete pavement shown on the Drawings and required by the Specifications constructed on a prepared surface in reasonably close conformity with the lines, grades, and typical cross sections shown on the plans or otherwise specified.

B. Coordinate work of other trades who will be working adjacent to paving areas. Coordinate work with Contractor providing compacted base for paving materials.

C. Inspection and Testing Services required by this Section are to be performed by an Agency retained by the Contractor and approved by the Owner. This includes all field sampling and testing required by the Field Quality Control Section of this Specification.

D. Related Sections:
1. Section 31 00 00, "Earthwork"
2. Section 31 23 33, "Piped Utilities - Basic Methods"
3. Section 32 13 00, "Rigid Pavement"

E. Do not place asphalt surface course until site work has been completed and construction traffic has been reduced to a minimum.

1.02 QUALITY ASSURANCE

A. Reference Standards:
1. The Asphalt Institute – Manual MS-2 – Mix Design Methods.
2. The Asphalt Institute – Manual MS-4 – The Asphalt Handbook.
3. The Asphalt Institute – Manual MS-13 – Asphalt Surface Treatments and Asphalt Penetration Macadam.
4. ASTM D946 – Asphalt Cement for Use in Pavement Construction.
5. ASTM D1188 – Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures using Paraffin Coated Specimens.
6. ASTM D2041 – Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.
7. ASTM D2950 – Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
8. State of Ohio, Department of Transportation – Construction and Materials Specifications (CMS) 2019.
9. City of Columbus, Ohio - Construction and Material Specifications (CCMS) 2018.

B. Regulatory Requirements:
1. Conform to applicable City standards for paving work on public property. In the event of a conflict between the Drawings and Specifications and the City standards, the City standards shall govern. No extra charges will be allowed for any changes necessary for compliance with City standards.
2. Perform work in accordance with State of Ohio, City of Columbus, Department of Transportation Construction and Material Specifications, 2019.

3. Mixing Plant: Conform to State of Ohio, City of Columbus, Department of Transportation, Construction and Material Specifications, 2019.

C. Weather Limitations:
1. Place bituminous pavement only when the surface is dry and when weather conditions are such that proper handling, finishing and compaction can be accomplished. In no case, however, shall bituminous pavement be placed when the surface temperature is below the minimum established in the following table:

COURSE THICKNESS	MINIMUM SURFACE TEMPERATURE
1.5 Inches and Over	40°F
1.0 to 1.4 Inches	50°F
Less than 1.0 Inches	60°F

1.03 SUBMITTALS

A. Submit for approval the mixing plant to be used.

B. Submit approved job mix formulas for each asphalt concrete pavement prior to preparation of the mixture.

C. Submit all aggregate and asphalt binder test data, as required.

D. Submit product data and manufacturers instructions, including traffic paint.

E. Submit for approval the name of agency proposed for the required inspection and testing services. All of the required field testing and sampling is to be performed by personnel employed by the proposed agency.

F. Submit reports of all required testing and inspection.

PART 2 PRODUCTS

2.01 MATERIALS

A. Surface Course: CMSC Item 441, Asphalt Concrete Surface Course, Type 1, medium or light traffic, PG 64-22.
1. Refer to drawings and details for extent of medium and light traffic designations.

B. Intermediate Course: CMSC Item 441, Asphalt Concrete Surface Course, Type 2, medium or light traffic, PG 64-22.
1. Refer to drawings and details for extent of medium and light traffic designations.

C. Tack Coat: CCMS Item 407.

D. Bituminous Aggregate Base Course: CMSC Item 301, Asphalt Concrete Base, PG 64-22.

E. Aggregate Base Course: CCMS Item 304.

2.02 EQUIPMENT

A. Spreading Equipment: Provide self-contained spreading equipment of sufficient size, power, and stability to receive, distribute, and strike-off the bituminous mixture at rates and widths commensurate with the typical sections and other details shown on the plans. Provide equipment with automatic control systems which maintain the screed in a constant position relative to profile and cross-slope references. These references shall be such that control of the screed position is reasonably independent of irregularities in the underlying surface and of the spreader operation.

B. Rollers: Provide rollers of the standard steel wheel and pneumatic tire types and meeting the requirements of CCMS Item 401.12.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify compacted subgrade base is dry and ready to support paving and imposed loads.

B. Proof roll subgrade and correct any areas determined unacceptable to Testing Agency, in accordance with the Agency's recommendations immediately prior to placement of asphalt pavement.

C. Verify gradients and elevations of base are correct.

D. Beginning of installation means acceptance of substrate.

E. Protect existing surfaces and structures adjacent to paving. Repair any damage caused by paving operations at no additional cost to the Owner.

3.02 CONDITIONING EXISTING SURFACE

A. Immediately prior to the arrival of pavement mixtures, thoroughly clear the pavement base, leveling course, or old pavement of all soil, grass, dirt, or other foreign materials.

B. When the surface of the existing pavement is irregular, bring to uniform grade as directed using the material specified. Paint contact surfaces of curbing, gutters, manholes, and other structures with a thin, uniform coating of bituminous material prior to the bituminous mixture being placed against them.

C. Where mixture is to be placed against the vertical face of rigid pavement, clean vertical face of foreign material and give an application of bituminous material in a manner which results in a coating of approximately 1/4 gallon per square yard.

D. Coat surfaces of catch basin frames with oil to prevent bond with asphalt paving.

3.03 PAVEMENT REPAIR

A. Saw cut perimeter of pavement repair. Extend saw cut fully through the existing surface and asphaltic base material, enabling the removal of the existing failed pavement, leaving a neat and straight edge.

B. Completely excavate the existing pavement section in areas of repair and remove from the site. Use excavating equipment which shall not damage existing pavement to remain.

C. In the event that the entire pavement section is removed, proof roll the area. Undercut and replace any existing subbase that is soft and yielding with ODOT CCMS Item 304. Remove all unsuitable subgrade material excavated from the pavement repair area from the site. Proof roll in the presence of the Associate / Engineer / Testing Agency. Payment shall be made per contract conditions relative to changes in work. / Payment shall be made on the bases of unit price established.

D. Where mixture is to be placed against the vertical face of an existing pavement structure, clean the vertical face of foreign material and give an application of tack coat.

3.04 PAVEMENT RESURFACING

A. Coordinate junction of new and existing pavement. Where new overlay abuts existing pavement, scarify a minimum of 4 feet wide and depth equal to overlay thickness to provide butt joint. Feathering will not be permitted.

B. Scarify areas around existing structures 4'-0" wide, such that the new overlay will be placed to meeting existing surface level. Scarify other areas of overlay as shown on the Drawings. Maintain positive drainage slopes.

C. Scarify by milling, grinding or cold planning the existing pavement surface to establish a new surface profile and cross section in preparation for the asphaltic overlay. Provide a surface after grinding that is grooved or ridged finish uniform and resistant to raveling or traffic displacement. Provided a textured surface that has grooves of 0.25 inches in width.

D. Include grinding around utility castings in the area of the pavement scarified. The At Contractor's option remove the entire existing bituminous pavement around the castings where grinding is not completed and replace it with bituminous surface course placed and compacted in 3 inch lifts. Vertically cut the limits of the area to be patched, mechanically compact the existing base course and prime the bottom and vertical edges before backfilling.

E. Provide a power operated, self-propelled grinding machine with a cutting drum with lacing patterns that will attain a grooved surface and produce a pressurized watering system for dust control.

F. Thoroughly clean all areas to be resurfaced. Do not flush cleanup water into the storm sewer system. Remove waste debris cleaned from the site.

G. Provide asphaltic concrete overlay in areas of resurfacing according to the Drawings and this entire Specification Section, as applicable.

3.05 PREPARATION, MIXING, AND HAULING OF MIXTURE:

A. Preparation:
   1. Bituminous Material Preparation: Heat bituminous material and deliver to the mixer within the temperature range specified in CCMS Item 702. Do not use foaming bituminous materials.

2. Aggregate Preparation: Feed aggregates to the cold elevator in their proper proportions at a rate permitting correct and uniform control of heating and drying. Remove all aggregates in the hot bins that will produce a mix outside the temperature limits or that contain sufficient moisture or expanding gases to cause foaming in the mixture and return to the proper stockpiles.

B. Mixing:
1. After all of the aggregate is in the mixer, add bituminous material in an evenly spread sheet over the full length of the mixer. The mixing time shall be the time interval between the start of the application of the bituminous material and the opening of the mixer gate. Mix bituminous material for a minimum of 30 seconds. Discharge all bituminous material in no more than 30 seconds.
2. Maintain temperatures of the mixture at the plant in order to be placed at the temperatures specified in Paragraph 3.06.

C. Hauling:
1. Use trucks for hauling bituminous mixtures that have tight, clean, smooth metal beds which have been thinly coated with a minimum amount of approved material to prevent the mixture from adhering to the beds. Provide each truck a securely fastened, waterproof cover of suitable material to adequately protect the mixture from the wind and weather. Remove covers prior to dumping mixture into the paver.
2. When hot mixtures are being transported at prevailing air temperatures below 50º F or when the length of haul exceeds 20 miles, insulate all truck beds to maintain the specified temperature of the mixture. Do not haul distances in excess of 50 miles unless specifically approved by the Engineer.

3.06 SPREADING

A. Place tack coat prior to placing surface course or intermediate course per CCMS Item 407.

B. Spread the pavement mixture on an approved surface with bituminous pavers or spreaders to achieve the specified thickness and compaction. Maximum compacted depth of any one layer shall be as follows:
1. Aggregate Base Course: 8 inches
2. Bituminous Aggregate Base Course: 6 inches
3. Intermediate Course: 3 inches
4. Surface Course: 3 inches

C. Immediately after the mixture is spread, correct irregularities in grade and alignment by the addition or removal of the mixture before compaction has started.

D. Remove and replace any areas showing an excess or deficiency of bituminous material before or after compaction.

E. In areas where irregularities or unavoidable obstacles make the use of mechanical spreading equipment impracticable, spread or rake the mixture with hand tools. For such areas, dump, spread, and screen the mixture to give the specified thickness and compaction.

3.07 COMPACTION

A. Provide a bituminous mixture with a minimum temperature of 270 degrees F prior to placing in the paver. Immediately after the bituminous mixture has been spread, struck off, and surface irregularities adjusted, thoroughly and uniformly compact by rolling.

B. Coordinate the spreading of the mixture with the required roller coverage, considering the rate of cooling of the mixture as affected by lift thickness and environmental conditions. Complete final rolling before the pavement reaches a temperature of 180 degrees F.

C. Along curbs, headers, walls, and in other areas not accessible to rollers, thoroughly compact the mixture with hot, hand tampers or with mechanical tampers.

D. For all hot bituminous mixtures, provide the number and type of rollers sufficient to compact the mixture at the rate of spreading without exceeding the capacity of the rollers in operation. Compact base, intermediate, and surface courses with a combination of both steel and Type I pneumatic tire rollers, except in small areas which may be compacted by hand tools.

E. Unless otherwise directed, begin rolling at the outer edges and proceed longitudinally at a slow, uniform speed. After each coverage or complete round trip, progress the roller by overlapping the previous pass by at least half of the width of the roller.

F. Continue rolling until full coverage of the course has been completed and all roller marks are eliminated.

G. Replace mixture that becomes loose, broken, contaminated, or otherwise defective with fresh, hot mixture compacted to conform with the surrounding area.

H. After compaction of the surface course, seal curbs and gutters with asphalt binder. Apply mixture at a uniform width and at a rate just sufficient to fill surface voids.

I. Do not allow traffic to travel on the compacted pavement until it has cooled sufficiently to prevent glazing.

3.08 JOINTS

A. Place bituminous paving as continuously as possible. Make longitudinal and transverse joints as a vertical face. Set up joints at the proper height above the adjacent finished pavement to receive maximum compaction.

B. Provide a well bonded and sealed joint. Coated joint with a 4 inch wide strip of asphalt material along the entire length of the joint.

3.09 TRAFFIC PAINT

A. Paint all lines, arrows and other markings in accordance with CMSC Section 640 as required to define parking spaces and traffic flow on pavement as indicated on Drawings. Provide handicapped logos at all handicapped parking spaces.

B. Paint lines approximately 4 inches wide with even, clean edges and neat, sharp lines.

C. Apply by highway-type applicator machine in heavy one-coat application in method and coverage recommended by paint manufacturer. Do not hand paint any lines.

D. Apply traffic paint at the completion of the project when no more construction traffic is expected in the area.

3.10 SPREADING AND SURFACE TOLERANCES

A. Maintain the rate of spreading within a tolerance of 5 percent of the required calculated weight to achieve proper course depth and compaction.

B. Do not vary elevation of finished surface course from true elevation by more than 1/4 inch.

C. Do not vary transverse slope of the surface of the completed course from the specified slope by more than 3/8 inch in 10 feet.

D. Do not vary transverse slope of the surface of the completed course from the testing edge of a 10 foot straightedge by more than the tolerance specified:
1. Bituminous Aggregate Base course: 3/8 inch.
2. Intermediate course: 1/4 inch.
3. Surface course: 1/4 inch.

E. Remove and replace portions of the completed pavement that are defective in surface, compression, or composition or otherwise correct in a manner satisfactory to the Engineer.

3.11 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 1.

B. Bituminous Thickness Testing: Provide thickness measurement of field core samples per ASTM D1188 within 48 hours after the pavement is placed. Perform tests as follows:
1. One passing thickness test for each 500 square yards or each lift, whichever is less.
2. Provide random locations of cores or as directed by the Associate / Engineer or Testing Agency. Clearly identify horizontal location at each test core on test reports.
3. Allowable compacted pavement thickness shall be within + 0.25 inches of specified thickness.
4. Fill core holes by the next working day. Before filling, ensure the holes are dry and tack with asphalt material conforming to CMSC Item 407.02. Properly compact the asphalt concrete used to fill the hole leave flush with adjacent pavement.

C. Bituminous Density Testing: Provide density testing of placed bituminous pavement per ASTM D1188 and ASTM D2950 within 48 hours after the pavement is placed. Theoretical average Maximum Specific Gravity (MSG) shall be determined per ASTM D2041. Perform tests as follows:
1. One passing density test for each 500 sq. or each lift, whichever is less.
2. Provide random locations of tests or as directed by Associate / Engineer or Testing Agency. Test reports shall clearly identify horizontal location at each test location.
3. Provide compaction ranging from 90.0 to 97.9 percent of the average Maximum Specific Gravity (MSG) for Surface Course and 90.0 to 96.9 percent for Intermediate Course. Remove and replace any material placed outside of said ranges. Provide replacement pavement and quality assurance testing at no additional cost to the Owner.

4. Fill core holes by the next working day. Before filling, ensure the holes are dry and tack with asphalt material conforming to CMSC Item 407.02. The asphalt concrete used to fill the hole shall be properly compacted and shall be left flush with adjacent pavement.

3.12 ACCEPTANCE

A. Asphalt surface not conforming to sections "Spreading and Surface Tolerances" and "Field Quality Control" and/or exhibiting ponding after rain events are subject to rejection and removal and replacement at no cost to the Owner.

B. When Field Quality Control testing or observations indicate that the Contract requirements have not been met, the Contractor is to bear the costs of any additional testing any analysis to determine acceptability and also the cost of removal and replacement, if such is required.

3.13 PROTECTION

A. Immediately after placement, protect pavement under provisions of Division 1 from mechanical injury. Maintain clean pavement surface throughout the remainder of the project. Immediately remove any construction debris or soil tracked on new asphalt.

B. If pavement surface becomes faded or dirty prior to completion of project, clean and seal parking lot prior to applying traffic paint.

C. Protection of Work by Others: Protect all work by others such manholes, catch basins, sewer cleanouts, lighting posts and bases, sidewalks, etc. Damage to same shall be repaired at the Paving Contractor's expense.

END OF SECTION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Concrete sidewalks, detectable warnings, curbs, gutters, and streets.

B. Reinforcement.

C. Surface finish.

D. Curing

1.02 WORK INSTALLED BUT FINISHED UNDER OTHER SECTIONS

A. Not used.

1.03 RELATED WORK

A. Section 31 00 00, "Earthwork"

B. Section 32 12 00, "Flexible Pavement"

C. Section 33 40 00, "Storm Drainage"

1.04 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings.

B. ASTM D1751-99 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

C. ASTM D1752-04a – Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

D. ASTM C33-03 - Standard Specification for Concrete Aggregates.

E. ASTM C94-04a - Standard Specification for Ready Mixed Concrete.

F. ASTM C150-04a - Standard Specification for Portland Cement.

G. ASTM C260-01 - Standard Specification for Air-Entraining Admixtures for Concrete.

H. ASTM C309-03 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

I. ASTM C494-04 - Standard Specification for Chemical Admixtures for Concrete.

J. ASTM C920-02 – Standard Specification for Elastomeric Joint Sealants.

K. ASTM D5249 – Standard Specification for Backer Material for Use with Cold and Hot Applied Joint Sealants in Portland Cement Concrete and Asphalt Joints.

L. FS TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces.

M. City of Columbus, Ohio Construction and Material Specifications (CMSC) 2018.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Obtain materials from same source throughout.

C. Install curb and gutter in accordance with CMSC Item 609.

1.06 REGULATOR REQUIREMENTS

A. Conform to City code for paving work on public property.

1.07 TESTS

A. Testing and analysis will be performed under provisions of Division 1.

B. Submit proposed mix design of each class of concrete to appointed firm for review prior to commencement of work.

C. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with ACI 301.

1.08 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Include data on joint filler, admixtures, curing compounds.

C. Submit manufacturer's instructions under provisions of Division 1.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

A. Cement: ASTM C150-86, Type I, II or III Portland type, gray color.

B. Fine and Coarse Aggregate: ASTM C33-86.

C. Water: Potable.

2.02 FORM MATERIALS

A. Conform to ACI 301.

B. Joint Filler: ASTM D1751-83.

2.03 REINFORCEMENT

A. Reinforcing Steel: ASTM A615; 60 ksi yield grade.

B. Welded Steel Wire Fabric: Plain type, ANSI/ASTM A175; in flat sheets.

C. Tie Wire: Annealed steel, minimum 16 gauge.

D. Dowels: ASTM A615; 40 ksi yield grade, plain steel, uncoated finished.

E. Synthetic Fiber Reinforcement: ASTM C1116-97 and ASTM C1018-97. Acceptable products include, but are not limited:
1. Nycon Nylon Fibers.
2. Forta Nylo-Mono Nylon Fibers
3. Fibermesh Fibermix Stealth Polypropylene Fibers.
4. Grace Polypropylene Fibers
5. Forta Mighty-Mono Polypropylene Fibers

Synthetic fiber reinforcement shall be used in strict accordance with the manufacturer's recommendations. Dosage rate shall be as recommended by the manufacturer, but not less than 1 pound per cubic yard.

2.04 ACCESSORIES

A. Dissipating Curing Compound: Comply with ASTM C309-19, Type 1, Class A or B (clear), except moisture loss not to exceed 0.40 kg/sq m. in 72 hours. Compound shall comply with EPA's VOC requirements. Apply at the manufacturer's written recommended application rate.

B. Sealer: Clear membrane-forming compound which will not yellow. Must be formulated for the intended application, either interior or exterior and applied per the manufacturer's written recommendations. Must comply with EPA's VOC requirements and be compatible with the curing compound used.

C. Penetrating Sealer: Acceptable products include, but are not limited to:
1. L&M Construction Chemicals - Aquapel Plus 40
2. ProSoCo - Saltguard WB
3. Huls America Inc. - Chem-Trete BSM 40
4. Master Builders Inc. - Masterseal SL 40
5. Lymtal International - Iso-Flex 618-50 WB
6. BASF - Enviroseal 40 or Hydrozo Silane 40
7. Tex-Cote - Rainstopper RS140

D. Expansion, Isolation, and Construction Joints:
1. Pre-formed Joint Filler: Non-impregnated type, closed cell resilient polyethylene foam, 1/2 inch thick unless otherwise noted. Meet or exceed requirements of ASTM D 1752, Sections 5.1 through 5.4, and ASTM D 5249, Type 2. Ceramar Flexible Foam Expansion Joint by W.R. Meadows or approved equal.

2. Joint Cap: Two piece vinyl device with upper 1/2 inch removable after curing period. Width corresponding to joint filler. Products by Greenstreak Plastic Products, Vinylex Corp., Vulcan Metal Products, or approved equal.
3. Joint Sealant: High performance, self leveling, elastomeric polyurethane sealant conforming to ASTM C-920. Sikaflex 1CSL or approved equal.

2.05 ADMIXTURES

A. Air Entrainment: ASTM C260-86.

B. Chemical Admixture: ASTM C494-86, Type A or D - water reducing, Type C or E - accelerating.

2.06 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94.

B. Provide concrete for the following characteristics:

- Compressive Strength at 28 days: 4000 psi.
- Min cementitous materials content 564 lbs./cu. yd.
- Max water-cementitous ratio 0.45, air content 6+1, -1.5%

C. Use accelerating admixtures in cold weather only when approved by Architect/Engineer. Use of admixtures will not relax cold weather placement requirements.

D. Use set-retarding admixtures during hot weather only when approved by Architect/Engineer.

E. Add air entraining agent to concrete mix for concrete work exposed to exterior.

F. Concrete mixes shall not contain any deleterious or other reactive aggregates or materials that can initiate and promote alkali silica reaction (ASR).

2.07 DETECTABLE WARNINGS

A. Detectable warning surfaces shall contrast visually with walking surfaces and be textured to provide slip resistance. The preferred color for a light background shall be brick red. The preferred color for a dark background shall be light granite. Color shall be integral with the detectable warning surface and shall not be painted or surface applied.

B. Detectable warning surface shall have truncated domes with a consistent base diameter ranging from 0.9 inches 1.4 inches. Truncated domes shall have a height of 0.2 inches and a top diameter ranging from 50 to 65 percent of the base diameter.

C. Truncated domes shall have a consistent spacing ranging from 1.6 inches to 2.4 inches measured center-to-center. Base-to-base spacing measured between the most adjacent domes shall be 0.65 inches minimum.

D. Detectable warning surfaces shall be of the type specified on the drawings:
1. Type I – Pre-Manufactured Wet-Set Products

2. Type II – Stamped, Color Dyed Concrete
3. Type III – Precast Manufactured Clay and Concrete Pavers

E. Contractor shall submit detectable warning surface product data for review prior to construction.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify compacted subgrade or granular base stabilized soil is ready to support paving and imposed loads.

B. Proof roll subgrade and correct any areas determined unacceptable to Testing Agency immediately prior to placement of concrete pavement.

C. Verify gradients and elevations of base are correct.

D. Beginning of installation means acceptance of existing conditions.

E. Proof roll prior to base placement.

3.02 REINFORCEMENT

A. Place reinforcement at mid-height of slabs-on-grade.

B. Interrupt reinforcement at expansion joints.

C. Place reinforcement to achieve slab and curb alignment as detailed.

D. Provide dowelled joints at interruptions of concrete with one end of dowel set in capped sleeve to allow longitudinal movement, per CMSC Item 451.

3.03 JOINTS

A. Location: Locate as shown on drawings. In absence of information on drawings, provide joints as specified below.

B. Control Joints: Created within 8 hours of concrete placement. Sawed typical, tooled where allowed by the Engineer.
   1. Slabs:
      a. Spacing (in feet) shall be between 2 to 2-1/2 times slab thickness (in inches) in both directions, i.e. 4-inch thick slab shall have joint spacing at 8 foot to 10 foot centers.
      b. Grid of control joints to be approximately square with longest side to be not longer than 1.5 times the shortest side, i.e. 4-foot wide walk shall have joint spacing at 4 feet to 6 feet maximum.
      c. Depth of Joint: 1/4 of slab thickness.
      d. Width of Joint: 1/8 inch.
   2. Curbs:
      a. Maximum 10 feet on center. Aligned with joints in adjacent vehicular paving and sidewalks.

b. Depth of Joint: 1-1/2 inches minimum.
c. Width of Joint: 1/8 inch.

C. Isolation Joints: Formed before concrete placement.
1. Location in Slabs and Curbs: Provide where slabs and curbs abut vertical surfaces: at intersections of sidewalks, abrupt changes in slab width, walls, columns, pole bases, outside face or edge of curbs, and manholes, catch basins, or curb inlets.
2. Joint: Provide 1/2 inch wide Pre-formed Joint Filler with removable 3/8 inch deep Joint Caps. Joint Cap shall be set to finish grade elevation. After concrete has set, Joint Cap shall be removed and filled with 3/8 inch of Joint Sealant. Clean joint surfaces free from dirt, dust, and other contaminants that may affect the bond of the joint sealant material. Install Joint Sealant per manufacturer's specifications
a. Slabs: Provide Pre-formed Joint Filler to full depth of slab minus 3/8 inches to allow for installation of Joint Cap and Joint Sealant.
b. Curbs: Provide Pre-formed Joint Filler to full depth of curb. Joint Filler material shall be cut to match contour of face of curb minus 3/8 inches to allow for installation of Joint Cap and Joint Sealant.

D. Expansion Joints: Formed before concrete placement. Provide when specifically shown on the drawings or when placing concrete during temperatures less than 40 degrees Fahrenheit.
1. Location:
a. Slabs: Space maximum of 25 feet on center.
b. Curbs: Align with joints in pavement. In absence of concrete pavement, provide at intervals not exceeding 25 feet.
2. Joint: Provide 1/2 inch wide Pre-formed Joint Filler with removable 3/8 inch deep Joint Caps. Joint Cap shall be set to finish grade elevation. After concrete has set, Joint Cap shall be removed and filled with 3/8 inch of Joint Sealant. Clean joint surfaces free from dirt, dust, and other contaminants that may affect the bond of the joint sealant material. Install Joint Sealant per manufacturer's specifications
a. Slabs: Provide Pre-formed Joint Filler to full depth of slab minus 3/8 inches to allow for installation of Joint Cap and Joint Sealant.
b. Curbs: Provide Pre-formed Joint Filler to full depth of curb. Joint Filler material shall be cut to match contour of face of curb minus 3/8 inches to allow for installation of Joint Cap and Joint Sealant.

E. Construction Joints: Clean, formed joints shall be set at predetermined locations and/or when 30 minutes elapses between successive pours of concrete.
1. Slabs: Provide Pre-formed Joint Filler, Joint Cap, and Joint Sealant at predetermined location. Joint shall be similar to Isolation Joint specified previously.
2. Curbs: Provide Pre-formed Joint Filler, Joint Cap, and Joint Sealant at predetermined location. Joint shall be similar to Isolation Joint specified previously.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 301.

B. Hot Weather Placement: ACI 305.

C. Cold Weather Placement: ACI 306.

D. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.

E. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

F. Excavate, shape and compact subgrade for suitable bearing surface. Remove unacceptable material. Remove all roots occurring within 12 inches of nearest concrete surface. Fill depressions with acceptable material and compact.

G. Place, shape, and compact aggregate base to required section and grade. Provide 4 inch base course unless indicated otherwise.

H. Provide suitable forms of metal, wood or as approved to contain concrete to indicated line, grade and shape until set. Provide face forms for curb and other sections free of defects and conforming to indicated shapes. Provide side forms to full depth of concrete. Use approved flexible forms or curved forms of proper radius on curves having a radius of 150 feet or less.

I. Coat all forms with form treating material prior to placing concrete to prevent concrete damage during form removal.

J. Concrete mixing: ACI 301, Chapter 7, ready-mixed unless permission is given to site mix.

K. Place control, isolation, and expansion joints as indicated on Drawings and as specified previously.

L. Immediately before concrete placement, thoroughly wet all moisture absorbing material that will be in contact with the concrete. Standing water not permitted.

M. Place concrete in forms without segregation. Vibrate or hand tamp to remove voids. Strike off concrete and float smooth.

N. Do not place concrete on frozen ground.

O. Finish concrete as specified.

P. Place backfill using required material as soon as possible without damaging concrete.

Q. Repair or remove and replace damaged concrete as directed. Conform to ACI 301, Chapter 9.

R. Curing:
1. ACI 301, Chapter 12. Use waterproof sheet materials or liquid membrane.
2. Surfaces which are to receive penetrating sealer are to be moist-cured without the use of a curing compound.
3. Dissipating curing compound may be used, if completely removed prior to application of penetrating sealer.

S. Place expansion joints as indicated on Drawings. In addition, place where concrete surrounds or adjoins any existing fixed objects such as fire hydrants, columns, building foundations, and other rigid structures.

T. Maximum allowable deviation of formed edges from indicated location: 1/2 inch. Maximum allowable deviation of surface: 1/8 inch when checked with a 10 foot straight edge. Remove to nearest joint and replace any walk or slab exceeding stated deviations.

U. Slope walks and slabs away from buildings as indicated but not less than 1/8 inch per foot. Maintain design drainage grades to avoid low spots trapping water.

V. After water sheen has disappeared, lightly brush surface to a uniform texture unless otherwise indicated or directed. Edge joints to provide a smooth border around each panel.

W. Appearance: Take special precautions in material sources, mixing, delivery, and placement of walks to insure uniform appearance and coloration throughout the entire walkway. Variations in coloration, texture, and finish of any given type of walkway will be unacceptable.

X. Do not remove forms for minimum of 12 hours after finishing.

3.05 FINISHING

A. Sidewalk Paving: Light broom, radiused and trowel joint edges.

B. Curbs and Gutters: Light broom.

C. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.06 PENETRATING SEALER

A. Remove all dust, dirt, laitance, and other contaminants. Remove curing compound completely, if used.

B. Provide test patches as required to ensure compatibility and effectiveness.

C. Apply with spray or roller, at the manufacturer's written recommended coverage rate, to the following surfaces:
1. Horizontal top surface of all concrete exposed to the weather.
2. Vertical surfaces of columns, walls, curbs, etc. within 12 inches of a treated horizontal surface.

D. Entire application is to be in strict conformance with the manufacturer's written requirements.

3.07 DETECTABLE WARNINGS

A. Detectable warning surface shall extend the full width of travel of the curb ramp or landing. Warning surface shall extend a minimum of 24 inches in the direction of travel.

B. The detectable warning surface shall be located such that the edge of the detectable warning nearest the curb line is 6 inches from the face of curb.

C. Truncated domes shall be aligned in a square grid and must not be skewed diagonally in the direction of travel. Truncated domes shall be aligned in rows parallel and perpendicular to the direction of travel.

D. The detectable warning finish surface shall be uniformly profiled to match the adjacent pavement surfaces without lips or obstructions.

E. Type I and Type II Detectable warning surfaces shall be installed in accordance with the manufacturer's specifications.

F. Type III Precast Manufactured Clay and Concrete pavers shall be installed per the manufacturer's specifications or as follows:
   1. Pavers shall be laid on a 4 inch thick unreinforced concrete base and set into a 1/2 inch thick bed of freshly poured latex or epoxy modified cement mortar.
   2. Pavers (excluding dome surface) shall be flush with the surrounding concrete.
   3. Joints between pavers and adjacent concrete shall be mortared flush and smooth with the adjacent surface and shall not exceed 1/4 inch in width.
   4. Joint spacing between pavers shall be between 1/16 to 5/32 inches.
   5. Joints between pavers shall be sand filled. Sand shall be a well graded, washed, non-plastic angular material free from foreign matter. Maximum particle size shall be no larger than the joint spacing.
   6. Pavers shall be crack-free and consist of full, completely formed domes.
   7. A 6 inch concrete edge restraint shall be provided around the full perimeter of the pavers. Concrete shall be cast-in-place, 3000 psi concrete.
   8. Pavers shall be protected during construction to avoid damage. Paver surfaces shall be kept clean of cement.

3.08 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 1.

B. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.09 PROTECTION

A. Immediately after placement, protect concrete under provisions of Division 1 from premature drying, excessive hot or cold temperatures, and mechanical injury.

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SECTION 32 92 00

TURF AND GRASSES

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 includes the following:

1. Sodding.
2. Seeding
3. Lawn renovation.

1.3 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.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Certificates: For soil amendments and fertilizers, signed by product manufacturer.

C. Qualification Data: For landscape Installer.

D. Material Test Reports: For existing surface soil and imported topsoil.

E. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of lawns during a calendar year. Submit before expiration of required maintenance periods.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn establishment.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

B. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of topsoil.

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 a satisfactory topsoil.

D. Preinstallation Conference: Conduct conference at Project site upon request by CM.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.

1.7 SCHEDULING

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Contract Completion.

1. Spring Planting: March 15 until June 15.
2. Fall Planting: August 15 until October 15.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.8 LAWN MAINTENANCE

A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

1. Sodded turf: 60 days from date of Contract Completion.

    a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.

B. 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.

    1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch. Anchor as required to prevent displacement.

C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 4 inches.

    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 lawn at a minimum rate of 1 inch per week.

D. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 40 percent of grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

    1. Mow grass 3 to 4 inches high.

E. Lawn Postfertilization: Apply fertilizer after initial mowing and when grass is dry.

    1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to lawn area.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species: State-certified seed of grass species, as follows:

    1. Sun and Partial Shade: Proportioned by weight as follows:

        a. 70 percent turf-type tall fescue.
        b. 20 percent perennial ryegrass (Lolium perenne).
        c. 10 percent Kentucky bluegrass (Poa pratensis).

2.2 TURFGRASS SOD

A. Turfgrass Sod: Certified, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.

B. Turfgrass Species: Sod of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
   1. Turf-type tall fescue, a minimum of three cultivars.

2.3 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.

   1. Topsoil Source: Amend existing in-place surface soil to produce topsoil. Verify suitability of surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

      a. Surface soil may be supplemented with imported or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs or marshes.

2.4 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:

   1. Class: Class T, with a minimum 99 percent passing through No. 8 sieve and a minimum 75 percent passing through No. 60 sieve.

B. Aluminum Sulfate: Commercial grade, unadulterated.

C. Sand: Clean, washed, natural or manufactured, free of toxic materials.

2.5 ORGANIC SOIL AMENDMENTS

A. Peat: Finely divided or granular texture, with a pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having a water-absorbing capacity of 1100 to 2000 percent.

B. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.6 FERTILIZER

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.7 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic; free of plant-growth or germination inhibitors; with maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

C. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

2.8 PESTICIDES

A. General: Pesticide, registered and approved by 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 Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.9 PLANTING SOIL MIX

A. Planting Soil Mix: Mix topsoil with soil amendments and fertilizers as recommended in the soils report.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding overspray.

B. Provide 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 LAWN PREPARATION

A. Limit lawn subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 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.

    a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
    b. Mix lime with dry soil before mixing fertilizer.

3. Spread planting soil mix to a depth of 6 inches but 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. Spread approximately one-half the thickness of planting soil mix over loosened subgrade. Mix thoroughly into top 4 inches of subgrade. Spread remainder of planting soil mix.
    b. Reduce elevation of planting soil to allow for soil thickness of sod.

C. 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 of 6 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 6 inches of soil. Till soil to a homogeneous mixture of fine texture.

    a. Apply superphosphate fertilizer directly to surface soil before loosening.

3. Remove stones larger than 1 inch in any dimension and sticks, roots, trash, and other extraneous matter.
4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

D. 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 fine grading to areas that can be planted in the immediate future.

E. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

3.4 SEEDING

A. Sow seed with spreader or seeding machine. Hydroseeding is not permitted. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged.

B. Sow lawn seed at the rate of 6 to 8 lb/1000 sq. ft.

C. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes exceeding 1:6 with erosion-control fiber mesh installed and stapled according to manufacturer's written instructions.

E. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into topsoil with suitable mechanical equipment.
2. Bond straw mulch by spraying with asphalt emulsion at the rate of 10 to 13 gal./1000 sq. ft.. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.

F. Protect seeded areas from hot, dry weather or drying winds by applying straw mulch within 24 hours after completing seeding operations. Soak and scatter uniformly to a depth of 3/16 inch and roll to a smooth surface.

3.5 SODDING

A. Lay sod within 24 hours of harvesting. 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 subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. 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 angle of 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 2 anchors per sod strip to prevent slippage.

C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.6 TURF RENOVATION

A. Renovate existing lawn.

B. Renovate existing lawn damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

1. Reestablish lawn where settlement or washouts occur or where minor regrading is required.

C. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury in soil.

D. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.

E. Mow, dethatch, core aerate, and rake existing lawn.

F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.

H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.

I. Apply soil amendments and initial fertilizers required for establishing new lawns and mix thoroughly into top 4 inches of existing soil. Provide new planting soil to fill low spots and meet finish grades.

J. Sod and protect with straw mulch as required for new lawns.

K. Water newly planted areas and keep moist until new lawn is established.

3.7 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.8 TURF MAINTENANCE

A. 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 remulch 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. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
   3. 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: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
   1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch.
   2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.
   3. Use installed irrigation system if available.

C. Mow turf 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. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
   1. Mow grass to a height of 3 to 4 inches.
   2. Do not mow detention basin.

D. Turf Postfertilization: Apply fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

3.9 SATISFACTORY LAWNS

A. 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.

B. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.10 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.

C. Remove erosion-control measures after grass establishment period.

END OF SECTION

SECTION 329300

PLANTS

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. Trees.
2. Shrubs.
3. Ground cover.
4. Plants.

1.3 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum laced as recommended by ANSI Z60.1.

C. Balled and Potted Stock: Exterior plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of exterior plant required.

D. Bare-Root Stock: Exterior plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of exterior plant required.

E. Clump: Where three or more young trees were planted in a group and have grown together as a single tree having three or more main stems or trunks.

F. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball

shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of exterior plant required.

G. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted exterior plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of exterior plant.

H. Stock: Healthy, vigorous, well-rooted exterior plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of exterior plant.

I. Finish Grade: Elevation of finished surface of planting soil.

J. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

K. Multi-Stem: Where three or more main stems arise from the ground from a single root crown or at a point right above the root crown.

L. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

M. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

N. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For qualified landscape Installer.

C. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis for standard products.
2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

D. Material Test Reports: For existing surface soil and imported topsoil.

E. Planting Schedule: Indicating anticipated planting dates for exterior plants.

F. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of exterior plants during a calendar year. Submit before expiration of required maintenance periods.

G. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of exterior plants.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

B. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of topsoil.

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.

D. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock."

E. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches above the ground for trees up to 4-inch caliper size, and 12 inches above the ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

F. Observation: Architect may observe trees and shrubs either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size, and quality. Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

G. Plant Substitutions: All substitutions of plant materials must be approved in writing. Enterprise Green Communities (EGC) requires minimum 50% native or adaptive species, and prohibits use of invasive species. Substitution of plant material must include documentation that proposed substitution does not reduce percentage of native or adaptive plant material required for project and that proposed plant material is non-invasive.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver exterior plants freshly dug.

B. Do not prune trees and shrubs before delivery except as approved by Architect. 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.

C. Handle planting stock by root ball.

D. 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. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
2. Do not remove container-grown stock from containers before time of planting.
3. Water root systems of exterior plants stored on-site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.7 PROJECT CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting: March 15 until June 15.
2. Fall Planting: August 15 until October 15.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed according to manufacturer's written instructions and warranty requirements.

C. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns unless otherwise acceptable to Architect.

1. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.

1.8 WARRANTY

A. Special Warranty: Installer's standard form in which Installer agrees to repair or replace plantings and accessories 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.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Replacement of plant material as part of pucnlist inspection does not constitute a warranty replacement.

2. Warranty Periods from Date of Substantial Completion:

a. Trees and Shrubs: One year.
b. Ground Cover and Plants: One year.

3. Include the following remedial actions as a minimum:

a. Remove dead exterior plants immediately. Replace immediately unless required to plant in the succeeding planting season.
b. Replace exterior plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
c. A limit of one replacement of each exterior plant will be required except for losses or replacements due to failure to comply with requirements.
d. Provide extended warranty for replaced plant materials; warranty period equal to original warranty period.

1.9 MAINTENANCE SERVICE

A. Initial Maintenance Service for Trees and Shrubs: 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: 12 months from date of Substantial Completion.

B. Initial Maintenance Service for Ground Cover and Plants: 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: Six months from 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. Provide trees and shrubs of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. 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.

D. Label at least one tree and one shrub of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.

E. If formal arrangements or consecutive order of trees or shrubs is shown, select stock for uniform height and spread, and number label to assure symmetry in planting.

2.2 SHADE AND FLOWERING TREES

A. Type 1 Shade Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, complying with ANSI Z60.1 for type of trees required.

1. Provide balled and burlapped trees.
2. Branching Height: One-third to one-half of tree height.

B. Small Upright Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1; stem form as follows:

1. Stem Form: Single trunk and/or Multi-trunk clump, as indicated.
2. Provide balled and burlapped trees.

C. Small Spreading Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1; stem form as follows:

1. Stem Form: Single trunk, Multi-stem, and/or Clump, as indicated.
2. Provide balled and burlapped trees.

2.3 DECIDUOUS SHRUBS

A. Form and Size: Shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of shrub.

1. Shrub sizes indicated are sizes after pruning.
2. Provide balled and burlapped, balled and potted, and/or container-grown shrubs.

2.4 BROADLEAF EVERGREENS

A. Form and Size: Normal-quality, well-balanced, broadleaf evergreens, of type, height, spread, and shape required, complying with ANSI Z60.1.

B. Form and Size: Specimen quality as described, symmetrically shaped broadleaf evergreens.

1. Shearing Designation: Semi-sheared or lightly sheared (LS).

2. Provide balled and burlapped, and/or container-grown trees.

2.5 GROUND COVER PLANTS

A. Ground Cover: Provide ground cover of species indicated, established and well rooted in pots or similar containers, and complying with ANSI Z60.1.

2.6 PLANTS

A. Annuals: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery.

B. Perennials: Provide healthy, field-grown plants from a commercial nursery, of species and variety shown or listed, complying with requirements in ANSI Z60.1.

2.7 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 6 percent organic material content; free of stones 1 inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth.

1. Topsoil Source: Amend existing in-place surface soil to produce topsoil. Verify suitability of surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

a. Surface soil may be supplemented with imported or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.

2.8 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural limestone containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Provide lime in form of dolomitic limestone.

B. Aluminum Sulfate: Commercial grade, unadulterated.

C. Perlite: Horticultural perlite, soil amendment grade.

D. Agricultural Gypsum: Finely ground, containing a minimum of 90 percent calcium sulfate.

E. Sand: Clean, washed, natural or manufactured, free of toxic materials.

2.9 ORGANIC SOIL AMENDMENTS

A. Peat: Finely divided or granular texture, with a pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having a water-absorbing capacity of 1100 to 2000 percent.

B. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.10 FERTILIZER

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.11 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Triple-ground, shredded hardwood.

2.12 MISCELLANEOUS PRODUCTS

A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

2.13 PLANTING SOIL MIX

A. Planting Soil Mix: Mix topsoil with soil amendments and fertilizers as recommended in the soils report.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive exterior plants for compliance with requirements and conditions affecting installation and performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, and lawns and existing exterior plants from damage caused by planting operations.

B. Provide 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.

C. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

3.3 PLANTING BED ESTABLISHMENT

A. Loosen subgrade of planting beds to a minimum depth of 6 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. 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.

a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
b. Mix lime with dry soil before mixing fertilizer.

2. Spread planting soil mix to a depth of 12 inches in plant beds with shrubs and perennials and to a depth of 18 inches in plant beds with trees. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

a. Spread approximately one-half the thickness of planting soil mix over loosened subgrade. Mix thoroughly into top 4 inches of subgrade. Spread remainder of planting soil mix.

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.

C. Before planting, restore planting beds if eroded or otherwise disturbed after finish grading.

3.4 EXCAVATION FOR TREES AND SHRUBS

A. 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 for balled and burlapped, and container-grown stock.
2. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.

B. Subsoil removed from excavations may be used as backfill.

C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.

D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.

3.5 TREE AND SHRUB PLANTING

A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1.

B. Set balled and burlapped stock plumb and in center of pit or trench with top of root ball 1 inch above adjacent finish grades.

1. 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.

C. Set container-grown stock plumb and in center of pit or trench with top of root ball flush with adjacent finish grades.

1. Carefully remove root ball from container without damaging root ball or plant.
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. Organic Mulching: Apply 3-inch average thickness of organic mulch extending 12 inches beyond edge of planting pit or trench. Do not place mulch within 3 inches of trunks or stems.

3.6 TREE AND SHRUB PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape.

3.7 GROUND COVER AND PLANT PLANTING

A. Set out and space ground cover and plants as indicated.

B. Dig holes large enough to allow spreading of roots and backfill with planting soil.

C. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

D. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

E. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.8 PLANTING BED MULCHING

A. Mulch backfilled surfaces of planting beds and other areas indicated. Provide mulch ring around trees in lawn areas.

1. Organic Mulch: Apply 3-inch average thickness of organic mulch, and finish level with adjacent finish grades. Do not place mulch against plant stems.

3.9 PLANT MAINTENANCE

A. Tree and Shrub Maintenance: Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, adjusting and repairing, 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.

3.10 CLEANUP AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.

B. 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.

3.11 DISPOSAL

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Provide new water lines from the existing water main to points shown on the plans. This includes, but is not limited to the following:
   1. Piping and fittings
   2. Fire hydrants
   3. Curb boxes and valves
   4. Post indicating valves, standard and electrically supervised
   5. Post type siamese
   6. Tapping sleeves and valves
   7. Meter pit and piping
   8. Flushing and testing
   9. Sterilization
   10. All labor, equipment, devices, materials and performing all operations necessary in connection with the combined water system as herein specified and shown, indicated or noted on the drawings and subject to the terms and conditions of the contract.

1.02 RELATED SECTIONS

A. Section 03 30 00, "Cast-in-Place Concrete"

B. Section 31 23 33, "Piped Utilities - Basic Methods"

1.03 REFERENCES

A. American Society of Testing and Materials (ASTM).
   - A377 Specification for Gray Iron and Ductile Iron Pressure Pipe.
   - A47 Specification for Ferritic Malleable Iron Castings.
   - A53 Specifications for Pipe, Steel, Black and Hot-Dipped, Zinc coated welded and seamless
   - B32 Solder Metal.
   - B88 Seamless Copper Water Tube.

B. American Water Works Association (AWWA).
   - B300 Hypochlorites.
   - B301 Liquid Chlorine.
   - C104 Cement-Mortar Lining for Cast-Iron and Ductile-Iron Pipe and Fittings for Water.
   - C110 Ductile-Iron and Gray-Iron Fittings, 3 inches through 48 inches, for Water and Other Liquids.
   - C111 Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
   - C115 Flanged Ductile Iron and Gray Iron Pipe with Threaded Flanges.
   - C151 Ductile-Iron Pipe. Centrifugal Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
   - C153 Ductile-Iron Compact Fittings, 3 inches through 12 inches, for Water and Sewage Systems.
   - C502 Dry Barrel Fire Hydrants.
   - C508 Swing-Check Valves for Waterworks Service, 2 inch through 24 inch NPS.

C515 Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service.
C511 Reduced-Pressure Principle Backflow Prevention Assembly.
C600 Installation of Grey and Ductile Cast-Iron Water Mains and Appurtenances.
C651 Disinfecting Water Mains.
C700 Cold-Water Meters - Displacement Type, Bronze Main Case.
C701 Cold-Water Meters - Turbine Type, for Customer Service.
C702 Cold-Water Meters - Compound Type.
C703 Cold Water Meters - Fire Service Type.
C704 Cold-Water Meters - Propeller Type for Main Line Application.
C800 Underground Service Line Valves and Fittings.

C. American National Standards Institute (ANSI).

D. Underwriter's Laboratories (U.L.).

E. Factory Mutual (FM).

F. National Sanitation Foundation (NSF).

G. Plumbing and Drainage Institute (PDI).

H. National Fire Protection Association (NFPA).

I. Local Authority Standards / City of Columbus Standards

1.04 REGULATOR REQUIREMENTS

A. Conform to applicable City code for materials and installation of the Work of this Section.

B. Contractor to obtain and pay for all required permits, tap fees, inspection fees, etc., as required by Governing Authority.

1.05 CONCRETE WORK

A. Unless otherwise noted, all cast-in-place concrete shall be by the General Trades Contractor.

B. Unless otherwise noted, all concrete material and installation shall be as required in Division 3 of the Specifications.

1.06 SUBMITTALS

A. Submit under provisions of Division 1.

B. Submit product data, shop drawings, catalog cuts, etc., for pipe, fire hydrants, siamese, detector checks, meters, fittings, valves and accessories.

C. Certification from the Contractor stating that hydrostatic tests have been conducted in accordance with Specifications and in the presence of the Project Manager Engineer / Inspector and that the completed pipeline is acceptable in accordance with criteria set forth in Specifications for leakage.

D. Certification from the Contractor stating that pipe lines constructed have been disinfected as specified and are safe for conveying potable water.

E. Sequence of work in accordance with this Section and Division 1.

1.07 QUALITY ASSURANCE

A. Conform to applicable governing code for materials and installation of the work of this Section. In the event of a conflict between the drawings and the code, the code shall govern. No extra charges will be allowed for any changes necessary for code compliance.

PART 2 PRODUCTS

2.01 DUCTILE IRON PIPE (PIPE SIZE 3 INCHES AND LARGER)

A. Pipe shall conform to ANSI/AWWA C151/A21.51, Class 53, push-on type (buried piping), or to ANSI/AWWA C115/A21.15, flanged type (exposed piping - water vaults, meter pits, etc.). Pipe shall have cement mortar lining per ANSI/AWWA C104/A21.4 inside and asphaltic coating per ANSI/AWWA C151/A21.51 outside.

B. Fittings shall be ductile iron per ANSI/AWWA C110/A21.10. Fittings shall have cement mortar lining per ANSI/AWWA C104/A21.4 inside and asphaltic coating per ANSI/AWWA C110/A21.10 outside. Fittings 16 inches and smaller may be manufactured according to ANSI/AWWA C153/A21.53. Pressure rating shall be 350 psi minimum.

C. Joints for exterior buried piping shall be mechanical joint type for fittings and push-on type for pipe, rubber ring gasket type conforming to ANSI/AWWA C111/A21.11.
1. "Tyton Joint Pipe" as manufactured by U.S. Pipe Co.
2. "Super Bell-Tite Joint Pipe" as manufactured by Clow Co.

D. Joints for exposed piping (meter pits, water vaults, etc.) shall be flanged joints conforming to ANSI/AWWA C115/A21.15 and to ANSI B16.1, 125 lb. template.

E. All piping and fittings shall be certified by the NSF for use in potable water systems.

2.02 SEAMLESS COPPER WATER TUBING (LESS THAN 3 INCHES SIZE)

A. Seamless copper water tubing shall be Type "K" soft temper (buried piping) or Type "L" hard drawn (exposed piping - pits, vaults, etc.), conforming to ASTM B88 with solder (exposed piping) or brazed (buried piping) joints.

B. Joints shall be 150 psi wrought copper socket solder (ANSI/ASTM B16.22) or brazed (ANSI B31.1) joints.

C. Solder shall be 95/5 tin-antimony (ASTM B32), lead-free.
1. "Silvabrite 100" as manufactured by Engelhard.
2. "Bridgit" as manufactured by J.W. Harris Co.

D. Copper Brazing Alloys: Silver/Phosphorous or Silver/Zinc alloys having a melting point greater than 1,000 degrees F. (ANSI B31.1)
1. Sil-Fos filler as manufactured by Handy Harmon.

2. Aircosil filler as manufactured by Airco Welding Products.

E. Copper/phosphorous or silver/zinc alloys having a melting point greater than 1,350 degrees F.
1. "Stay-Silv 0" as manufactured by J.W. Harris.
2. "FOS-Flo 7" as manufactured by Handy Harmon.

F. Fittings shall be of the recessed solder joint type (exposed) or brazed (buried) of either wrought copper or cast brass.

G. Flux shall be non-corrosive.

H. All piping and fittings shall be certified by the NSF for use in potable water systems.

I. No alloys containing lead shall be used for brazing or soldering. Contractor shall certify that solder or brazing used for entire new piping system is lead-free.

2.03 GALVANIZED CARBON STEEL PIPE (LESS THAN 4 INCHES SIZE)

A. Galvanized carbon steel pipe shall be Schedule 40 with screwed ends conforming to ASTM A53.

B. Fittings shall be malleable iron screwed end fittings, conforming to ASTM A47 and A338 with minimum pressure rating of 150 psi.

C. All piping and fittings shall be certified by NSF for use in potable water systems.

2.04 VALVES

A. Gate Valves: 3 Inches and Larger: Resilient wedge, iron body, non-rising stem, UL/FM listed, mechanical joint or flanged ends (flanged ends in valve pits only), working pressure rating 150 psi minimum, renewable bronze yoke bushings, and bronze seat rings; shall conform to AWWA C515. Square operating nut, counter clockwise to open (buried piping) or handwheel operator (valve pits).
1. American Darling, Clow, Mueller.

B. Gate Valves: Smaller than 3 Inches: Class 150, solid wedge, non-rising stem (buried piping) or inside screw and rising stem (valve pits), flanged or threaded end connections with a union on one side of the valve. Square operating nut, counter clockwise to open (buried piping) or handwheel operator (valve pits).

C. Indicator Valves:
1. Factory assembled UL listed and FM approved PIV, rated at 175 psi minimum, with inside screw grade post indicator-operator. Turn operator counterclockwise to open unless otherwise directed by local fire department. Provide post with a fail-safe feature in case of breaking off above grade to keep valve intact and to move to open position. Furnish worm gear type operator with permanently oil lubricated watertight gear case complete with handle. Bituminous coat all surfaces below grade not less than 12 mils thick. Finish fill, prime and factory finish all above grade surfaces with a multiple coat of high-gloss, weather-resistant, red enamel.

2. Mueller, Co. Model No. A20806, Kennedy Model No. 2945A and Clow Model No. 2945A.
3. Electrically supervised. PIV complete with integral tamper switch. Division 16 Contractor to provide control/signal wiring.

D. Swing Check Valves:
1. UL/FM listed, 175# WWP cast iron body; brass moving parts including clapper valve seat and pivot shaft, Buna-N "O" ring, flanged connections.
a. Viking Model C2, Grinnell, Reliable, or Central.

2.05 VALVE BOXES

A. Valve boxes shall be cast iron Buffalo type and shall have screw type extension adjustment with flared base. Boxes shall be of sufficient length so that at least 6 inches of adjustment remains when installed to finished grade. The word "water" shall be cast on the cover.
1. Sigma Corporation, East Jordan Iron Works, Bingham and Taylor, or approved equal.

2.06 TAPPING SLEEVES AND VALVES

A. Materials and operations shall conform to AWWA C515. Valves shall have one (1) end flanged and other end mechanical joint type with flange for bolting to tapping machine. Sleeves shall be 2-piece cast iron, with mechanical joint ends. Tapping sleeves furnished complete with joint accessories. Valve and sleeve assembly shall be capable of withstanding at least 125 psi work pressure.
1. Clow Co. Model F5093 valve and F5205 sleeve or approved equal.

2.07 DETECTOR CHECK

A. UL/FM listed, 175# WWP, cast iron body, two (2) tapped bases for meter and bypass trimming, hard rubber bushings, bronze clapper with full face rubber gasket, neoprene discs, flanged connections. Bronze hinge pins, weights and seat.

B. Full meter bypass including magnetic drive disc meter with bronze case, globe and check valves.

C. Hersey Model DC, Grinnell, Reliable, Central, Automatic Sprinkler, or Viking.

2.08 FIRE HYDRANT

A. Provide fire hydrants per City of Columbus Fire Department and Water Department standards. If no such standards exist, the following may be used:
1. Dry barrel type, low profile hydrant shall comply with local government requirements and shall be UL listed and FM approved. Hydrant shall have 5 1/4 inch valve opening and two (2) hose outlets and one (1) 4 1/2 inch steamer nozzle complete with non-binding caps and cap chains. Hose outlet threads shall be local fire department.
2. Exterior surface shall be filled, primed, and finished with a multiple coat, high-gloss, weather-resistant red enamel. All surfaces below grade shall receive a coating of bitumen not less than 12 mils thick. Care shall be exercised not to plug barrel drainage outlet applicable provisions of AWWA C502.
3. Mueller Co., Clow, East Jordan Iron Works.

2.09 SIAMESE CONNECTION

A. Polished brass angle body, post type, two-way 2 1/2 x 2 1/2 x 6 with clappers, 18 inch long polished brass cover sleeve, polished brass I.D. base plate labeled STANDPIPE, plugs and chains with threads to match Local Fire Department.
   1. Potter-Roemer, Inc. Fig. 5760 series, Croker-Standard, Elkhart Brass, Guardian, or W.D. Allen.

2.10 DISINFECTION MATERIALS

A. Liquid chlorine shall conform to AWWA B301. Calcium and sodium hypochlorite shall conform to AWWA B300.

2.11 PRESSURE REDUCING VALVES

A. 2 Inch and Smaller: All bronze body, stainless steel renewable seats, reinforced Buna-N diaphragm and valve disc (ASSE 1003), dead end service type.

B. 3 Inch and Larger: Flanged cast iron body dead end service type with bypass tappings, renewable stainless-steel stem and seats, replaceable diaphragm and housing, rubber disc, globe valve, 250 psi WWP with internal parts to be epoxy coated.

2.12 WATER METER

A. Furnish meter with construction and readout approved by (or furnished by) Utility Company / authority having jurisdiction.

B. Remote Readout Register: Hersey Gen-a-reader II measuring in cubic feet per minute.
   1. Hersey, Badger or approved equal.

2.13 CURB OR SERVICE STOP

A. Ground key, round way, inverted key type; shall be made of bronze conforming to ASTM B61/B62 and rated 150 psi minimum. Ends shall be as appropriate for connection to the service piping. Arrow shall be cast into body of the curb or service stops indicating direction of flow.

2.14 BACKFLOW PREVENTERS

A. 175# SWP reduced pressure (ASSE 1013), bronze or cast iron body, with vents, inlet, outlet and valve test cocks, neoprene discs, Buna-N or plastic disc-stainless spring interior check and differential pressure relief valves, 32 degrees F or 145 degrees F meeting the requirements of the local water department.
   1. 3/4 Inch to 10 Inches: Watts #909 with air gap air drain funnel. Refer to the Manufacturer's Catalogs for size of drain pipe required.

2.15 CORPORATION STOPS

A. Ground key type, made of bronze conforming to ASTM B61/B62 and suitable for the working pressure of the system. Ends shall be suitable for solder joint, or flared tube compression type joint.

Threaded ends of inlet and outlet of corporation stops shall conform to AWWA C800, coupling nut for connection to flared copper tubing shall conform to ANSI B16.26.

2.16 YARD HYDRANT

A. Freezeless/pollution-proof sanitary post type yard hydrant Woodford Model S3 with 1 inch female pipe thread inlet, 3/4 inch brass hose nozzle outlet, PVC drain reservoir and vacuum breaker. Supply line shall be 3/4 inch copper Type K per ASTM B88. Minimum depth of cover 4 feet, unless noted otherwise.

2.17 SPECIALTIES

A. Supervisory (Tamper) Switch:
   1. Weather-resistant, single-pole, double-throw switch, roller type switch actuator, spring-loaded plunger, tamper-proof cover (extra set of contacts).
      a. Potter-Roemer Fig. 6220

B. Pressure Gauge:
   1. UL/FM listed, dial spring, brass case, 3 1/2 inches diameter, 1/4 inch NPT male connection, range: 0-300 psig.
      a. Reliable Model UA, Viking, Grinnell, Central, Star, or Automatic Sprinkler.

PART 3 EXECUTION

3.01 GENERAL CONSTRUCTION REQUIREMENTS

A. Handling:
   1. Utmost care shall be exercised in transporting and handling of pipe, fittings, valves, etc., in order to avoid shock damage to pipe or protective coatings and linings. Pipe, fittings and accessories shall be loaded and unloaded by lifting with hoist or skidding in a manner that will avoid shock or damage. Under no circumstances shall such materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground. In the event that any part of the coating or lining is damaged, the repair shall be made by the Contractor to the satisfaction of the Engineer or the pipe shall be rejected.
   2. In distributing the material at the site of the work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench without blocking access to driveways, alleys, or public utility facilities.

3.02 PIPING INSTALLATION

A. Pipe buried in ground shall have firm bearing along entire length of undisturbed earth. Pipe on fill or loose soil shall be supported every 6 feet on brick or concrete piers and then firmly embedded in sand. Provide compacted clay bulkheads to prevent groundwater in sand from draining to building.

B. Pipe trenches shall be evenly graded.

C. Depth of bury shall not be less than 4 feet from finished grade to top of pipe barrel. Should there be an apparent significant discrepancy between the ground elevations shown on the drawing and those established in the Contractor's stakeout, the Engineer shall be notified at least ten (10) days ahead of the pipe laying operation. Pipe shall not be laid with depth of bury less than 4 feet without the approval of the Engineer.

D. Securely anchor each mechanical joint, tee, plug, caps and bends using pipe clamps, tie-rods or concrete thrust blocks conforming to the requirements of NFPA 24 and the authorities having jurisdiction.

E. All changes in direction shall be made with fittings or joint deflection not exceeding manufacturer's recommendations. Any transition from one (1) pipe size to another shall be made with a reducing fitting. Reducing bushings are prohibited except where specifically called for on the drawings or unless approved by the Engineer.

F. Pipe cuttings and drilling, where necessary, shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise authorized, cutting shall be done by means of an approved type mechanical cutter. Cut sections of pipe shall be reamed or filed to remove all burrs.

G. Laying:
1. Each section of pipe shall be inspected for defects prior to being lowered into the trench. Defective, damaged or unsound pipe shall not be used.
2. Pipe trenching and bedding foundation shall be provided in accordance with Section 31 23 33, "Piped Utilities." Trenches shall be kept dry during bedding and laying operations. Pipe shall not be laid when the conditions of trench or weather are unsuitable.
3. All pipe shall be carefully lowered into the trench by crane or other method as approved by the Engineer.
4. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. If the pipelaying crew cannot put the pipe into the trench and in place without getting earth into it, the Engineer may require that before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size shall be placed over each end and left there until the connection is to be made to the preceding pipe. During laying operations, no debris, tools, clothing, or other material shall be placed in the pipe. When work is not in progress, open ends of pipe and fittings shall be securely closed so that no trench water, earth or other substances can enter the pipe or fittings. As work progresses, the interior of the pipe shall be cleaned of any dirt and superfluous materials.

5. After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with approved backfill material tamped under it except at the bells. Pipe and fittings which do not allow a sufficient and uniform space for joints shall be removed and replaced with pipe and fittings of proper dimensions to insure such uniform space. The manufacturer's recommendations as to limits of deflection of joints shall be strictly adhered to. Precautions shall be taken to prevent dirt from entering the joint space.
6. Joints on laid pipe shall not be covered until approved. Pipe, pipe fittings, or appurtenances found defective after installation shall be replaced at the Contractor's expense.

H. Locating:
1. Where location of water pipe is not clearly defined by dimensions of Drawings, water pipe shall not be laid horizontally closer than 10 feet from an active sanitary sewer line except where the bottom of the water pipe will be at least 18 inches above top of the sewer pipe.
2. Where water pipe will cross under active gravity flow sanitary sewer lines, sewer pipe for a distance of at least 10 feet on each side of crossing shall be fully encased in concrete 4 inches thick or shall be made of pressure pipe with no joint located within 3 feet horizontally of the crossing. Joints in sewer pipe closer horizontally of the crossing than 3 feet shall be encased in concrete.
3. Water lines in all cases shall cross above sewage force main or inverted siphons and shall not be less than 18 inches above the sewer main. Sewage force mains or inverted siphon shall be lowered in order to satisfy above requirements and also the minimum cover depth over water line of 4 feet.
4. Water lines shall not be laid in same trench with any gas line, fuel line or electric wiring.

I. Install utility warning tape 18 inches below finished grade.

J. Distribution System Installation.
1. Gate Valves: Install in accordance with AWWA C600 and manufacturer's recommendations.
2. Tapping Sleeves and Valves: The Contractor shall be approved by the authority having jurisdiction for tapping service connection. Install under pressure on lines shown. Valves and sleeves shall be installed in accordance with manufacturer's recommendations. Lines shall be drilled and valves installed using approved equipment as recommended by valve manufacturer. Outages to existing mains during installation, except where approved in cases of emergency, will not be permitted.
3. Valve Boxes: Install in accordance with AWWA C600 over all new below grade valves. Boxes shall be centered over the valves. Earth fill shall be carefully tamped around each valve box to a distance of 4 feet on all sides of the box or to the undisturbed trench face if less than 4 feet. A concrete collar shall be placed around each box top at finished grade. Collar shall be 18 inches diameter and 8 inches thick.

K. Thrust Blocks
1. Provide cast-in-place concrete thrust blocks where shown and of the size indicated. The base and thrust bearing sides of block shall be cast directly against undisturbed earth. Sides of thrust blocks not subject to thrust may be cast against forms. The area of bearing shall not be less than that indicated on the drawings. Blocking shall be placed so that the fitting joints will be accessible for repair.
2. Approved joint restraint systems may be used in lieu of thrust blocks.

L. Fire Hydrants
1. Install in accordance with AWWA C600, as applicable except at modified herein.
2. Operating nut shall not be more than 3 feet above the finished grade. Hydrants shall be set so that the bury line marked on the barrel is flush with finished grade. Set hydrants plumb and on a firm footing. Footers shall be provided prior to setting hydrant consisting of either cast-in-place slab or solid concrete block not less than 6 inches thick and 15 inches square. Thrust blocks or restraint rods shall be provided as shown after hydrant has been set in place.
3. Provision shall be taken to carry off drainage from each new hydrant. The area around the base of each new hydrant shall be excavated sufficiently to permit placement of approximately 1/3 cubic yard of 3/4 inch size clean crushed stone to a level several inches above drain opening. The stone shall be placed as shown and covered with roofing paper prior to backfilling to prevent clogging of drain pit.
4. Where ground water is encountered standing at levels above that of hydrants drains the Contractor shall immediately contact the inspector who shall notify the project engineer. Measures will be taken to remedy the situation as directed.
5. Each hydrant and branch line shall be thoroughly flushed, pressure tested and disinfected as specified after thrust blocks and concrete footings have been cured prior to any backfilling.

3.03 QUALITY CONTROL

3.03.1 HYDROSTATIC TESTS

A. General Requirements:
1. The Contractor shall provide all necessary water, equipment and instrumentation required for proper completion of the flushing and testing of piping systems. Source and quality of water, test procedures and disposal of water shall be approved by the Engineer.
2. All tests shall be made in the presence of the Local Authority's Inspector. Preliminary tests made by the Contractor without being observed by the Inspector will not be accepted. Notify the Engineer and the Inspector at least twenty-four (24) hours before any work is to be inspected or tested.
3. All defects in the piping systems shall be repaired and/or replaced and retested until acceptable to the Engineer. Repairs shall be made to the standard of quality specified for the entire system.
4. Sections of the system may be tested separately, however, any defect which may develop in a section previously tested and accepted shall be promptly corrected and retested. Pressure tests shall be made between valves to demonstrate ability of valve to sustain pressure.
5. All piping systems shall be tested in accordance with these test methods in addition to any test required by local plumbing codes or building authorities.

B. Flushing: All piping systems shall be flushed with water to remove construction debris prior to testing. Water for flushing operations shall be paid by the Contractor at the rate set by the authority having jurisdiction.

C. Hydrostatic Testing:
1. Perform in accordance with AWWA C600 or NFPA 24. Any contradictions between these Specifications and AWWA C600 or NFPA 24, AWWA C600 or NFPA 24 shall govern. Local Code shall govern over these Specifications or AWWA C600 or NFPA 24.

2. All newly laid pipe, above ground or below ground, or any valved section thereof, shall be subjected to a hydrostatic pressure test as hereinafter tabulated. All piping, that will be considered inaccessible or impossible to repair after the completion of all work, shall be hydrostatically tested while still accessible. Examples of such piping are those near or under basins, lagoons, railroads, paved roads, concrete structures, and concrete foundations.
3. The Contractor shall backfill all pipe and provide all reaction backing before hydrostatic testing. It shall be the Contractor's responsibility to locate and repair any and all leaks that may develop. The Engineer may direct the Contractor to leave certain joints and connections uncovered until testing has been completed.
4. Where any section of a main is provided with concrete reaction backing, the hydrostatic pressure test shall not be made until at least five (5) days have elapsed after the concrete reaction backing was installed. If high early strength cement is used in the concrete reaction backing, the hydrostatic pressure test shall not be made until at least two (2) days have elapsed.
5. Reaction backing shall be in accordance with the drawings.
6. Before applying the specified test pressure, all air shall be expelled from the pipe and the lines shall be thoroughly flushed. If hydrants or blow off valves are not available, taps at points of highest elevation shall be made before the test is made and plugs inserted after the air has been expelled.
7. Each valved section of the pipe shall be slowly filled with water at specified test pressure, based on the elevations of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. The Contractor shall make arrangements for metering the amount of water used during the test.
8. The Contractor shall complete testing, backfilling, grading, and cleanup between valved sections as he advances. If the Contractor fails to comply with this provision, pipe laying will be stopped until cleanup is completed.
9. After the section of line to be tested has been filled with water, the specified test pressure shall be applied and maintained for a minimum period of six (6) consecutive hours and for such additional period necessary for the inspector to complete the inspection of the line under test. If defects are noted, repairs shall be made at no additional cost to the Owner and the test repeated until all parts of the line withstand test pressure.
10. Hydrostatic test pressure (gauge) shall be the greater of 1.5 times the working pressure at the point of testing or 150 psi for all pressure piping. Maximum permitted leakage based on 18 foot pipe length is 8 quarts per hour per 100 joints of 12 inches nominal diameter and correspondingly varied for other pressures and sizes of pipe as provided in the AWWA C600 Specification.
11. The pressure shall be maintained within a maximum variation of 5% during the entire leakage test. Leakage measurements shall not be started until the air has been expelled and a constant test pressure has been established.

3.03.2 DISINFECTION

A. Before acceptance of domestic operation, each unit of completed supply line and distribution system shall be disinfected as specified below or as prescribed by AWWA C651.

B. After pressure tests have been made, the unit to be disinfected shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. The chlorinating material shall be either liquid chlorine conforming to AWWA B301 or hypochlorite conforming to AWWA B300. The chlorine material shall provide a dosage of not less than 50 parts per million and shall be introduced into water lines in an approved manner. Treated water shall be retained in pipe long enough to destroy all non-spore-forming bacteria. Except where a shorter period is approved, retention time shall be at least twenty-four (24) hours and shall produce not less than 10 ppm of chlorine at extreme end of line at end of retention period. All valves on lines being disinfected shall be opened and closed several times during contact period. Lines shall then be flushed with clean water until residual chlorine is reduced to less than 1.0 ppm. Samples of water shall be taken from points in the system in sterilized containers for bacterial examination. Disinfecting shall be repeated until tests indicate absence of pollution for at least two (2) full days. System will not be accepted until satisfactory bacteriological results have been obtained.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary drainage piping, fittings, drop connections, and accessories.

B. Connection of building sanitary drainage system to municipal sewers.

C. Manholes.

D. Permits, inspection fees, tap fees, etc.

1.02 RELATED SECTIONS

A. Section 31 00 00, "Earthwork"

B. Section 31 23 33, "Piped Utilities - Basic Methods"

C. Section 03 30 00, "Cast-in-Place Concrete"

1.03 REFERENCES

A. ASTM 2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.

B. ASTM D3034 - Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

C. ASTM D3212 - Joints for drainage Sewer Plastics Pipes using Flexible Elastomeric Seals.

D. ANSI/ASTM A74 - Cast Iron Soil Pipe and Fittings.

E. AWWA C106 - Cast Iron Pressure Pipe.

F. ASTM C12 - Standard Practice for Installing Vitrified Clay Pipe Lines.

G. ASTM C700 - Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.

H. ASTM C425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.

1.04 REGULATORY REQUIREMENTS

A. Conform to applicable municipal code for materials and installation of the Work of this Section. In the event of a conflict between the drawings and the code, the code shall govern. No extra charges will be allowed for any changes necessary for code compliance.

B. Contractor to obtain and pay for all required permits, tap fees, inspection fees, etc., as required by State and local authority.

1.05 SUBMITTALS

A. Submit shop drawings under provisions of Division 1.

B. Submit shop drawings indicating dimensions, and invert elevations of manholes and cleanouts.

C. Submit product data under provisions of Division 1.

D. Submit product data for pipe, manholes, castings, and pipe accessories.

E. Submit shop drawings indicating dimensions, layout of piping, layout of tanks, dimension of tanks, pump capacities and horsepower, and location and elevations of testing wells, manholes and cleanouts.

1.06 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Division 1.

B. Accurately record location of pipe runs, connections, manholes, cleanouts, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities. Provide location, size, and elevation of uncharted utilities.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Plastic Pipe: ANSI/ASTM D3034, SDR 35 Type PSM, polyvinyl chloride (PVC) material.

B. Plastic Pipe Joints: ASTM D3212, bell and spigot style, flexible elastomeric seals.

C. Clay Pipe 4 Inches-24 Inches: ASTM C-700, Vitrified Clay Pipe, Extra Strength.

D. Clay Pipe Joints: ASTM C-425.

E. Cast Iron Soil Pipe: ANSI/ASTM A74. Building service lines only.

2.02 PIPE ACCESSORIES

A. Fittings: Same material as pipe, molded or formed to suit pipe size and end design, in required "T," bends, elbows, cleanouts, reducers, traps, and other configurations required.

2.03 MANHOLES

A. Lid and Frame: Cast iron construction, removable lid, closed lid design; nominal lid and frame diameter as shown on plans.

B. Shaft Construction and Eccentric Cone Top Section: ASTM C478, O-ring joints per ASTM C443 reinforced precast concrete pipe sections, lipped male/female joints; cast ladder rungs into shaft sections at 16 inches, nominal shaft diameter of 48 inches. Cast-in-place concrete side walls may be used in place of precast construction. Cast-in-place side walls shall be 8 inches nominal thickness.

C. Base Pad: Cast-in-place concrete of type specified in Section 03 30 00, "Cast-in-Place Concrete"; leveled top surface to receive sewer pipe Section. Precast base sections may be used in lieu of cast-in-place base.

D. Resilient connectors between precast manhole and pipes shall conform to ASTM C-923.

2.04 CLEANOUTS

A. Cleanouts shall be adjustable, vandal-proof with heavy cast iron top for exterior use.
1. Zurn Z-1400-VP as manufactured by Zurn Industries, Inc.
2. Jay R. Smith 4220-U, as manufactured by Jay R. Smith Manufacturing Co.

2.05 BEDDING MATERIAL

A. Type E as specified in Section 31 00 00, "Earthwork."

2.06 FILL MATERIAL

A. Type A, D, J or K as specified in Section 31 00 00, "Earthwork."

2.07 VENT PIPING

A. Pipe: PVC Pipe, Schedule 40 per ASTM D1785.

B. Fittings: Per ASTM D2466. Connect with solvent cement type per ASTM D2855-93.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that trench cut is ready to receive work, and excavations, dimensions, and elevations are as indicated on Drawings.

B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with Type A or Type D fill material.

B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling and compaction.

3.03 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ANSI/ASTM D2321, and manufacturer's instructions. Seal joints watertight.

B. Install rigid pipe, fittings and accessories in accordance with ASTM C-12 and manufacturer's instructions.

C. Bed pipe with Type E material per standard detail on Drawings.

D. Lay pipe to slope gradient noted on Drawings.

E. Install bedding of Type E material at sides and over top of pipe per standard detail.

F. Place bedding in maximum 6 inch lifts, consolidating each lift.

G. Refer to Section 31 23 33, "Piped Utilities - Basic Methods," for backfill and compaction requirements. Do not displace or damage pipe when compacting.

H. Every length of pipe shall be inspected and cleaned of all dirt and debris before being laid. Prior to the placing of a length of pipe, the end of the previously laid length shall be carefully and thoroughly wiped smooth and cleaned to obtain an even and close fitting joint.

I. No length of pipe shall be laid until the preceding lengths of pipe have been thoroughly embedded in place, so as to prevent movement or disturbance of the pipe.

J. Where existing pipe is to be extended, the same type of pipe shall be used unless otherwise specified or directed.

K. Only full lengths of pipe are to be used in the installation, except that partial lengths of pipe may be used at the entrance to structures where necessary to obtain a proper connection to the structure.

L. All pipe entering structures shall be cut flush with the inside face of the structure, and the cut ends of the pipe and surface of the structure shall be properly rounded and finished so that there will be no protrusion, ragged edges, or imperfections that will impede the flow of water or affect the hydraulic characteristics of the installation.

M. The Contractor shall protect the installation at all times during construction, and movement of construction equipment, vehicles and loads over and adjacent to any pipe shall be done at the Contractor's risk.

N. At all times when pipe laying is not in progress, all open ends of all pipes shall be closed by approved temporary watertight plugs. If water is in the trench when work is resumed, the plug shall not be removed until the trench has been pumped dry and all danger of water entering the pipe has passed.

3.04 INSTALLATION - MANHOLES AND CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.

C. Establish elevations and pipe inverts for inlets and outlets as indicated.

D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.05 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Division 1.

3.06 PROTECTION

A. Protect finished installation under provisions of Division 1.

B. Protect pipe and bedding from damage or displacement until backfilling operation in progress.

3.07 TESTING

A. Leakage Tests. Leakage through the joints of all sanitary sewer pipe shall not exceed the following allowable limits:

100 gallons per inch of tributary pipe diameter per twenty-four (24) hours per mile of length of the computed equivalent for shorter lengths and shorter periods of time. All sanitary sewers shall be tested.

1. Infiltration Test: This test is to be conducted when the height of ground water table is 2 feet or more above the elevation of the inside crown of pipe at the upstream limit of the section being tested.

   The infiltration test shall be made by installing a weir or other measuring device approved by the Engineer in the lower end of the sewer section to be tested. The quantity of ground water infiltration into the sewer shall be measured and shall not exceed the allowable leakage.

2. Exfiltration Test: This test is to be conducted when the height of the ground water table is less than 2 feet above the elevation of the inside crown of pipe at the upstream limit of the section being tested.

   In general, a test section shall include the distance between two (2) successive manholes. Should the test section fail the exfiltration test, the entire system installed shall be tested, either manhole to manhole or as a whole as directed by the Engineer. The inlet end of the upstream and downstream manholes shall be closed with a watertight bulkhead and the sewer, along with the upstream manhole, shall be filled with water until the elevation of the water in the upstream manhole is 2 feet higher than the inside crown of the pipe in the section being tested, or 2 feet above the existing ground water in the trench, whichever is the higher elevation. The length of section to be tested may be filled and maintained full of water for a period of approximately twenty-four (24) hours prior to the start of the test. If the water level in the upper manhole has dropped during this twenty-four (24) hour period, the level shall be raised to the test elevation marked prior to the measurement of leakage. If the Contractor elects to test at any time during the twenty-four (24) hour period, the water shall be set at the test elevation mark and the test made.

The exfiltration will be determined by measuring the volume of water that is required to be added to return the surface of the water in the upstream manhole to the test elevation mark. The test period shall be a minimum of one (1) hour duration from the start of the test.

The Engineer, because of adjacent trench material consideration, may order that after the completion of the exfiltration test the test section of line shall be drained and the infiltration, under existing ground conditions, shall be measured within three (3) hours by means of a weir located in the downstream manhole.

The allowable leakage is based on maximum difference in elevation of 8 feet between the level of water in the upper manhole and the invert of the bulkhead pipe at the downstream manhole. If the difference in elevation exceeds 8 feet, the allowable leakage shall be increased 5% for each 1 foot in excess of eight feet.

3. Air Test: In lieu of exfiltration tests required for pipe sizes 8 inches through 24 inches and subject to approval of the Engineer, the Contractor may request an air test for checking tightness of sanitary sewer pipe construction. Air test shall conform to ASTM F-1417. Selection sections or sections of pipe between manholes shall be tested. Manholes shall be tested by plugging connecting pipe and filling with water to 2 feet from the crown of the highest entering pipe. After the filled manhole has been allowed to stand for twenty-four (24) hours, no loss of water will be permitted in a four (4) hour period.

   Air testing of pipes will be accomplished only by use of equipment that has been approved by the Engineer and in accordance with the following steps:
   a. Plug all pipe outlets with suitable test plugs. Brace each plug securely.
   b. Add air slowly to the portion of the pipe installation under test until the internal air pressure is raised to 4.0 psig.
   c. After an internal pressure of 4.0 psig is obtained, allow at least two (2) minutes for air temperature to stabilize, adding only the amount of air required to maintain pressure.
   d. When pressure decreases to 3.5 psig, start stop-watch. Determine the time in seconds that is required for the internal air pressure to reach 2.5 psig. Minimum permissible pressure holding time for runs of single pipe diameter and for systems of 4 inch, 6 inch, or 8 inch laterals in combination with trunk lines shall be as published in tables by the National Clay Pipe Institute.

   In the event the allowable leakage limits are not met, the Contractor shall determine the location where excess water is entering or leaving the sewer. The sewer and/or manholes shall be repaired in a manner satisfactory to the Engineer and retested until the leakage is within the allowable limit.

   The Contractor shall include, in the price bid per linear foot of sewer, the cost of all bulkheads, plugs, pipe stopper, pumps, compressors, water, weirs, labor, delays, and any other items of cost necessary for the performance and completion of the required leakage test and for the cost of any repairs of adjustments which may be necessary to make the project conform to the required allowable leakage limits.

All leakage tests shall be conducted under the supervision of the Engineer or his/her representative.

4. Manholes: Manholes shall be air tested per ASTM C-1244.

B. Deflection: Prior to final acceptance of completed thermoplastic sewer lines, the Contractor shall, at his/her expense, perform a pipe deflection test on all main line sanitary sewers.

All lines shall be measured for vertical ring deflection no sooner than thirty (30) days after completion of backfilling operations, provided in the judgment of the Engineer, sufficient settlement of the backfill has occurred. The Engineer shall be the sole judge as to when sufficient settlement has occurred.

The maximum limit of vertical deflection shall not exceed 5% of the base inside diameter of the pipe as presented in Appendix XI of ASTM D-3034.

The test shall be accomplished by manually pulling an approved "go, no-go" mandrel with nine (9) arms.

The Contractor shall be responsible to provide all equipment and labor, including mandrel, to perform and conduct the required test. The Contractor shall also be responsible to notify the Engineer at least forty-eight (48) hours in advance of the anticipated date of the testing for scheduling of personnel needed to monitor the testing operations.

In areas where deflections exceed the 5% limit, the Contractor, at no additional expense to the Owner, will correct the problem area(s) as directed by the Engineer by one of the following procedures:

1. Trench shall be re-excavated, the backfill and pipe removed and replaced in accordance with the original plans and specifications. If in the opinion of the Engineer or his/her representative the pipe has been damaged the pipe shall be replaced with new pipe and installed per the plans and specifications. The failed sections of pipe corrected by this method shall be retested in accordance with this section no sooner than thirty (30) days after the correction is made or otherwise directed by the Engineer.
2. The failed section(s) will be rerounded by means of an internal pneumatic vibratory compactor, performed by an approved company providing this service. Methods, types of equipment, and company to provide service shall be submitted in writing to the Engineer for approval at least five (5) working days in advance of performing this procedure. This method may only be used if approved by the Engineer and it is determined that the deflection has not exceeded 10% of the base inside diameter of the pipe, by pulling a nine (9) arm "go, no-go" mandrel having a diameter equal to 90% of the base inside diameter of the pipe.

After either Procedure 1 or 2 is completed, the repaired area(s) will be retested according to this section prior to final acceptance.

END OF SECTION

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PART 1 GENERAL

1.01 SECTION INCLUDES

A. Storm drainage piping, fittings, and accessories.

B. Connection of building and site storm water drainage system to municipal sewers.

C. Catch basins, curb inlets, manholes, underdrains, and headwalls.

D. Rock channel protection.

E. Permits, inspection fees, tap fees, etc.

1.02 RELATED SECTIONS

A. Section 31 23 33, "Piped Utilities - Basic Methods"

B. Section 31 00 00, "Earthwork"

1.03 REFERENCES

A. ASTM A74-87: Specification for Cast Iron Soil Pipe and Fittings.

B. ANSI/ASTM C76-89: Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

C. ANSI/ASTM C443-85: Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

D. ASTM D1248-89: Polyethylene Plastics Molding and Extrusion Materials.

E. ASTM D2321-89: Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.

F. ASTM D-3034-89: Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

G. ASTM D3212-89: Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

H. ASTM F405-89: Standard Specification for Corrugated Polyethylene (PE) Tubing and Fittings.

I. ASTM F794: Standard Specification for Poly(Vinyl Chloride) (PVC), Large Diameter Ribbed Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

J. Uni-Bell, Uni-B-9: Recommended Standard Performance Specifications for Poly(Vinyl Chloride) (PVC), Large Diameter Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

K. AASHTO M252: Standard Specification for Corrugated Polyethylene Drainage Tubing, 3 to 10 Inches Diameter.

L. AASHTO M 294: Standard Specification for Corrugated Polyethylene Pipe, 4 to 60 Inches Diameter.

1.04 REGULATORY REQUIREMENTS

A. Conform to applicable City code for materials and installation of the Work of this Section.

B. Contractor to obtain and pay for all required permits, tap fees, inspection fees, etc., as required by Governing Authority.

1.05 SUBMITTALS

A. Submit shop drawings under provisions of Division 1.

B. Submit shop drawings indicating dimensions, and invert elevations of manholes and cleanouts.

C. Submit product data under provisions of Division 1.

D. Submit product data for pipe, manholes, castings, and pipe accessories.

1.06 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Division 1.

B. Accurately record location of pipe runs, connections, catch basins, manholes, cleanouts, and invert elevations if different than shown on plans.

C. Identify and describe unexpected variations to subsoil condition or discovery of uncharted utilities.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Pipe Size: 12 Inches or Larger.
1. Reinforced Concrete Pipe: ANSI/ASTM C76, Class III mesh reinforcement, inside nominal diameter as shown on plans, bell and spigot end joints, tongue and groove end joints.
2. Concrete Pipe Joint Device: Flexible Plastic Gaskets: AASHTO M198, Type B, Mastic joint / ANSI/ASTM C443, rubber compression gasket joint
3. Smooth Interior Corrugated Polyethylene Pipe and Fittings: AASHTO M 294 Type S.
4. Smooth Interior Ribbed Poly (Vinyl Chloride) (PVC) Gravity Sewer Pipe & Fittings: ASTM F794, Uni-Bell, Uni-B-9.

B. Pipe Size: Less than 12 inches.
1. Service weight cast iron soil pipe and fittings for sizes through 15 inches: Bell and spigot type conforming to ASTM A74.

2. Type PSM Poly (Vinyl Chloride) (PVC) sewer pipe and fittings ASTM D-3034, joints per ASTM D-3212.
3. Smooth Interior Corrugated Polyethylene Pipe and Fittings: AASHTO M 252 Type S.
4. Smooth Interior Ribbed Poly (Vinyl Chloride) (PVC) Gravity Sewer Pipe & Fittings: ASTM F794, Uni-Bell, Uni-B-9.

2.02 PIPE ACCESSORIES

A. Polyethylene Pipe:
1. The pipe and fittings shall be free of foreign inclusions and visible defects. The ends of the pipe shall be cut squarely and cleanly so as not to adversely effect joining.
2. The nominal size for the pipe and fittings is based on the nominal inside diameter of the pipe. Inside diameter tolerances shall be plus 3% minus 1.5%. Corrugated fittings may be either molded or fabricated by the manufacturer. Fittings produced by manufacturers other than the supplier of the pipe lengths shall not be permitted without the approval of the project engineer.
3. Couplings shall be corrugated to match the pipe corrugations and the width shall not be less than 1/2 the nominal diameter of the pipe. Split couplings shall be manufactured to engage an equal number of corrugations on each side of the pipe joint.
4. A manufacturer's certification that the product was manufactured, tested, and supplied in accordance with this specification shall be furnished upon request to the project engineer.

2.03 CATCH BASINS, CURB INLETS

A. Basin Lid and Frame: Cast iron construction, nominal lid and frame size as shown on plans manufactured by Neenah Foundry Co. or equal.

B. Shaft and Top Section: Reinforced precast concrete, lipped male/female joints; nominal dimensions as shown on plans. Cast-in-place, brick or block side walls may be used in place of precast construction. Brick or concrete block side walls shall be 8 inches nominal thickness. When brick or concrete block are used, the outside walls of the manhole shall be plastered with a 1/2 inch coat of lime cement mortar.

C. Base Pad: Cast-in-place concrete of type specified in Section 03 30 00, "Cast-in-Place Concrete"; leveled top surface to receive concrete shaft sections, sleeved to receive storm sewer pipe sections. Precast base sections may be used in lieu of cast-in-place base.

2.04 MANHOLES

A. Lid and Frame: Cast iron construction, removable lid, open checkerboard grill 22 1/4 inches.

B. Shaft Construction and Eccentric Cone Top Section: Reinforced precast concrete pipe sections, lipped male/female joints; cast steel ladder rungs into shaft sections at 16 inches; nominal shaft diameter of 48 inches. Cast-in-place, brick or block side walls may be used in place of precast construction. Brick or concrete block side walls shall be 8 inches nominal thickness. When brick or concrete block are used, the outside walls of the manhole shall be plastered with a 1/2 inch coat of lime cement mortar.

C. Base Pad: Cast-in-place concrete of type specified in Section 03 30 00, "Cast-in-Place Concrete"; leveled top surface to receive concrete shaft sections, sleeved to receive sewer pipe sections. Precast base sections may be used in lieu of cast-in-place base.

2.05 HEAD WALLS

A. Size and type as shown on plans.

2.06 UNDER DRAINS

A. Filter Fabric: Mirafi Geotextile, 160N or equal.

B. Filter Aggregate: ODOT #8/Type H.

C. Tubing: Polyethylene tubing, ASTM F-405 / AASHTO M 252.

2.07 CLEANOUTS

A. Cleanouts shall be adjustable, vandal-proof with heavy duty cast iron top for exterior use.
   1. Zurn Z-1400-VP, as manufactured by Zurn Industries, Inc.
   2. Jay R. Smith 4220-U, as manufactured by Jay R. Smith Manufacturing Co.

2.08 ROCK CHANNEL PROTECTION

The material shall consist of sound durable rock broken concrete or stone. Reinforcing steel in broken concrete shall not protrude beyond the surface of the concrete. A filter shall be placed consisting of filter fabric or a 6 inches bed of No. 3 or 4 crushed gravel stone or slag. Filter fabric shall be placed with long dimension parallel to the flow and shall be laid loosely but without wrinkles.

This material shall be one (1) of four (4) types defined below:

Type A shall consist of sizes such that at least 85% of the total material by weight shall be larger than an 18 inch but less than a 30 inch square opening. At least 50% of material by weight shall be larger than a 24 inch square opening. The material smaller than an 18 inch square opening shall consist predominantly of rock spalls and rock fines and shall be free of soil.

Type B shall consist of sizes such that at least 85% of the total material by weight shall be larger than a 12 inch but less than a 24 inch square opening. At least 50% of the total material by weight shall be larger than an 18 inch square opening. The material smaller than a 12 inch square opening shall consist predominantly of rock spalls and rock fines and shall be free of soil.

Type C shall consist of sizes such that at least 85% of the total material by weight shall be larger than a 6 inch but less than an 18 inch square opening. At least 50% of the total material by weight shall be larger than a 12 inch square opening. The material smaller than a 6 inch square opening shall consist predominantly of rock spalls and rock fines and shall be free of soil.

Type D shall consist of sizes such that at least 85% of the total material by weight shall be larger than a 3 inch but less than a 12 inch square opening. At least 50% of the total material by weight shall be larger than a 6 inch square opening. The material smaller than a 3 inch square opening shall consist predominantly of rock spalls and rock fines and shall be free of soil.

2.09 TRENCH DRAINS

A. Lid and Frame: Cast iron construction nominal lid and frame size as shown on plans. Model No. Neenah R-4999-BX with Type "C" grate or East Jordan Iron Works V-7362.

2.10 AREA DRAINS

A. 12 inch square top drain, Dura-Coated cast iron body with bottom outlet, seepage pan and combination membrane flashing clamp and frame for heavy duty cast iron loose slotted grate with suspended sediment bucket.
   1. ZURN Z-610, as manufactured by Zurn Industries, Inc.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that trench cut is ready to receive work, and excavations, dimensions, and elevations are as indicated on Plans.

B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with Type A or Type D fill material.

B. Remove large stones or other hard matter which could damage storm sewer or impede consistent backfilling or compaction.

3.03 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories, in accordance with ANSI/ASTM C76, ASTM D2321, and manufacturer's instructions.

B. Bed sewer with Type E fill material per standard drawing provided on plans.

C. Lay pipe to slope gradients noted on Drawings.

D. Place bedding material in maximum 6 inch lifts, consolidating each lift.

E. Backfill and compact per the requirements of Section 31 23 33, "Piped Utilities - Basic Methods." Do not displace or damage pipe when compacting.

3.04 INSTALLATION - CATCH BASINS, MANHOLES, AND CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation, provide 6 inches of Type E fill material under base.

B. Form and place cast-in-place concrete base pad, with provision for storm sewer pipe end sections.

C. Establish elevations and pipe inverts for inlets and outlets as indicated.

D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

E. Form invert channel in manhole to spring line of sewer.

3.05 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Division 1.

3.06 PROTECTION

A. Protect finished installation under provisions of Division 1.

3.07 DEFLECTION

A. Prior to final acceptance of completed thermoplastic sewer lines, the Contractor shall, at his/her expense, perform a pipe deflection test on all main line storm sewers.

All lines shall be measured for vertical ring deflection no sooner than thirty (30) days after completion of backfilling operations, provided in the judgment of the engineer, sufficient settlement of the backfill has occurred. The Engineer shall be the sole judge as to when sufficient settlement has occurred.

The maximum limit of vertical deflection shall not exceed 5% of the base inside diameter of the pipe as presented in Appendix XI of ASTM D-3034.

The test shall be accomplished by manually pulling an approved "go, no-go" mandrel with nine (9) arms.

The Contractor shall be responsible to provide all equipment and labor, including mandrel, to perform and conduct the required test. The Contractor shall also be responsible to notify the Engineer at least forty-eight (48) hours in advance of the anticipated date of the testing for scheduling of personnel needed to monitor the testing operations.

In areas where deflections exceed the 5% limit, the Contractor, at no additional expense to the Owner, will correct the problem area(s) as directed by the Engineer by one of the following procedures:

1. Trench shall be re-excavated, the backfill and pipe removed and replaced in accordance with the original plans and specifications. If in the opinion of the Engineer or his/her representative the pipe has been damaged the pipe shall be replaced with new pipe and installed per the plans and Specifications. The failed sections of pipe corrected by this method shall be retested in accordance with this section no sooner than thirty (30) days after the correction is made or otherwise directed by the Engineer.

2. The failed section(s) will be rerounded by means of an internal pneumatic vibratory compactor, performed by an approved company providing this service. Methods, types of equipment, and company to provide service shall be submitted in writing to the Engineer for approval at least five (5) working days in advance of performing this procedure. This method may only be used if approved by the Engineer and it is determined that the deflection has not exceeded 10% of the base inside diameter of the pipe, by pulling a nine (9) arm "go, no-go" mandrel having a diameter equal to 90% of the base inside diameter of the pipe.

After either Procedure 1 or 2 is completed, the repaired area(s) will be retested according to this section prior to final acceptance.

END OF SECTION

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APPENDIX A

Fitness Equipment

Provided for Reference…

Fitness Equipment List.

Prepared by:

G&G Fitness Equipment
7350 Transit Rd.
Williamsville, NY 14221

Proposal For: **COLUMBUS METROPOLITAN**

4/3/2025

Account Manager: **Bryan Knapp**

Phone: 614-557-7965 | Email: bknapp@ggfitness.com | Fax: 716-204-2521

7350 Transit Rd, Williamsville, NY 14221

Proposal # Q006368
Date: 4/3/2025
Acct ID: C157401

Account Manager: Bryan Knapp **Phone:** 614-557-7965 **Fax:** 716-204-2521 **Email:** bknapp@ggfitness.com

To place this order, please complete Terms & Conditions, sign and email to: commercial@livefit.com

BILL TO

COLUMBUS METROPOLITAN
Housing Authority
Columbus, OH 43211-2771

SHIP TO

The Falls Apartments
Housing Authority
Columbus, OH 43211-2771

	Description	Qty	MSRP	Your Price	Ext. Price
	True Launch Treadmill Model TC3-DA-35	3	$4,000.00	$2,800.00	$8,400.00
	True Unite LED Treadmill Console Model CC6-LT0A	3	$799.00	$559.00	$1,677.00
	True Fitness Launch Elliptical Model XC3-0A-35	2	$3,700.00	$2,590.00	$5,180.00
	True Unite Led Elliptical Console Model CC6-LX0A	2	$799.00	$559.00	$1,118.00
	True Launch Recumbent Bike Model RC3-0A-35	1	$2,500.00	$1,750.00	$1,750.00
	True Unite LED Bike Console Model CC6-LBKA	1	$799.00	$559.00	$559.00
	SPIRIT CIC850 SPIN BIKE Model 850390	1	$2,099.99	$1,400.00	$1,400.00

7350 Transit Rd, Williamsville, NY 14221

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Acct ID: C157401

Account Manager: Bryan Knapp **Phone:** 614-557-7965 **Fax:** 716-204-2521 **Email:** bknapp@ggfitness.com

To place this order, please complete Terms & Conditions, sign and email to: commercial@livefit.com

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COLUMBUS METROPOLITAN
Housing Authority
Columbus, OH 43211-2771

SHIP TO

The Falls Apartments
Housing Authority
Columbus, OH 43211-2771

	Description	Qty	MSRP	Your Price	Ext. Price
	TRUE FUNCTIONAL TRAINER TWO 215LBS STACK MATTE BLACK Model SM1000-35	1	$4,599.00	$3,219.00	$3,219.00
	TRUE FLAT INCLINE BENCH MATTE BLACK Model SF1000-35	2	$799.00	$559.00	$1,118.00
	TRUE 3 TEIR FLAT TRAY DUMBBELL RACK MATTE RACK Model SF1050-35	1	$899.00	$629.00	$629.00
	DUMBBELL,HEX,RUBBER,5LB W/CONTOURED HANDLE Model SDR-005	2	$9.45	$7.56	$15.12
	DUMBBELL,HEX,RUBBER,10LB W/CONTOURED HANDLE Model SDR-010	2	$18.90	$15.12	$30.24
	DUMBBELL,HEX,RUBBER,15LB W/COUTOURED HANDLE Model SDR-015	2	$28.35	$22.68	$45.36
	DUMBBELL,HEX,RUBBER,20LB W/CONTOURED HANDLE Model SDR-020	2	$37.80	$30.24	$60.48

7350 Transit Rd, Williamsville, NY 14221

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Housing Authority
Columbus, OH 43211-2771

SHIP TO

The Falls Apartments
Housing Authority
Columbus, OH 43211-2771

	Description	Qty	MSRP	Your Price	Ext. Price
	DUMBBELL,HEX,RUBBER,25LB W/CONTOURED HANDLE Model SDR-025	2	$47.25	$37.80	$75.60
	DUMBBELL,HEX,RUBBER,30LB W/CONTOURED HANDLE Model SDR-030	2	$56.70	$45.36	$90.72
	DUMBBELL,HEX,RUBBER,35LB W/CONTOURED HANDLE Model SDR-035	2	$66.15	$52.92	$105.84
	DUMBBELL,HEX,RUBBER,40LB W/CONTOURED HANDLE Model SDR-040	2	$75.60	$60.48	$120.96
	DUMBBELL,HEX,RUBBER,45LB W/CONTOURED HANDLE Model SDR-045	2	$85.05	$68.04	$136.08
	DUMBBELL,HEX,RUBBER,50LB W/CONTOURED HANDLE Model SDR-050	2	$94.50	$75.60	$151.20
	TRUE LEG PRESS/CALF STACK 255LB - Matte Black Model SD1003H-35	1	$4,499.00	$3,149.00	$3,149.00

7350 Transit Rd, Williamsville, NY 14221

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COLUMBUS METROPOLITAN

Housing Authority
Columbus, OH 43211-2771

SHIP TO

The Falls Apartments
Housing Authority
Columbus, OH 43211-2771

	Description	Qty	MSRP	Your Price	Ext. Price
	TRUE LEG EXTENTION/CURL HEAVY - Matte Black Model SD1000H-35	1	$4,499.00	$3,149.00	$3,149.00
	True LAT/ROW HEAVY - Matte Black Model SD1002H-35	1	$4,499.00	$3,149.00	$3,149.00
	TRUE FITNESS MULTI PRESS HEAVY STACK 255 LB - Matte Black Model SD1005H-35	1	$4,799.00	$3,359.00	$3,359.00
	GRONK BALANCE TRAINER 64CM, ADJUSTABLE 32IN BANDS Model 3401-G1	1	$119.00	$99.00	$99.00
	PRISM SELF-GUIDED COMMERCIAL PACKAGE DELUXE Model 400-155-131	1	$1,999.00	$1,599.00	$1,599.00

Comments:

* Please ask about our financing options *

Product Total:	$40,385.60
Delivery & Assembly:	$4,100.00
Freight:	$.00
Total:	$44,485.60
Sales Tax:	$.00
Total (USD):	**$44,485.60**

Important Notes and Specifications

Estimated Lead Time: Cardio lead times are approximately 4 weeks, Strength lead times are approximately 12 weeks, Custom logo lead times 12-16 weeks.'

Requirements: All treadmills require a 120 volt 20 amp dedicated outlet (NEMA 5-20R receptacle). 220 volt treadmills are special order and require an 8 week lead time.

Bolt-down Requirements: If applicable, strength machines require a minimum of 2.5" of concrete anchor embeddment not including any rubber flooring or overlays. Concrete thickness must be a minimum of 4.75". All ledger boards will be an additional charge. Extra charges may apply if your facility is found to not meet these requirements at installation time. The mounting of all wall-mounted produts are at the responsibility of the owner.

Delivery Cancellations: All delivery cancellations require 24 hours notification. If cancelled with less than 24 hours notice, charges may apply.

Image Disclaimer: All efforts were taken to make the item images as accurate as possible. However, images on quotes are for representation purposes only and may not be exactly to your specific equipment options.

Desired Delivery Date		**Frame Color**	BLACK
Ground Floor Delivery	Yes	**Upholstery Color**	BLACK
Door Size	36"	**Power Cord Length**	STANDARD
Lift Gate Required	Yes		

I have read and understand all the requirements listed above:_____ (initials)

Terms and Conditions

Please select the payment terms desired:

☐ Pre-paid Drop Ship: 100% of total invoice must be paid at time of order for any product shipping directly from manufacturer to customer.

Initials: _____

☐ Pre-paid: 50% of total invoice due as down-payment when order is plced. Balance due prior to scheduling delivery.

Initials: _____

☐ Net_____ Days: On approved credit or government purchase order. Full Payment will be due on or before the specified number of days.

Initials: _____

1. Any and all late payments will be assessed a 1.5% late fee charged on the remaining outstanding balance. Additional late fee charges will accrue thereafter at a rate of 1.5% per 10 day period. Orders with Pre-pay or COD terms will be effectively due on day of delivery for purposes of late charge calculations.

2. If partial deliveries are accepted by the customer, payment ofr those items is due as they are delivered, per th terms of the sale.

3. G&G Fitness Equipment Inc. reserves the right to reacquire any equipment equal to the dollar amount owed, including late fees, interest, extraction fes and other professional and/or attorney's fees related to the prior collection attempts of monies owed to G&G Fitness Equipment, Inc. should late payments exceed 14 days or if regular payment schedules are defaulted at any time.

4. Any and all attorney's fees and other agency fees that may result from non-payment will be charged to the party in default and may be subject to all applicable late fees and charges.

5. Terms and Conditions of sale which appear on purchaser's documents (including purchase orders) and which are inconsistent with these terms should be null and void.

6. Restocking Fee and Additional Charges: All returns will be assessed a 50% restocking fee. In addition, any incurred freight, delivery, and installation charges will be applied. If the product has already been delivered to the facility, extraction fees will also be applicable.

7. Special Order Products: Special order products are non-returnable and non-refundable. Once a special-order product has shipped from the manufacturer or vendor (or after production starts for built-to-order products), the order cannot be canceled, and the customer is required to take possession of the product.

8. Cancellation Policy for Non-Special-Order Products: If a customer wishes to cancel a non-special-order product before delivery, they may do so. However, cancellations after the product has been delivered will be subject to the restocking fee and applicable charges as stated above.

9. Delays in delivery at customer request are subject to storage fees of $10 per month per piece.

10. Customers with sites located beyond twenty-five miles from our nearest service depot may be responsible for additional travel charges for service on equipment even when covered under manufacturer's labor warranty.

11. Orders over five thousand dollars paid with a credit card will incur a 2% convenience fee.

Customer Approval Signature Date

Quote valid for 7 Days

By signing you affirm that you are authorized to enter into a purchse agreement on behalf of the aforementioned organization and that you have read and agreed to all specifications, terms and conditions.

APPENDIX B

Geotechnical Engineering Report

Provided for Reference…

Subsurface Exploration and Geotechnical Engineering Report

Prepared by:

Geotechnical Consultants, Inc. (GCI)
720 Green Crest Drive
Westerville, OH 43081

GEOTECHNICAL CONSULTANTS INC.

GCI PROJECT No. 25-G-30009

Subsurface Exploration and Geotechnical Engineering Report

CMHA Refugee Road Housing Development
3355 Refugee Road
Columbus, Ohio

Prepared for:
Moody Nolan

April 22, 2025

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Reference: Subsurface Exploration and Geotechnical Engineering Report
CMHA Refugee Road Housing Development
3355 Refugee Road – Columbus, OH
GCI Project No. 25-G-30009

As you requested and authorized, Geotechnical Consultants, Inc. (GCI) performed a subsurface exploration and prepared a geotechnical engineering report for the above referenced project. In summary, the borings generally encountered a surface cover of topsoil and existing fill (in 4 of the borings) underlain by moderate to high plasticity lean clay, often containing veins of fat clay, overlying glacial till. Sand and silt strata were frequently encountered within and below the glacial tills. Groundwater seepage was encountered in twenty-five (25) of the borings at depths of 8 to 19 feet. Water seepage was encountered at a depth of 2 feet in one of the borings within existing fill. We did not encounter bedrock in the depths of our borings (maximum depth of 25 feet).

Geotechnical considerations for the project relate to the impacts that the topsoil and vegetation cover, potentially elevated soil moisture, soft zones in the upper level lean clays, and potential groundwater conditions will have on earthwork, subgrade preparation, new fill placement, and ultimately foundations, slab, and pavement support. Once the building pads have been properly prepared, it is GCI's opinion that the proposed residential development can be supported using conventional shallow foundations and concrete slabs. We discuss geotechnical considerations and provide foundation recommendations in the report.

After you have reviewed the report, feel free to contact us with any questions you may have. We appreciate the opportunity to provide our services for this project and hope to continue providing our services through construction.

Respectfully submitted,
Geotechnical Consultants, Inc.

Michael Travis, P.E.
Project Manager

Curtis L. Miller, P.E.
In-House Reviewer

Distribution: Anup Janardhanan @ Moody Nolan – pdf via email
GCI file

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INTRODUCTION

As requested and authorized by Anup Janardhanan on behalf of Moody Nolan, Geotechnical Consultants, Inc. (GCI) performed a subsurface exploration and prepared this geotechnical engineering report for the proposed residential development to be located on the southeast quadrant of the intersection of Refugee Road and Schwartz Road in Columbus, Ohio. GCI was provided with an electronic copy of the proposed site plan showing the proposed building and pavement layout and the requested boring locations (Overall Staking Plan from Moody Nolan, dated 12/06/24).

Our subsurface study consisted of thirty-six (36) standard penetration borings drilled within the proposed building, pavement, and pond areas. The borings were drilled to depths of 10 to 25 feet. GCI field located the borings using a handheld GPS with GIS coordinates; locations should be considered approximate. GCI did not determine the ground surface elevations at the boring locations.

The intent of this study was to evaluate subsurface conditions and offer geotechnical recommendations relative to earthwork, foundations, slabs, and pavements for the proposed residential development in Columbus, Ohio. We issue this report prior to the receipt of final site layout and grading plans. GCI should review these plans when available, and provide additional recommendations and borings, if necessary.

GCI prepared this report for the exclusive use of Moody Nolan and their consultants for specific application to the above referenced project in accordance with generally accepted soil and foundation engineering practices. We make no warranty, expressed or implied.

SITE LOCATION AND PROJECT DESCRIPTIONS

The project site consists of an undeveloped parcel located at the southeast quadrant of the intersection of Refugee Road and Schwartz Road in Columbus, Ohio. The site is bordered by an existing residential development to the south and southwest, open undeveloped land to the east, Refugee Road to the north, and existing commercial development to the northwest and northeast. At the time of our site drilling operations, the trees that previously covered the site had been dropped and were left in place. We required the use of a bulldozer to move the downed trees and provide access to the boring locations. We show the general site location on an attached map. The aerial photograph below shows conditions at the site prior to the trees being felled.

Aerial Site Photograph and Approximate Development Area (Google Earth, 2023)

Based on the provided plan, we understand the site is approximately 8.55 acres in size and will contain ten 3-story, slab-on-grade, multi-family residential structures, along with a clubhouse, several covered garage areas, three detention basins, and new pavement areas.

Historical Imagery

Review of historical imagery suggests that portions of the site have been disturbed from the construction of the surrounding development. The image below shows features of the site before it was overgrown with trees and vegetation. As shown on the image below, sporadic piles of material are visible throughout the site.

ODOT Aerial Image Archive (photo dated: 12/07/1989)

SUBSURFACE CONDITIONS

GCI mobilized track-mounted rotary drill rigs (with automatic sampling hammers) to the site on April 7th through April 10th, 2025 to complete the test borings. We drilled a total of thirty-six (36) standard penetration borings across the site within the proposed building, garage, pavement, and pond areas. The building and garage borings were drilled to depths of 15 to 25 feet, the pavement borings were drilled to a depth of 10 feet, and the basin area borings were drilled to a depth of 15 feet.

A boring location plan, boring logs, and a summary table of the encountered subsurface conditions are attached in the appendix. We also summarize the subsurface findings below. Refer to the individual boring logs for more detailed subsurface information at specific boring locations.

Surface Cover

The borings encountered a topsoil cover ranging in thickness from 0.2 feet to 1 foot with an average of 0.5 feet. Note that topsoil depths could be deeper in areas of the site.

Existing fill soils were encountered in four of the borings (B-9, B-21, G-1, and P-3) extending to depths of 2.5 to 4 feet below existing grade. Brick fragments were also noted within the topsoil in one of the borings (B-12). The existing fill soils generally consisted of stained and brown lean clay to sandy lean clay and contained mulch and wood fragments, rock fragments, brick fragments, and cinders. Topsoil was also noted within areas of the fill and is expected to be encountered at the bottom of the fill mass. A layer of possible fill was encountered in borings B-21 and G-1 below the existing fill and consisted of heavily stained black lean clay.

Natural Soils

Below the surface cover, the borings encountered brown mottled gray lean clay (classified as CL per the Unified / ASTM Classification system). The mottled lean clays were noted to be of moderate plasticity with minor amounts of sand and gravel. The upper portion of the mottled clays was typically stained below the topsoil surface cover. Some higher plasticity gray “veining” was noted with depth in the mottled lean clays in areas of the site. Standard penetration testing indicated generally soft to medium stiff cohesive consistency, with areas that were stiff. The upper portions of the mottled lean clays were often soft and had weight of hammer (WH) blow counts. Boring P-3 terminated in the mottled lean clay at a depth of 10 feet below existing grade.

Below the mottled clays the borings encountered brown glacial till at depths of 3 to 7 feet. The brown glacial till was visually classified as lean clay with sand (CL) of low to moderate plasticity. The till soils contained significantly more embedded sand and gravel when compared to the overlying mottled lean clay. Gray till was encountered below the brown till in thirty (30) of the borings at depths of 8 to 13 feet. Sand, silt, and gravel seams were common to the glacial till soils. Cobbles were also frequently encountered. Thicker deposits of poorly graded sand with silt and gravel (SP-SM), silty sand (SM), and clayey sand (SC) were encountered within or below the glacial tills. Standard penetration testing indicated generally medium stiff to very stiff cohesive consistency, with areas that were hard, and loose to very dense cohesionless density.

The borings terminated in the glacial till or sand layers below/within the glacial tills at depths of 10 to 25 feet below existing grades.

Bedrock

We did not encounter bedrock within the maximum drilled depths of our borings (25 feet).

Groundwater and Soil Moisture Conditions

During the drilling process, we encountered groundwater seepage in twenty-five (25) of the borings at depths ranging from 8 to 19 feet. Water seepage was encountered at a depth of 2 feet in boring P-3 within existing fill soils. Upon completion of drilling, the groundwater level rose in most of the boreholes. The groundwater seepage was typically encountered in the granular layers within or below the glacial tills.

Moisture conditions in the upper mottled lean clay and glacial tills were commonly moist to very moist. Wet samples were noted in proximity to and below groundwater seepage and sand/silt seams. Note that groundwater levels and moisture conditions can vary with changes in season and in response to precipitation events.

ANALYSES AND CONCLUSIONS

GEOTECHNICAL EVALUATION

It is GCI's opinion that the site is suitable for the proposed residential development project. We note that the potential for high moisture conditions in the upper lean clay soils associated with seasonal conditions (including perched groundwater seepage) could pose earthwork and construction difficulties. The degree to which the high moisture soils will affect the project will depend to some extent on the time of year construction is performed and final site grading. In general terms, we would expect less of an impact if work is performed during the prevailing dry seasons.

Based on our subsurface findings, the proposed slab-on-grade residential structures can be founded on conventional spread footings and continuous wall foundation systems, bearing in either firm and stable natural soils or engineered fill placed over firm and stable natural soils; provided the site is prepared as recommended herein. The following paragraphs discuss the impact of the subsurface conditions on site development and structure foundations.

Existing/Possible Fill

Existing/possible fill was encountered in four of the borings (B-9, B-21, G-1, and P-3) extending to depths of 2.5 to 4 feet below existing grade. As shown in the above aerial image, existing fills may be encountered sporadically around the project site. There is a risk of foundation settlement if footings bear within the existing/possible fills. We make the following comments with respect to addressing the fill during construction.

Building Pad

Based on the borings, it is GCI's opinion that the existing/possible fill is not suitable to support new building foundations without risk of settlement. We discuss below two options for preparing the building pad areas and constructing the building foundations.

Option 1: Fill Removal and Replacement

The first option with the lowest associated risk is to remove existing fill and any trapped topsoil from within the building footprints plus 10 feet laterally beyond. The excavation would then be backfilled with structural fill (as described in the *Fill Placement and Compaction* section of report). Prior to new fill placement, the undercut subgrade should be carefully proof-rolled to assess the stability of the

natural soils. Soft subgrades should be brought to a stable condition prior to new fill placement. In our opinion, existing non-organic fill and the natural, non-organic site soils can be re-used as structural fill. Fill with excessive amounts of organic material and other deleterious material are not suitable for reuse in controlled fill; these materials can be disposed of at an off-site location, wasted to green spaces, or reused in landscaping mounds.

Once this procedure is completed, foundations could be placed in the new, controlled fill at design grades with no unusual undercuts anticipated. This option would mitigate the risk of foundation and slab settlement due to the existing fill.

Option 2: Extend Foundations

The second option for building construction is to leave stable, non-organic existing/possible fill in-place for slab support, and to extend the foundations downward through the fill and any trapped topsoil to bear directly on the stable, natural soils. Undercuts can be backfilled to grade with a control density fill to allow footings to be constructed at design grade.

With this procedure, there is some risk of slab settlement due to the existing fill and potential buried topsoil that would remain in place. The owner must assume the risk of possible settlement and slab cracking when constructing over the existing fill materials. We believe the risk of settlement and slab cracking will be relatively low, provided the fill is firm and stable when thoroughly proof-rolled.

Pavements

It is our opinion that the existing fill can remain in place to support pavements, provided the fill is stable during a proof-roll. The owner must accept some risk of pavement settlement associated with constructing over the existing fill. We believe the risk of settlement and cracking will be relatively low, provided the fill is firm and stable when proof-rolled.

Site Stripping

The borings encountered a topsoil cover ranging from 0.2 feet to 1 foot in thickness. Topsoil, vegetation, trees, root mats, stumps, and other organic materials are not considered suitable for foundation, floor slab, or pavement support and should be completely removed to a minimum of 10 feet laterally beyond proposed building and pavement areas. The upper natural soils may be stained and can remain in-place provided they are non-organic and stable below a proof-roll. Topsoil can be disposed of at an off-site location, wasted to green spaces, placed in borrow pits or ponds, or reused in landscaping mounds.

Subgrade Stability

Once the topsoil is removed, we anticipate the exposed subgrades will consist of stained and mottled lean clays. Elevated moisture conditions will cause subgrade instability, especially below repeated construction traffic. We did encounter soft conditions related to elevated soil moisture within the upper 4 to 6 feet in areas of the site.

Depending on the time of mass grading and earthwork, we expect that some level of stabilization should be expected to create stable subgrades and create fills that will need

to be near optimum moisture to meet compaction requirements. Subgrade stability will also be a concern where the site is to be cut and where subgrades consist of the upper potentially very moist, moderate to high plasticity clays.

Conventional mechanical aeration methods to dry wet soils are typically not feasible through fall, winter, and early spring seasons. Drying of clay soils by means of air-drying (even under favorable conditions) is a time-consuming, weather dependent endeavor. As such, a contingency budget should be strongly considered by the client/owner for chemical drying and/or removal and replacement of wet soils to achieve stable subgrades and proceed with mass earthwork operations. Subgrade instabilities will be exacerbated below repetitive rubber-tired traffic during construction unless the subgrades are stabilized or construction traffic is controlled to designated travel paths. Chemical stabilization of the building pads and pavement areas would also improve subgrade performance through building construction during unfavorable weather conditions. The use of soil additives, such as lime, cement, or LDK, or installation of geosynthetics, should be reviewed by GCI prior to use in the field.

Regardless of the encountered soil moisture conditions, the earthwork contractor should proof-roll the exposed soil subgrades using a fully-loaded, tandem-axle dump truck (or equivalent) to determine the extent of the soft, yielding subgrade areas. Soft spots identified during the proof-roll should be undercut to firm, stable conditions or otherwise stabilized prior to placing additional fill, slab construction, or paving. Structural fill can be placed to design grade provided the exposed subgrades are proof-rolled, and firm, stable conditions are verified prior to fill placement.

If construction is performed during a dry season, we recommend that dry/desiccated soils be thoroughly tilled, moisture conditioned to at least optimum moisture (over optimum preferred), and recompacted prior to placement of additional fill, or slab and pavement base aggregate.

The borings showed that perched water could be encountered in the existing fills and in the glacial till soils that contain random, discontinuous, and occasional water bearing layers of sand with gravel. These layers can cause subgrade instability where they are located close to the working surface and saturated. Site cuts may encounter some perched groundwater conditions in the existing fills or in the glacial till due to the discontinuous nature of the sand and silt strata.

Fill Placement and Compaction

Fill materials within building pads and pavement areas should be placed in a controlled manner. Fill should be placed in maximum 8-inch thick loose lifts and compacted to at least 98% of the maximum Standard Proctor dry density. Lift thickness should be reduced to 6 inches in confined areas where hand operated compaction equipment is used. The clay-based site soils will compact best using static-weight, sheepsfoot compactors.

Moisture should be controlled within 3% of the optimum Standard Proctor moisture. The upper several feet of the existing natural soils could be very moist at the time of earthwork, and some drying of these soils should be anticipated to achieve compaction and stable subgrades as discussed above. However, if the soils are on the dry side of optimum, it will be necessary to add moisture to the soils to be able to achieve compaction.

Compaction will be difficult to obtain if soft/unstable subgrades are not properly remediated before starting to place fill, or if the proposed fill materials contain excess moisture. We recommend that site earthwork and grading be performed during traditionally drier times of the year such as late spring, summer, and early fall.

FOUNDATIONS

In our opinion, the proposed residential structures can be constructed on conventional spread footings and continuous wall foundations. Provided the site is prepared as described herein, all footings should bear on stable, natural soils (extended as needed) or new, controlled fill placed directly over stable natural soils with some consideration as outlined below.

Footings bearing on acceptable soils (natural soils or controlled fill placed directly over stable natural soils) can be designed using a maximum net allowable bearing capacity not to exceed 3,000 pounds per square foot. Regardless of calculated sizes, we recommend minimum sizes of 16 inches wide for wall footings and 30 inches square for column pads to prevent a “punch” effect. All exterior footings should extend to local frost bearing depth (32 inches) or to stable bearing (as stated above), whichever is deeper. Interior footings in heated areas may be placed as shallow as feasible, if bearing on acceptable soils. Interior footings should be lowered to frost bearing depth to prevent frost from penetrating bearing soils if winter construction is planned.

Typical to local practice, if soft or unstable, natural soils are encountered at footing subgrade, undercut to stable soils. Based on the encountered soil conditions, some amount of undercuts should be expected and planned for to achieve stable bearing

conditions. Undercut areas can be backfilled to design bottom-of-footing elevation using controlled density fill (CDF) to allow footing construction at design grade. Alternatively, the foundations can be constructed on firm, stable site soils at the bottom-of-footing undercut. Soft, unstable bearing soils should be reviewed by the soil engineer prior to undercuts.

Provided the shallow foundations are properly designed and constructed as discussed above, we estimate total settlement for shallow foundations to be 1-inch or less, with differential settlement between adjacent foundations to be less than ½ inch would be appropriate for the above listed bearing capacity.

FLOOR SLABS

Once the building pads have been prepared, conventional concrete slabs-on-grade are feasible for the residential buildings. Subgrades should be thoroughly proof-rolled and any soft, yielding areas brought to a stable condition prior to slab construction or placement of aggregate base.

GCI recommends placing a minimum of 4 inches of granular fill (well-graded crushed stone, such as AASHTO #57 Stone or ODOT Item 304) under lightly loaded floor slabs to serve as a capillary cut-off, and to provide a uniform, firm subbase. The stone layer should be increased to at least 6 inches for more heavily loaded slabs, such as garage slabs. The stone layer should be increased to 8 inches and consist of free draining material below below-grade slabs and should include drains leading to permanent sumps. We recommend interior and exterior drains leading to the permanent sumps. We also

recommend placing a vapor retarder below the slabs where moisture may be a problem with slab-on-grade floor coverings.

BELOW-GRADE WALLS

Retaining walls allowed to move freely at the top of the wall should be designed using active lateral earth pressure. Walls restrained at both top and bottom should be designed to resist an at-rest lateral soil pressure. The design loading depends on the type of backfill material used and boundary support conditions. The following table provides recommended equivalent fluid pressures for two types of soils and loading conditions.

Soil Type	Equivalent Active Fluid Pressure (pcf)	Equivalent At-Rest Fluid Pressure (pcf)
Lean Clay (site soils)	55	70
Sand and Gravel (properly compacted)	35	55

** *The above values are based on an assumed backfill density of between 125 and 130 pcf for the upper level natural soils and engineered fill placed with some compactive effort (respectively) and a horizontal backfill surface behind the wall. Any lateral pressures from possible surcharge loads should also be used in design.*

We do not recommend using cohesive soils as wall backfill due to their poor drainage characteristics and potential for lateral wall loads resulting from surface frost. We recommend that granular material (less than 15% passing the No. 200 sieve) be used for all wall backfill. The stone should be placed in a wedge defined by a line extending up at a 35° angle from the vertical to allow use of the lower values above. We recommend that footing drains and underslab drains leading to daylight (or connected to the site stormwater system) be installed to minimize the build-up of hydrostatic forces behind the below-grade walls.

SEISMIC FACTOR

The site soils generally consist of medium stiff to very stiff cohesive soils and loose to dense granular soils. Based on the boring findings and in accordance with the Ohio Building Code - Site Class Definitions, the site is estimated as a Site Class D – stiff soil profile.

EXCAVATIONS

The natural clay-based site soils can be excavated with conventional track hoe equipment. The glacial tills contain layers of sand, silt, and gravel that will become unstable in open excavation, especially when saturated. In addition, perched groundwater and high moisture content in the mottled lean clays could cause sloughing of excavation sidewalls depending on the depth of the excavations; especially in utility and deeper excavations. Excavations that encounter granular layers and/or groundwater seepage will require additional laybacks and possibly excavation support (trench boxes, etc.). **All excavations should comply with current OSHA regulations**.

GROUNDWATER

We encountered groundwater seepage in twenty-five (25) of the borings at depths ranging from 8 to 19 feet. Water seepage was encountered at a depth of 2 feet in boring P-3 within existing fill soils. The groundwater appeared to be associated with the sand, gravel, and silt seams and layers within or below the glacial tills. We do not anticipate that groundwater seepage will pose significant problems with most normal shallow footing excavations within the building pads (provided the site is not lowered). We do note that deeper excavations, such as basins, utility excavations or elevator pits, could potentially encounter perched groundwater in saturated sand and gravel seams within the glacial till

soils. If water is encountered in site excavations, the excavations should be dewatered to allow footing construction and utility trench backfilling in dry conditions. The use of working mats of crushed stone and portable sump pumps should be sufficient to allow construction in dry conditions. Deeper excavations may encounter more significant seepage if the thicker layers of granular soils are encountered. Contact GCI if excessive seepage is encountered.

DETENTION BASINS

If the basins are to maintain a normal pond level, a liner may be needed where granular seams are encountered in the sides and/or bottom of the excavation. The lean clay site soils would make a suitable liner for the pond. Granular seams/layers should be gouged out and covered with a minimum of 18 inches of compacted clay.

Fill should be properly placed and compacted to a minimum of 98% Standard Proctor dry density, as described in the Site Preparation and Earthwork section of this report. If dewatering is required to construct the liner, it should be continued until the pond has been filled.

PAVEMENTS

Provided the site is properly prepared, conventional aggregate base and flexible asphalt wearing course pavements can be used. Prior to pavement construction, the subgrade should be carefully proof-rolled, and stabilized as necessary to provide a CBR value of at least 3, which we believe is feasible provided the subgrades can pass a proof-roll. A specific pavement design is beyond the scope of work of this report; GCI can provide one if requested. We provide recommendations below for minimum pavement sections, but a

site-specific pavement design would require additional laboratory testing and pavement use criteria. We note that the minimum recommended sections discussed below are not suitable for heavy construction traffic during site development. We also note that local jurisdictions may dictate the pavement sections.

We assume that traffic for a residential development will consist of automobiles and occasional trucks. Based on our experience with similar projects and soils, and assuming properly prepared subgrades, we recommend a minimum light-duty (automobiles only) pavement section consisting of 3 inches of asphalt (surface over intermediate) over 8 inches of aggregate base. For areas subject to heavier traffic, including the main traffic aisles and areas subjected to occasional refuse truck traffic and occasional truck deliveries, we suggest a pavement section consisting of a minimum of 4 inches of asphalt (surface over intermediate) over 10 inches of aggregate base. We recommend a minimum of 8 inches of air-entrained, Portland cement concrete for any dumpster pads and the dumpster pad approach areas.

Providing adequate subbase drainage is important to future pavement performance. Finger drains connecting to weep-holes in inlets, proper grading of pavement subgrades and surfaces to shed run-off, and underdrains in pavement swales are suggested subbase drainage methods and should be designed by the site civil engineer. Installing a medium-duty geogrid below the base aggregate course in areas subjected to stopping and turning traffic or concentrated traffic flow, such as the main entrance/exit drives, will increase the structural number of the pavement section and improve the pavement performance.

SITE PREPARATION AND EARTHWORK

We provide below general guidelines for site preparation and earthwork operations.

1. Strip vegetation, topsoil, and root mat systems from below the proposed building footprints and pavement areas plus a minimum of 10 feet laterally beyond. Remove any trees, stumps, and grub out root balls. Stockpile any topsoil encountered for redistribution in proposed green space areas, reuse in landscaping mounds, or to backfill on-site borrow pits, otherwise haul the topsoil off-site. Care should be taken to not over strip stained lean clays.

2. If the existing/possible fills are decided to be removed and replaced, remove the existing/possible fill soils to expose stable natural soils.

3. Thoroughly and carefully proof-roll the exposed soil subgrades with a fully-loaded, tandem-axle dump truck (or equivalent) to identify potential soft subgrade areas. The upper 2 to 6 feet of natural and fill soils could be very moist and associated instabilities are to be expected. Undercut soft areas or otherwise stabilize soft spots identified during the proof-roll prior to placing controlled fill to design grade. We have made additional comments in the *Geotechnical Evaluation* section above.

4. Place controlled fills to design grade within proposed building and pavement areas, as required. Remove any frozen subgrades prior to proceeding with fill placement. Non-organic natural soils or non-organic removed fills are suitable for reuse in new controlled fills. Do not place frozen materials for fill. **Off-site borrow materials should be reviewed by our office prior to use.**

5. Place controlled fills in maximum 8-inch thick loose lifts and compact each lift to a minimum of 98% of the maximum Standard Proctor dry density (ASTM D-698). The moisture in the fill soils should be controlled to within ±3% the optimum Standard Proctor moisture content. Cohesive soils will compact best with a sheepsfoot roller.

6. Construct foundations and start building construction after the building pads are filled to grade. Refer to the *Geotechnical* and *Foundations* sections of this report for specific foundation design parameters.

7. Building and pavement areas should be steel-wheel rolled to a smooth surface prior to placement of base aggregate. Subgrade preparation during wet seasons may require the use of engineering fabric or geo-grid.

8. It is recommended that GCI be retained to observe proof-rolling operations, cut and fill operations, and footing excavations. If work is performed during the winter (e.g., when freezing temperatures occur), special protective measures will be required during filling and footing construction procedures. Contact GCI for additional recommendations on cold-weather earthwork operations, if applicable.

CONSTRUCTION MATERIALS ENGINEERING AND TESTING

GCI provides construction materials engineering and testing services. For project continuity throughout construction, we recommend that GCI be retained to observe, test, and document:

- earthwork procedures (stripping, fill placement, compaction, utility trench backfill, etc.),
- slab and foundation preparation (proof-rolling, excavations, undercuts, etc.),
- concrete placement and compressive strength testing (footings, slabs, pavements, etc.), and
- structural steel (welds, bolts, etc.).

The purpose of this work is to assess that the intent of our recommendations is being followed and to make timely changes to our recommendations (as needed) in the event site conditions vary from those encountered in our borings. Please contact our field department to initiate these services.

FINAL

We recommend that GCI review final site layout and grading plans. Recommendations contained in this report may be changed based on review of final site plans. If any changes in the nature, design or locations of the construction are planned, conclusions and recommendations should not be considered valid unless verified in writing by GCI. The recommendations contained in this report are the opinion of GCI based on the subsurface conditions found in the borings and available development information. It should be noted that the nature and extent of variations between borings might not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report. This report has been prepared for design purposes only and should not be considered sufficient to prepare an accurate bid document.

If you have any questions or need for any additional information, please contact our office. It has been a pleasure to be of service to you on this project, and we hope to continue our services through construction.

GEOTECHNICAL
CONSULTANTS INC.

APPENDIX – CMHA Refugee Road Housing Development

General Notes for Soil Sampling and Classifications
Site Location Map and Boring Location Plan
Summary of Encountered Subsurface Conditions
Test Boring Logs (36 sheets)

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GENERAL NOTES FOR SOIL SAMPLING AND CLASSIFICATIONS

BORINGS, SAMPLING AND GROUNDWATER OBSERVATIONS:

Drilling and sampling were conducted in accordance with procedures generally recognized and accepted as standard methods of exploration of subsurface conditions. The borings were drilled using a truck-mounted drill rig using auger boring methods with standard penetration testing performed in each boring at intervals ranging from 1.5 to 5.0 feet. The stratification lines on the logs represent the approximate boundary between soil types at that specific location and the transition may be gradual.

Water levels were measured at drill locations under conditions stated on the logs. This data has been reviewed and interpretations made in the text of the report. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time the measurements were made.

The Standard Penetration Test (ASTM-D-1586) is performed by driving a 2.0 inch O.D. split barrel sampler a distance of 18 inches utilizing a 140 pound hammer free falling 30 inches. The number of blows required to drive the sampler each 6 inches of penetration are recorded. The summation of the blows required to drive the sampler for the final 12 inches of penetration is termed the Standard Penetration Resistance (N). Soil density/consistency in terms of the N-value is as follows:

COHESIONLESS DENSITY		COHESIVE CONSISTENCY	
0-10	Loose	0-4	Soft
10-30	Medium Dense	4-8	Medium Stiff
30-50	Dense	8-15	Stiff
50 +	Very Dense	15-30	Very Stiff
		30 +	Hard

SOIL MOISTURE TERMS

Soil Samples obtained during the drilling process are visually characterized for moisture content as follows:

MOISTURE CONTENT	DESCRIPTION
Damp	Soil moisture is much drier than the Atterberg plastic limit (where soils are cohesive) and generally more than 3% below Standard Proctor “optimum” moisture conditions. Soils of this moisture generally require added moisture to achieve proper compaction.
Moist	Soil moisture is near the Atterberg plastic limit (cohesive soils) and generally within ±3% of the Standard Proctor “optimum” moisture content. Little to no moisture conditioning is anticipated to be required to achieve proper compaction and stable subgrades.
Very Moist	Soil moisture conditions are above the Atterberg plastic limit (cohesive soils) and generally greater than 3% above Standard Proctor “optimum” moisture conditions. Drying of the soils to near “optimum” conditions is anticipated to achieve proper compaction and stable subgrades.
Wet	Soils are saturated. Significant drying of soils is anticipated to achieve proper compaction and stable subgrades.

SOIL CLASSIFICATION PROCEDURE:

Soil samples obtained during the drilling process are preserved in plastic bags and visually classified in the laboratory. Select soil samples may be subjected to laboratory testing to determine natural moisture content, gradation, Atterberg limits and unit weight. Soil classifications on logs may be adjusted based on results of laboratory testing.

Soils are classified in accordance with the ASTM version of the Unified Soil Classification System. ASTM D-2487 “Classification of Soils for Engineering Purposes (Unified Soil Classification System) describes a system for classifying soils based on laboratory testing. ASTM D-2488 “Description and Identification of Soil (Visual-Manual Procedure) describes a system for classifying soils based on visual examination and manual tests.

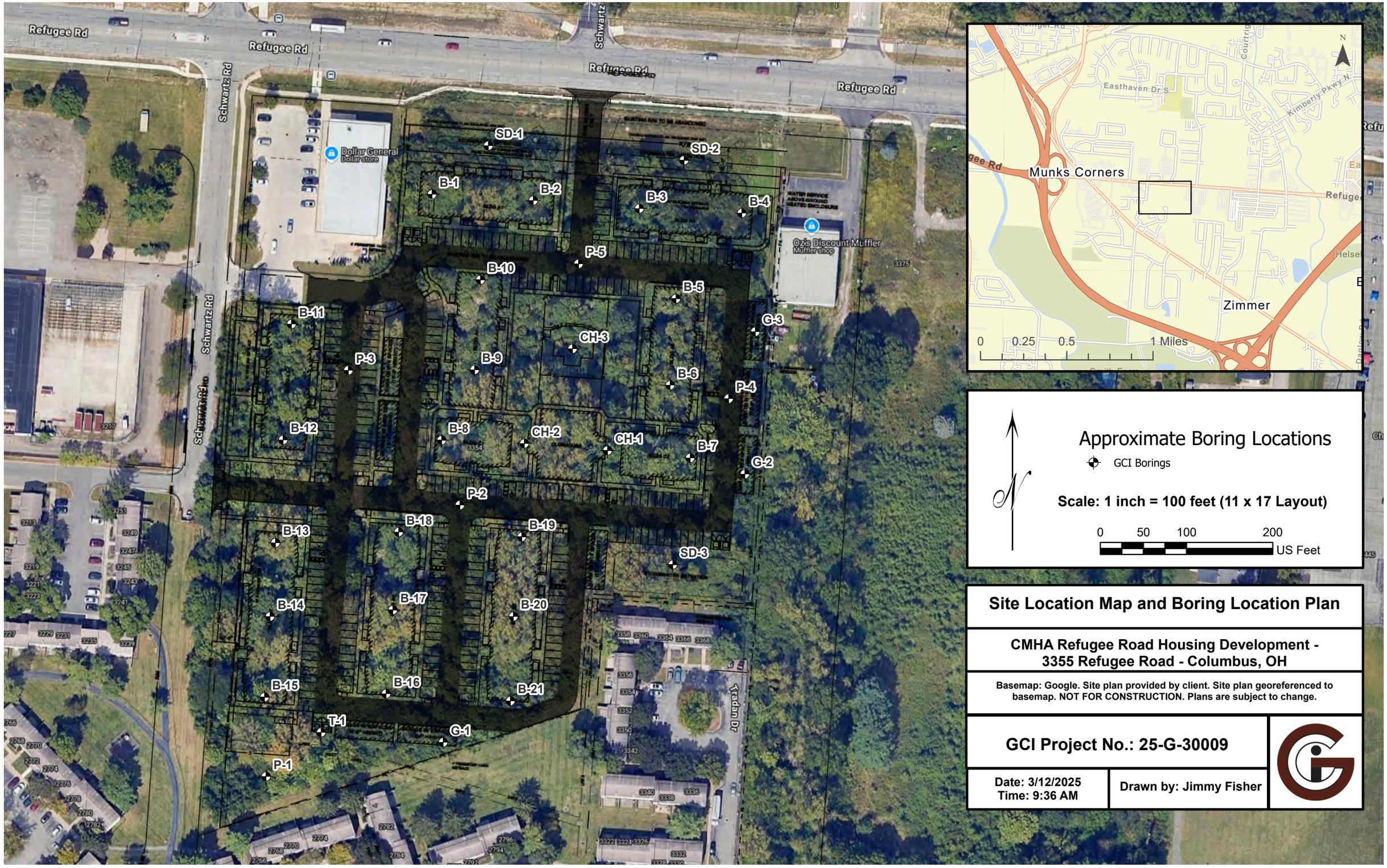
Soil classifications are based on the following tables (see reverse side):

GENERAL NOTES FOR SOIL SAMPLING AND CLASSIFICATIONS

PARTICLE SIZE DEFINITION		
Boulders:		>12"
Cobbles:		3" to 12"
Gravel:	Coarse:	3/4" to 3"
	Fine:	No. 4 (3/16") to 3/4"
Sand:	Coarse	No. 10 (2.0mm) to No. 4 (4.75mm)
	Medium	No. 40 (0.425mm) to No. 10 (2.0mm)
	Fine	No. 200 (0.074mm) to No. 40 (0.425mm)
Silt & Clay		<0.074mm; classification based on overall plasticity; in general clay particles <0.005mm.

CONSTITUENT MODIFIERS	
Trace	Less than 5%
Few	5-10%
Little	15-25%
Some	30-45%
Mostly	50-100%

ASTM/UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART		
COARSE-GRAINED SOILS (more than 50% of materials is larger than No. 200 sieve size)		
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	*Clean Gravel (less than 5% fines)*	
	GW	Well-graded gravel, gravel-sand mixtures, little or no fines
	GP	Poorly-graded gravels, gravel sand mixtures, little or no fines
	Gravels with fines (more than 12% fines)	
	GM	Silty gravels, gravel-sand-silt mixtures
	GC	Clayey gravels, gravel-sand-clay mixtures
SANDS More than 50% of coarse fraction smaller than No. 4 sieve size	*Clean Sands (Less than 5% fines)*	
	SW	Well-graded sands, gravelly sands, little or no fines
	SP	Poorly-graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	
	SM	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand-clay mixtures
Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 percent ……GW, GP, SW, SP Greater than 12 percent ……GM, GC, SM, SC 5 to 12 percent ……Borderline cases requiring dual symbols: SP-SM, GP-GM, etc.		
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size)		
SILTS AND CLAYS Liquid Limit less than 50%	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
	CL	Inorganic clays or low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	CL-ML	Inorganic silty clay of slight plasticity, P.I. between 4 and 7
	OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid Limit 50% or greater	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays or medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS	PT	Peat and other highly organic soils



Approximate Boring Locations

GCI Borings

Scale: 1 inch = 100 feet (11 x 17 Layout)

0 50 100 200 US Feet

Site Location Map and Boring Location Plan

CMHA Refugee Road Housing Development -
3355 Refugee Road - Columbus, OH

Basemap: Google. Site plan provided by client. Site plan georeferenced to basemap. NOT FOR CONSTRUCTION. Plans are subject to change.

GCI Project No.: 25-G-30009

Date: 3/12/2025 Time: 9:36 AM	Drawn by: Jimmy Fisher

Summary of Encountered Subsurface Conditions

CMHA Refugee Road Housing Development
3355 Refugee Road - Columbus, OH
GCI Job Number: 25-G-30009

Borehole	Surface Layer	Topsoil Thickness (ft.)	Bottom of Fill Cover (feet)	Groundwater: Level Encountered (ft)	Groundwater: Level at Completion (ft)	Depth to Top of Lean Clay (ft)	Depth to Top of Brown Till (ft)	Depth to Top of Gray Till (ft)	Depth to Top of Sand/Gravel (ft)	Bottom of Boring Depth (ft)
				Depth	Depth					
B- 1	Topsoil	0.5	--	19	10	0.5	4.0	8.5	18.0	20.0
B- 2	Topsoil	0.3	--	17	11	0.3	5.5	--	18.0	25.0
B- 3	Topsoil	0.4	--	17	11	0.4	5.0	12.0		19.0
B- 4	Topsoil	0.4	--	17	6	0.4	6.0	13.0	19.0	24.5
B- 5	Topsoil	0.5	--	15	5	0.5	5.0	9.0		20.0
B- 6	Topsoil	0.7	--	17	6.5	0.7	5.0	9.5		25.0
B- 7	Topsoil	0.2	--	15	18	0.2	5.0	9.0		20.0
B- 8	Topsoil	0.7	--	--	--	0.7	6.0	12.0		25.0
B- 9	Fill	--	4.0	13	11	4.0	6.0	--	12.0	20.0
B-10	Topsoil	0.4	--	16	5	0.4	5.5	13.0	16.0	25.0
B-11	Topsoil	0.4	--	12	8	0.4	7.0	9.5	18.0	20.0
B-12	Topsoil	0.5	--	17	12	0.5	7.0	12.5	17.0	25.0
B-13	Topsoil	0.4	--	17	12	0.4	4.5	13.0	17.0	20.0
B-14	Topsoil	0.9	--	17	14	0.9	5.5	11.0	17.0	25.0
B-15	Topsoil	0.5	--	17	15	0.5	5.0	11.5	17.0	19.5
B-16	Topsoil	0.8	--	14	12	0.8	5.0	11.5	14.0	25.0
B-17	Topsoil	0.4	--	12	10	0.4	5.5	9.0	12.0	20.0
B-18	Topsoil	0.6	--	13	6	0.6	5.0	9.0	19.0	25.0
B-19	Topsoil	0.9	--	12	6	0.9	7.0	13.0		20.0
B-20	Topsoil	0.7	--	13	10	0.7	7.0	13.0	18.0	20.0
B-21	Topsoil	1.0	3.0	10	7	3.0	7.0	12.0	17.0	20.0
CH- 1	Topsoil	0.2	--	--	--	0.2	4.5	9.5		15.0
CH- 2	Topsoil	0.6	--	9	6	0.6	5.0	9.0		15.0
CH- 3	Topsoil	0.6	--	--	--	0.6	5.0	11.0		15.0
G- 1	Topsoil	0.3	2.5	8	8	2.5	7.0	13.0		15.0
G- 2	Topsoil	0.4	--	--	--	0.4	5.0	9.5		15.0
G- 3	Topsoil	0.7	--	--	--	0.7	4.5	13.0		15.0

Summary of Encountered Subsurface Conditions

CMHA Refugee Road Housing Development
3355 Refugee Road - Columbus, OH
GCI Job Number: 25-G-30009

Borehole	Surface Layer	Topsoil Thickness (ft.)	Bottom of Fill Cover (feet)	Groundwater: Level Encountered (ft)	Groundwater: Level at Completion (ft)	Depth to Top of Lean Clay (ft)	Depth to Top of Brown Till (ft)	Depth to Top of Gray Till (ft)	Depth to Top of Sand/Gravel (ft)	Bottom of Boring Depth (ft)
				Depth	Depth					
P- 1	Topsoil	0.5	--	--	--	0.5	6.5	--		10.0
P- 2	Topsoil	0.2	--	--	--	0.2	5.0	9.0		10.0
P- 3	Fill	--	4.0	2	2	4.0	--	--		10.0
P- 4	Topsoil	0.7	--	--	--	0.7	6.0	--		10.0
P- 5	Topsoil	0.3	--	--	--	0.3	3.0	8.0		10.0
SD- 1	Topsoil	0.4	--	--	--	0.4	5.0	9.5		15.0
SD- 2	Topsoil	0.4	--	13	8	0.4	5.0	--		15.0
SD- 3	Topsoil	0.4	--	--	--	0.4	5.0	12.0		15.0
T- 1	Topsoil	0.5	--	10	--	0.5	6.0	9.5		15.0

Average Topsoil Depth at boring locations: 0.5 feet

TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B- 1**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/7/2025**

GROUND WATER OBSERVATION

10.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT _____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	1.25	0.0-1.5	SS	2	2	3	Very Moist	0.5	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
	2.5	2.0-3.5	SS	2	2	3	Very Moist to Moist		
								4.0	
	4.5	4.0-5.5	SS	4	5	8	Moist		Brown Lean Clay with Sand (CL) - glacial till, moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
5									
	4.5	8.5-10.0	SS	5	7	10	Moist	8.5	
									Gray Sandy Lean Clay (CL) - glacial till, moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
10									
	--	13.5-15.0	SS	9	9	12	Moist		cobble encountered at 13.5'
15									
								18.0	
	--	18.5-20.0	SS	18	27	50	Wet		Gray Poorly Graded Sand with Silt and Gravel (SP-SM) - fine to coarse sand, little gravel, few silt
									Water Seepage at 19'
								20.0	BOTTOM OF BORING: 20'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B- 2**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/7/2025**

GROUND WATER OBSERVATION

11.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT _____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	1.0	0.0-1.5	SS	1	1	1	Very Moist	0.3	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
	1.5	2.0-3.5	SS	2	3	4	Very Moist		
	3.0	4.0-5.5	SS	3	4	5	Moist		
5								5.5	
									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	3.0	8.5-10.0	SS	4	4	8	Moist		
10									
	4.0	13.5-15.0	SS	10	13	20	Moist		
15									
								18.0	**Water Seepage at 17'**
	--	18.5-20.0	SS	15	18	25	Wet		Gray Poorly Graded Sand with Silt and Gravel (SP-SM) - fine to coarse sand, little gravel, few silt, contains areas of lean clay (CL)
20									
	--	23.5-25.0	SS	18	18	20	Wet		
25								25.0	BOTTOM OF BORING: 25'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B- 3**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/8/2025**

GROUND WATER OBSERVATION

11.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	1.25	0.0-1.5	SS	WH	1	2	Very Moist	0.4	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
									WH = Weight of Hammer
	2.0	2.0-3.5	SS	4	4	4	Very Moist		
	2.0/4.5	4.0-5.5	SS	5	4	8	Moist	5.0	
5									Brown Lean Clay with Sand (CL) - glacial till, moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	3.75	8.5-10.0	SS	5	7	7	Moist		
10									layer of silty sand (SM) noted from 10' to 12'
								12.0	
									Gray Sandy Lean Clay (CL) - glacial till, moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	4.0	13.5-15.0	SS	15	10	15	Very Moist		
15									**Water Seepage at 17'**
	--	18.5-19.0	SS	50			Moist to Very Moist		cobble encountered at 18.5'
								19.0	BOTTOM OF BORING: 19'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B- 4**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/7/2025**

GROUND WATER OBSERVATION

6.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT _____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	1.0	0.0-1.5	SS	WH	1	1	Very Moist	0.4	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
	1.5	2.0-3.5	SS	3	4	5	Very Moist		WH = Weight of Hammer
	2.0	4.0-5.5	SS	4	5	5	Moist		
5								6.0	
	2.0	8.5-10.0	SS	5	5	5	Moist		Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
10								13.0	
	4.0	13.5-15.0	SS	7	7	7	Moist		Gray Sandy Lean Clay (CL) - glacial till, moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
15									**Water Seepage at 17'**
	3.0/--	18.5-20.0	SS	20	19	15	Wet	19.0	
20									Gray Poorly Graded Sand with Silt and Gravel (SP-SM) - fine to coarse sand, little gravel, few silt
	--	23.5-24.5	SS	39	50		Wet		
								24.5	
25									BOTTOM OF BORING: 24.5'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B- 5**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/10/2025**

GROUND WATER OBSERVATION

5.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0 - 10	Loose	0 - 4	Soft
10 - 30	Medium Dense	4 - 8	Medium Stiff
30 - 50	Dense	8 - 15	Stiff
50 +	Very Dense	15 - 30	Very Stiff
		30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	2.5	0.0-1.5	SS	2	3	3	Very Moist	0.5	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
	3.0	2.0-3.5	SS	4	3	4	Moist		
	3.5	4.0-5.5	SS	2	4	4	Moist	5.0	
5									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	3.0	8.5-10.0	SS	6	4	3	Moist	9.0	
10									Gray Sandy Lean Clay (CL) - glacial till, moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	4.5	13.5-15.0	SS	7	8	8	Moist		
15									**Water Seepage at 15'**
									layer of Gray Poorly Graded Sand with Gravel (SP) noted at 15'
	--/3.5	18.5-20.0	SS	10	8	10	Very Moist		
								20.0	BOTTOM OF BORING: 20'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B- 6**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/8/2025**

GROUND WATER OBSERVATION

6.5 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT _____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	2.0	0.0-1.5	SS	WH	2	2	Very Moist	0.7	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
	2.0	2.0-3.5	SS	2	3	6	Moist		WH = Weight of Hammer
	2.5	4.0-5.5	SS	3	3	3	Moist	5.0	
5									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	3.5	8.5-10.0	SS	4	5	5	Moist	9.5	
10									Gray Sandy Lean Clay (CL) - glacial till, moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	NR	13.5-15.0	SS	10	10	20			
15									layer of Gray Poorly Graded Sand with Gravel (SP) noted at 16'
									Water Seepage at 17'
	2.5	18.5-20.0	SS	12	15	21	Very Moist		
20									
	4.5	23.5-25.0	SS	21	22	35	Moist		
25								25.0	BOTTOM OF BORING: 25'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B- 7**

CLIENT **Moody/Nolan, Ltd., Inc.** PROJ. NO. **25-G-30009** SURF. ELEV. _____ DATE DRILLED **4/10/2025**

GROUND WATER OBSERVATION

18.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT _____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	1.5	0.0-1.5	SS	WH	1	1	Moist	0.2	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel, contains veins of gray fat clay (CH)
									WH = Weight of Hammer
	2.75	2.0-3.5	SS	2	3	2	Moist		
	1.0/3.0	4.0-5.5	SS	1	1	3	Very Moist	5.0	
5									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	3.0	8.5-10.0	SS	4	6	9	Very Moist	9.0	
10									Gray Sandy Lean Clay (CL) - glacial till, moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	4.5	13.5-15.0	SS	5	7	12	Moist		
15									**Water Seepage at 15'**
	4.25	18.5-20.0	SS	7	11	15	Moist	20.0	BOTTOM OF BORING: 20'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B- 8**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/8/2025**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT _____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	2.0	0.0-1.5	SS	2	2	2	Very Moist	0.7	Topsoil
	2.5	2.0-3.5	SS	3	4	3	Moist		Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel, contains veins of gray fat clay (CH)
5	3.5	4.0-5.5	SS	3	3	3	Moist	6.0	
	3.5	8.5-10.0	SS	7	7	6	Very Moist		Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
10								12.0	
	4.5	13.5-15.0	SS	9	17	17	Moist		Gray Sandy Lean Clay (CL) - glacial till, moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
15									
	4.5	18.5-20.0	SS	15	15	16	Moist		
20									
	4.5	23.5-25.0	SS	12	16	15	Moist		
25								25.0	BOTTOM OF BORING: 25'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B- 9**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/8/2025**

GROUND WATER OBSERVATION

11.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT _____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	--	0.0-1.5	SS	3	5	4	Moist		Fill: Stained and Brown Lean Clay to Lean Clay with Sand (CL) - moderate plasticity, few to little sand, contains mulch and wood fragments, rock fragments, brick fragments, and cinders
	2.75	2.0-3.5	SS	4	3	3	Moist		Fill: Topsoil/Possible Trapped Topsoil layer
								4.0	
	3.5	4.0-5.5	SS	3	4	5	Moist		Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
5								6.0	
									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	2.75	8.5-10.0	SS	4	4	4	Very Moist		
10								12.0	
									Gray Poorly Graded Sand with Silt and Gravel (SP-SM) - fine to coarse sand, little gravel, few silt, contains areas of lean clay (CL) **Water Seepage at 13'**
	NR	13.5-15.0	SS	12	10	13	Wet		
15									
	4.5/--	18.5-20.0	SS	23	30	31	Moist		
								20.0	BOTTOM OF BORING: 20'

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B-10**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/7/2025**

GROUND WATER OBSERVATION

5.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	1.0	0.0-1.5	SS	WH	1	2	Very Moist	0.4	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
	2.5	2.0-3.5	SS	2	3	4	Moist		WH = Weight of Hammer
	3.5	4.0-5.5	SS	3	3	5	Moist		
5								5.5	
									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	3.5	8.5-10.0	SS	5	10	13	Moist		
10									
								13.0	
	4.5	13.5-15.0	SS	7	9	14	Moist		Gray Sandy Lean Clay (CL) - glacial till, moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
15									**Water Seepage at 16'**
								16.0	
									Gray Poorly Graded Sand with Silt and Gravel (SP-SM) - fine to coarse sand, little gravel, few silt, contains areas of sandy lean clay (CL)
	--	18.5-20.0	SS	13	13	13	Wet		
20									
	--/4.5	23.5-25.0	SS	12	10	14	Wet		
								25.0	
25									BOTTOM OF BORING: 25'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B-11**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/8/2025**

GROUND WATER OBSERVATION

8.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	1.5	0.0-1.5	SS	2	2	5	Very Moist	0.4	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel, contains veins of gray fat clay (CH)
	2.0	2.0-3.5	SS	3	4	3	Very Moist to Moist		
	2.25	4.0-5.5	SS	2	2	4	Moist		
5								7.0	
									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	2.5	8.5-10.0	SS	4	5	6	Moist	9.5	
10									Gray Sandy Lean Clay (CL) - glacial till, low to moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
									Water Seepage at 12'
	3.5	13.5-15.0	SS	8	8	8	Very Moist		
15								18.0	
	--	18.5-20.0	SS	18	16	12	Wet		Gray Poorly Graded Sand with Silt and Gravel (SP-SM) - fine to coarse sand, little gravel, few silt
								20.0	BOTTOM OF BORING: 20'

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B-12**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/8/2025**

GROUND WATER OBSERVATION

12.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	2.0	0.0-1.5	SS	3	3	4	Moist	0.5	Topsoil, contains brick fragments
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
	2.75	2.0-3.5	SS	3	3	4	Moist		
	2.75	4.0-5.5	SS	3	4	4	Moist		
5								7.0	
	4.5	8.5-10.0	SS	7	5	6	Moist		Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
10								12.5	
	4.5	13.5-15.0	SS	9	7	9	Moist		Gray Sandy Lean Clay (CL) - glacial till, low to moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
15								17.0	**Water Seepage at 17'**
	--	18.5-20.0	SS	5	8	13	Wet		Gray Poorly Graded Sand with Silt and Gravel (SP-SM) - fine to coarse sand, little gravel, few silt
20									
	--	23.5-25.0	SS	12	11	11	Wet		
25								25.0	BOTTOM OF BORING: 25'

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B-13**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/8/2025**

GROUND WATER OBSERVATION

12.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT _____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	2.0	0.0-1.5	SS	2	3	3	Very Moist	0.4	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
	2.75	2.0-3.5	SS	3	3	3	Moist		
	4.0	4.0-5.5	SS	4	6	6	Moist	4.5	
5									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	4.0	8.5-10.0	SS	5	3	5	Moist		
10									
								13.0	
	4.5	13.5-15.0	SS	4	6	6	Moist		Gray Sandy Lean Clay (CL) - glacial till, low to moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
15									**Water Seepage at 17'**
								17.0	
	--	18.5-20.0	SS	10	21	11	Wet		Gray Poorly Graded Sand with Silt and Gravel (SP-SM) - fine to coarse sand, little gravel, few silt
								20.0	BOTTOM OF BORING: 20'

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B-14**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/8/2025**

GROUND WATER OBSERVATION

14.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT _____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	--	0.0-1.5	SS	1	3	4	Very Moist	0.9	Topsoil
	2.0	2.0-3.5	SS	2	2	3	Moist		Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
	3.0	4.0-5.5	SS	4	4	5	Moist	5.5	
5									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	4.0	8.5-10.0	SS	5	5	5	Moist		
10								11.0	
	3.0	13.5-15.0	SS	4	5	5	Moist to Very Moist		Gray Sandy Lean Clay (CL) - glacial till, low to moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
15								17.0	**Water Seepage at 17'**
	--	18.5-20.0	SS	21	21	27	Wet		Gray Poorly Graded Sand with Silt and Gravel (SP-SM) - fine to coarse sand, little gravel, few silt
20								22.0	
	4.5	23.5-25.0	SS	7	8	11	Very Moist		Gray Sandy Lean Clay (CL) - glacial till, low to moderate plasticity, some sand, few gravel
25								25.0	BOTTOM OF BORING: 25'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B-15**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/8/2025**

GROUND WATER OBSERVATION

15.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	3.0	0.0-1.5	SS	2	2	3	Moist	0.5	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
	1.5/3.0	2.0-3.5	SS	3	4	4	Moist		
	3.75	4.0-5.5	SS	3	5	6	Moist	5.0	
5									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	4.5	8.5-10.0	SS	7	5	6	Moist		
10								11.5	
									Gray Sandy Lean Clay (CL) - glacial till, low to moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	4.5	13.5-15.0	SS	6	5	9	Moist		
15									**Water Seepage at 17'**
								17.0	
									Gray Poorly Graded Sand with Silt and Gravel (SP-SM) - fine to coarse sand, little gravel, few silt
	--	18.5-19.5	SS	23	50		Wet		
								19.5	BOTTOM OF BORING: 19.5'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B-16**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/9/2025**

GROUND WATER OBSERVATION

12.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT _____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	3.0	0.0-1.5	SS	3	4	3	Moist	0.8	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
	3.75	2.0-3.5	SS	5	4	4	Moist		
	2.0	4.0-5.5	SS	3	2	3	Very Moist	5.0	
5									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	2.5	8.5-10.0	SS	3	4	6	Moist		
10								11.5	
									Gray Sandy Lean Clay (CL) - glacial till, low to moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	4.5	13.5-15.0	SS	4	8	13	Moist	14.0	**Water Seepage at 14'**
15									Gray Poorly Graded Sand with Silt and Gravel (SP-SM) - fine to coarse sand, little gravel, few silt
	--	18.5-20.0	SS	15	21	22	Wet		
20								22.0	
									Gray Sandy Lean Clay (CL) - glacial till, low to moderate plasticity, some sand, few gravel
	4.5	23.5-25.0	SS	8	7	9	Moist		
25								25.0	
									BOTTOM OF BORING: 25'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B-17**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/9/2025**

GROUND WATER OBSERVATION

10.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0 - 10	Loose	0 - 4	Soft
10 - 30	Medium Dense	4 - 8	Medium Stiff
30 - 50	Dense	8 - 15	Stiff
50 +	Very Dense	15 - 30	Very Stiff
		30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	2.5	0.0-1.5	SS	3	4	4	Moist	0.4	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
	3.0	2.0-3.5	SS	3	3	3	Moist		
	4.0	4.0-5.5	SS	3	3	4	Moist		
5								5.5	
									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	4.5	8.5-10.0	SS	7	5	5	Moist	9.0	
10									Gray Sandy Lean Clay (CL) - glacial till, low to moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
									Water Seepage at 12'
								12.0	
	--	13.5-15.0	SS	13	15	20	Wet		Gray Poorly Graded Sand with Silt and Gravel (SP-SM) - fine to coarse sand, little gravel, few silt
15									
	--	18.5-20.0	SS	19	25	32	Wet		
								20.0	BOTTOM OF BORING: 20'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B-18**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/9/2025**

GROUND WATER OBSERVATION

6.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	2.5	0.0-1.5	SS	2	1	2	Moist	0.6	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
	2.0	2.0-3.5	SS	3	3	4	Moist		
	1.5-2.75	4.0-5.5	SS	2	2	3	Moist	5.0	
5									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	4.5	8.5-10.0	SS	5	6	7	Moist	9.0	
10									Gray Sandy Lean Clay (CL) - glacial till, low to moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	--/4.0	13.5-15.0	SS	6	7	9	Very Moist		**Water Seepage at 13'**
15									
	--	18.5-20.0	SS	21	39	10	Wet	19.0	
20								21.0	Gray Poorly Graded Sand with Silt and Gravel (SP-SM) - fine to coarse sand, little gravel, few silt
									Gray Sandy Lean Clay (CL) - glacial till, low to moderate plasticity, some sand, few gravel
	4.5	23.5-25.0	SS	6	9	20	Moist		
25								25.0	BOTTOM OF BORING: 25'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B-19**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/9/2025**

GROUND WATER OBSERVATION

6.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	3.0	0.0-1.5	SS	4	3	2	Moist	0.9	Topsoil
	3.5	2.0-3.5	SS	4	5	5	Moist		Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel, contains veins of gray fat clay (CH)
	2.5	4.0-5.5	SS	3	4	4	Very Moist	7.0	
5									
	4.5	8.5-10.0	SS	5	8	7	Moist		Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
10									**Water Seepage at 12'**
								13.0	
	3.0	13.5-15.0	SS	10	6	6	Very Moist		Gray Sandy Lean Clay (CL) - glacial till, moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
15									
	3.75	18.5-20.0	SS	14	8	8	Moist		
								20.0	BOTTOM OF BORING: 20'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B-20**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/9/2025**

GROUND WATER OBSERVATION

10.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	2.0	0.0-1.5	SS	1	2	3	Very Moist	0.7	Topsoil
	3.75	2.0-3.5	SS	3	4	4	Moist		Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
	4.5	4.0-5.5	SS	4	3	4	Moist		
5								7.0	
	4.5	8.5-10.0	SS	6	16	10	Moist		Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
10									**Water Seepage at 13'**
	3.0	13.5-15.0	SS	10	6	8	Moist	13.0	Gray Sandy Lean Clay (CL) - glacial till, low to moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
15								18.0	
	--	18.5-20.0	SS	39	23	21	Very Moist		Gray Poorly Graded Sand with Silt and Gravel (SP-SM) - fine to coarse sand, little gravel, few silt, contains cobbles
								20.0	BOTTOM OF BORING AND AUGER REFUSAL: 20'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **B-21**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/8/2025**

GROUND WATER OBSERVATION

7.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT _____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	1.5	0.0-1.5	SS	3	5	5	Moist	1.0	Topsoil
								1.5	Fill: Brown Sandy Lean Clay mixed with Topsoil
	2.0	2.0-3.5	SS	3	3	4	Moist	3.0	Possible Fill: Heavily Stained Black Lean Clay
	2.5	4.0-5.5	SS	2	2	4	Moist	7.0	Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
	1.0/--	8.5-10.0	SS	5	7	10	Very Moist to Wet	12.0	Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel **Water Seepage at 10'** Clayey Sand (SC) noted from 9.5' to 12'
	3.0	13.5-15.0	SS	8	6	7	Very Moist	17.0	Gray Sandy Lean Clay (CL) - glacial till, low to moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	--	18.5-20.0	SS	30	30	30	Wet	20.0	Gray Poorly Graded Sand with Silt and Gravel (SP-SM) - fine to coarse sand, little gravel, few silt, contains cobbles BOTTOM OF BORING: 20'

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **CH- 1**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/10/2025**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	1.5	0.0-1.5	SS	1	1	2	Very Moist	0.2	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel, contains veins of gray fat clay (CH)
	1.75	2.0-3.5	SS	2	2	3	Very Moist		
	2.0	4.0-5.5	SS	3	3	3	Moist	4.5	
5									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	3.25	8.5-10.0	SS	5	4	6	Moist		
								9.5	
10									Gray Sandy Lean Clay (CL) - glacial till, moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	4.5	13.5-15.0	SS	5	5	8	Moist		
15								15.0	
									BOTTOM OF BORING: 15'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **CH- 2**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/10/2025**

GROUND WATER OBSERVATION

6.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	1.0	0.0-1.5	SS	WH	1	2	Very Moist	0.6	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
									WH = Weight of Hammer
	2.5	2.0-3.5	SS	3	3	3	Moist		
	2.5	4.0-5.5	SS	2	3	4	Moist	5.0	
5									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	1.0/--	8.5-10.0	SS	8	9	8	Wet		**Water Seepage at 9'**
								9.0	
10									Gray Sandy Lean Clay (CL) - glacial till, moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	4.5	13.5-15.0	SS	6	8	9	Moist		
15								15.0	
									BOTTOM OF BORING: 15'

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **CH- 3**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/8/2025**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	1.5	0.0-1.5	SS	1	1	2	Moist	0.6	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel, contains veins of gray fat clay (CH)
	2.0	2.0-3.5	SS	2	3	3	Moist		
	2.5	4.0-5.5	SS	3	3	4	Moist		
5								5.0	
									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	3.0	8.5-10.0	SS	8	9	9	Very Moist		
10								11.0	
									Gray Sandy Lean Clay (CL) - glacial till, moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	4.5	13.5-15.0	SS	5	6	7	Moist		
15								15.0	
									BOTTOM OF BORING: 15'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **G- 1**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/8/2025**

GROUND WATER OBSERVATION

8.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	2.0	0.0-1.5	SS	2	3	3	Moist	0.3	Topsoil
								1.5	Fill: Brown Sandy Lean Clay mixed with Topsoil
	2.5	2.0-3.5	SS	3	3	2	Moist	2.5	Possible Fill: Heavily Stained Black Lean Clay
	2.0	4.0-5.5	SS	2	2	4	Moist	7.0	Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
5	1.0/--	8.5-10.0	SS	2	2	2	Wet		Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
									Water Seepage at 8'
									Clayey Sand (SC) noted at 8'
10								13.0	
	4.0/--	13.5-15.0	SS	4	5	12	Very Moist		Gray Sandy Lean Clay (CL) - glacial till, low to moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
15								15.0	
									BOTTOM OF BORING: 15'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **G- 2**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/10/2025**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	1.5	0.0-1.5	SS	2	2	4	Very Moist	0.4	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
	2.0	2.0-3.5	SS	3	3	5	Very Moist		
	1.5	4.0-5.5	SS	3	3	3	Very Moist	5.0	
5									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	4.5	8.5-10.0	SS	6	9	15	Moist	9.5	
10									Gray Sandy Lean Clay (CL) - glacial till, moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	4.25	13.5-15.0	SS	5	8	12	Moist		
15								15.0	BOTTOM OF BORING: 15'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **G- 3**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/8/2025**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	1.0	0.0-1.5	SS	1	1	2	Very Moist	0.7	Topsoil
	1.0	2.0-3.5	SS	2	2	2	Very Moist		Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
	3.5-4.5	4.0-5.5	SS	5	5	8	Moist	4.5	
5									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	3.5	8.5-10.0	SS	7	11	8	Moist		
10								13.0	
	4.5	13.5-15.0	SS	8	6	8	Moist		Gray Sandy Lean Clay (CL) - glacial till, moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
15								15.0	
									BOTTOM OF BORING: 15'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **P- 1**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/8/2025**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	1.0	0.0-1.5	SS	WH	WH	1	Very Moist	0.5	Topsoil
	1.75	2.0-3.5	SS	2	2	2	Moist		Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel, contains veins of gray fat clay (CH) WH = Weight of Hammer
	3.25	4.0-5.5	SS	3	5	5	Moist		
5								6.5	
	4.5	8.5-10.0	SS	5	6	5	Moist		Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
10								10.0	
									BOTTOM OF BORING: 10'
15									

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **P- 2**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/9/2025**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT _____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	3.0	0.0-1.5	SS	2	2	2	Moist	0.2	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel, veins of gray fat clay (CH)
	2.5	2.0-3.5	SS	3	2	3	Moist to Very Moist		
	2.0	4.0-5.5	SS	2	3	3	Moist to Very Moist	5.0	
5									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	4.0	8.5-10.0	SS	5	7	6	Moist	9.0	
10								10.0	Gray Sandy Lean Clay (CL) - glacial till, moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
									BOTTOM OF BORING: 10'
15									

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **P- 3**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/8/2025**

GROUND WATER OBSERVATION

2.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT _____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	0.75	0.0-1.5	SS	3	3	3	Very Moist		Fill: Stained and Brown Lean Clay to Lean Clay with Sand (CL) - moderate plasticity, few to little sand, contains mulch and wood fragments, rock fragments, and brick fragments
	0.5	2.0-3.5	SS	4	3	2	Wet		**Water Seepage at 2'**
								4.0	
	2.75	4.0-5.5	SS	3	3	5	Very Moist		Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
5									
	NR	8.5-10.0	SS	4	7	8			
10								10.0	
									BOTTOM OF BORING: 10'
15									

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **P- 4**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/8/2025**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT _____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	1.5	0.0-1.5	SS	2	2	2	Moist	0.7	Topsoil
	2.5	2.0-3.5	SS	2	3	2	Moist	6.0	Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel, contains veins of gray fat clay (CH)
5	2.5	4.0-5.5	SS	3	3	3	Moist		
	4.5	8.5-10.0	SS	6	7	13	Moist	10.0	Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
10									BOTTOM OF BORING: 10'
15									

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **P- 5**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/8/2025**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	0.5/--	0.0-1.5	SS	WH	1	12	Very Moist	0.3	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel, rock encountered at 1 foot
									WH = Weight of Hammer
	2.5	2.0-3.5	SS	2	3	4	Very Moist to Moist	3.0	
	3.25	4.0-5.5	SS	5	5	7	Moist		Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
5									
								8.0	
	4.5/--	8.5-10.0	SS	5	8	12	Moist		Gray Sandy Lean Clay (CL) - glacial till, moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
10								10.0	
									BOTTOM OF BORING: 10'
15									

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **SD- 1**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/7/2025**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	0.75	0.0-1.5	SS	WH	WH	1	Very Moist	0.4	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
									WH = Weight of Hammer
	3.0	2.0-3.5	SS	2	3	2	Moist		
	4.0	4.0-5.5	SS	3	3	5	Moist	5.0	
5									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	3.0-4.5	8.5-10.0	SS	3	5	6	Moist	9.5	
10									Gray Sandy Lean Clay (CL) - glacial till, moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	NR	13.5-15.0	SS	7	9	10			
15								15.0	
									BOTTOM OF BORING: 15'

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **SD- 2**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/7/2025**

GROUND WATER OBSERVATION

8.0 FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	1.0	0.0-1.5	SS	1	1	1	Very Moist	0.4	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
	2.0	2.0-3.5	SS	3	3	4	Moist		
	2.5/4.0	4.0-5.5	SS	3	3	5	Moist		
5								5.0	Brown Lean Clay with Sand (CL) - glacial till, moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	--	8.5-10.0	SS	2	3	7	Very Moist to Wet		cobble encountered at 8'
10									frequent layers of silty sand (SM) and clayey sand (SC) noted below 8 feet
	--	13.5-15.0	SS	16	14	20	Wet		**Water Seepage at 13'**
15								15.0	BOTTOM OF BORING: 15'

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **SD- 3**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/8/2025**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	2.0	0.0-1.5	SS	3	2	4	Very Moist	0.4	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel
	2.25	2.0-3.5	SS	3	4	5	Moist		
	4.5	4.0-5.5	SS	4	5	4	Moist	5.0	
5									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	4.5	8.5-10.0	SS	4	6	9	Moist		
10								12.0	
									Gray Sandy Lean Clay (CL) - glacial till, moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	4.25	13.5-15.0	SS	25	40	45	Moist		
									cobble encountered at 14'
15								15.0	
									BOTTOM OF BORING: 15'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **CMHA Refugee Road Housing Development - 3355 Refugee Road - Columbus, OH** BORING NO. **T- 1**

PROJ. SURF. ELEV.

CLIENT **Moody/Nolan, Ltd., Inc.** NO. **25-G-30009** DATE DRILLED **4/8/2025**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	1.75	0.0-1.5	SS	WH	1	1	Very Moist	0.5	Topsoil
									Stained to Brown Mottled Gray Lean Clay (CL) - moderate plasticity, few sand, trace gravel, contains veins of gray fat clay (CH)
	3.5	2.0-3.5	SS	2	2	3	Moist		WH = Weight of Hammer
	2.5	4.0-5.5	SS	3	3	3	Moist		
5								6.0	
									Brown Lean Clay with Sand (CL) - glacial till, low to moderate plasticity, little sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
	4.5	8.5-10.0	SS	4	5	7	Moist		
								9.5	
10									Gray Sandy Lean Clay (CL) - glacial till, moderate plasticity, some sand, few gravel, contains random layers of silt (ML), silty sand (SM), and gravel
									Water Seepage at 10'
	4.5	13.5-15.0	SS	7	6	7	Moist		
15								15.0	
									BOTTOM OF BORING: 15'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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