

PROJECT MANUAL

CANALS EDGE RENOVATION

PREPARED FOR:



COLUMBUS METROPOLITAN HOUSING AUTHORITY

COMMUNITY. COMMITMENT. COLLABORATION.

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SECTION 00 43 25A

SUBSTITUTION PROCEDURES

1.01 GENERAL

- A. This Section applies to substitute products and procedures requested by the Bidder to be added during the Bid period.
 - 1. Substitutions included with the Bid that have not been approved under this Section must be listed on the Substitution Sheet included with the Form of Proposal.
 - 2. 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.
- B. Requirements of this Section are in addition to the requirements of Instructions to Bidders, General Conditions and Supplementary Conditions.
- C. Requirements of this Section are part of the requirements specified in Section 00 43 25B - Substitution Request Form.

1.02 LIMITATIONS ON SUBSTITUTIONS

- A. Substitutions will NOT be considered unless Section 00 43 25B - Substitution Request Form attached in this Project Manual is used and the requirements of this Section and ther Substitution Request Form are fully complied with.
 - 1. Other types of forms are NOT acceptable.
- B. Substitutions will NOT be considered when requested directly by subcontractor or supplier.
- C. Architect will determine the acceptability of all substitutions.

1.03 REQUEST FOR SUBSTITUTIONS

- A. Bidder's Representation
 - 1. Request for substitution constitutes a representation that the Bidder has investigated the proposed product and has determined that it is equal to or superior in all respects to the specified product.
 - 2. Request for substitution constitutes a representation that the Bidder will provide same type of warranty for substitution as for specified product.
 - 3. Request for substitution constitutes a representation that the Bidder will coordinate the installation of the accepted substitute, making such changes

- as may be required for the Work to be complete in all respects.
- 4. Request for substitution constitutes a representation that the Bidder waives all claims for additional costs related to substitutions which consequently become apparent.
- 5. Request for substitution constitutes a representation that the cost data is complete and includes all related cost under his Contract.
- 6. Request for substitution constitutes a representation that the Bidder has thoroughly investigated the proposed substitute to determine if license fees and royalties are pending on the proposed substitute.

B. Request for substitutions shall be submitted on Section 00 43 25B - Substitution Request Form attached in this Project Manual. Legible copies of this form shall be made as required for Bidder's submittals. Each submittal request form shall be complete with data substantiating compliance of proposed substitution with requirements of Contract Documents including the following information:

- 1. Project title and Architect's project number.
- 2. Identification of product specified including specification section and paragraph number.
- 3. Identification of proposed substitute complete with manufacturer's name and address, trade name of product, model or catalog number and product data.
- 4. List of fabricator and supplier (with address and phone number) for proposed substitute.
- 5. The affect of substitution on dimensions, material thickness, wiring, piping, ductwork, etc. indicated in Contract Documents.
- 6. The affect of substitution on other trades.
- 7. The affect of substitution on construction schedule.
- 8. Differences in quality and performance between specified product and proposed product.
- 9. Comparison of manufacturer's guarantees of specified product and proposed substitute.
- 10. Availability of maintenance services and replacement materials for proposed substitute.
- 11. License fees and/or royalties pending on proposed substitute.

1.04 SUBMITTAL PROCEDURES

A. Submit a separate Section 00 43 25B - Substitution Request Form for each substitution.

- 1. Form shall be completely and properly filled in. If form is incomplete, the Architect reserves the right to reject and return form to Bidder for completion and compliance with this section and Form 00 43 25B.
- 2. Submit to Architect two copies of the completed and signed form.

B. Requests for substitutions of products will be considered no later than ten (10) days prior to Bid Opening Date to allow time for Architect's evaluation of

substitutions and the preparation of an addendum, if required.

- C. Architect will issue the Addendum to all Bidders to notify them of the Architect's decision to accept the requested substitution.

END OF SECTION

SECTION 00 43 25B

SUBSTITUTION REQUEST FORMs

GENERAL: This form is part of the substitution requirements specified in Section 00 43 25A.

PROJECT TITLE & NO. _____

TO:MOODY NOLAN INC.

300 Spruce Street, Suite 300

Columbus, Ohio 43215

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

Contact and Email:

ATTN: _____

SPECIFIED ITEM _____

Section _____ Paragraph _____

PROPOSED SUBSTITUTE _____

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

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

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

3. What effect will substitution have on other trades? _____

4. What effect will substitution have on construction schedule? _____

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

6. Manufacturer's guarantees of the specified products and proposed products are:
Same: _____ Different (Explain) _____

8. List (on separate sheet), if applicable, the availability of maintenance services and replacement materials for proposed substitute.
9. List (on separate sheet) names, addresses and phone numbers of fabricators and suppliers for proposed substitutes.
10. There [are ____] [are no ____] license fees and royalties pending on the proposed substitute.
(Explain)

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

SUBMITTED TO BIDDER BY: (Supplier/Fabricator)

Firm _____

Address _____

Name and Title of Person Signing _____

Signature _____

Telephone No. _____ Date _____

SUBMITTED TO ARCHITECT BY: (Bidder)

Firm _____

Address _____

Name and Title of Person Signing _____

Signature _____

Telephone No. _____ Date _____

FAX No. _____ Email _____

12. ARCHITECT/ENGINEER'S REVIEW COMMENTS:

___ Tentatively Accepted
(pending issuance of
Addendum)

___ Rejected due to
incomplete form.

___ Not Accepted

___ Received Too Late

Signature _____

Date _____

Remarks _____

END OF SECTION

SECTION 01 22 00

UNIT PRICES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes administrative requirements and criteria applicable to portions of the work performed under a unit price payment method.

1.02 DEFINITIONS

- A. A unit price is an amount proposed by a bidder and stated on the Bid Form as a price per unit of measurement for materials or services that will be added to or deducted from the Contract Sum by Change Order to the extent that the quantities of work required by the Contract Documents are increased or decreased. In the event greater or lesser quantities of materials are required by the Contract Documents, the Unit Price will be used as the basis for adjustment by Change Order, for the duration of the Contract.
- B. Unit prices are indicated on the Bid Form. Where indicated, refer to individual specification sections for specific information regarding unit prices. A Unit Price schedule is included at the end of this Section. Specification sections referenced in this section contain the specifications for materials and methods described under each unit price.

1.03 DESCRIPTION OF REQUIREMENTS

- A. Include in the total bid amount all unit prices stated in the Contract Documents.]
- B. Requirements of the Work related to Unit Prices are specified in the Contract Documents and indicated on the Bid Form. The work associated with unit prices is over and above that which is identified on the Contract Documents which is base bid or alternate work.
- C. Work associated with unit prices is to be performed only with the prior approval of the Architect. No credit will be given for work performed under a unit price without such prior approval and verification of actual quantity of work completed.

1.04 MEASUREMENT AND PAYMENT OF UNIT PRICES

- A. Take all measurements and compute quantities. The Architect will verify measurements and quantities. Provide necessary equipment and assist in the verification of measurements and quantities.
 - 1. Measurement by Weight: Measured by handbook or scaled weight.

2. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.
 3. Measurement by Area: Measured by square dimension using mean length and width or radius.
 4. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.
- B. Unit Quantities: Quantities and measurements indicated in the Form of Proposal are for bidding and contract purposes only. Quantities and measurements supplied or placed in the work and verified by the Architect shall determine payment.
- C. Unit Price Includes: Full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; and including overhead and profit.
- D. Payment will not be made for materials wasted or disposed of in a manner that is not acceptable, materials remaining on hand after completion of the work, or installation of materials beyond the lines and levels of the required work.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 UNIT PRICES

- A. Water heater: Provide a unit price for one 40 gallon water heater and installation to match as noted on drawings in case we add another water heater or would remove a water heater from the schedule.
- B. Furnace: Provide a unit price for one HVAC system and installation including furnace, cooling coil, condenser and flushing the refrigerant lines to match as noted on the drawings in case we add or remove any HVAC systems. Include electrical demo and new work for the unit cost.
- C. Garage Door: Provide a unit price for one garage door replacement including all demolition, door and operator, trim replacement and accessories required for complete installation.

END OF SECTION

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.
1. 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.
 2. 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.
- B. 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.
- C. 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.

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.

1.02 SCHEDULE OF ALTERNATES

A. Contract Alternates

1. Alternate No. 1: Canopy

- a. This alternate involves all work of foundations, structural, accessories and finish, as indicated on drawings.

END OF SECTION

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. Administrative and supervisory personnel.
 - 2. Requests for Interpretation (RFIs).
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will 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.

1.03 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. 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.

1.04 SUBMITTALS

- A. Key Personnel Names: Within 15 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 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.

1.06 REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 2. 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 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.
- 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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 Architect.
- C. Attendance
 - 1. Owner's Representative
 - 2. Architect and Consultants

3. Major Subcontractors
4. Major Suppliers

D. Agenda: Discuss items of significance that could affect progress, including the following:

1. Tentative construction schedule.
3. Critical work sequencing and long-lead items.
4. Designation of key personnel and their duties.
5. 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.

END OF SECTION

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. 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.
- C. General Contractor: Provide a coordinated project construction schedule for the entire work.

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.

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 submission 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. Job site file.
 - 2. Subcontractors.
 - 3. Owner.
 - 4. Architect.
 - 5. Other concerned parties.

END OF SECTION

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. Submittals as approved 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. Make all submittals far enough in advance of scheduled dates for installation to provide sufficient time for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery.
 1. 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.
 2. 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. Electronic Files: At Contractor's written request, copies of Architect's electronic files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:

- 1. Execute Electronic File Transfer Agreement provided by the Architect to obtain files.
- 2. The electronic files 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 electronic files is current. All dimensions must be field-verified.

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 approved 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 approved 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.
 - 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 approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - 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: See Section 01 32 16, Construction Schedules.

G. Schedule of Values and Application for Payment: See Section 01 29 00, Payment Procedures.

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: See Section 01 45 29, Testing Laboratory services.

B. Coordination Drawings: See Section 01 31 21, Coordination Drawings.

- C. Contractor's Construction Schedule: See Section 01 32 16, Construction Schedules.
- D. 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.
- E. 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.
- F. 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.
- G. 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.
- H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- J. 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.
- K. 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.
- L. 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.

- M. 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.
- N. 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.
- O. 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.
- P. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. See Section 01 78 23, Operation and Maintenance Data.
- Q. 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.
- R. 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.
- S. 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.
- T. 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.
- U. 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.

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 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. Approval of a specific item does not indicate approval 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. REVIEWED
 - 2. APPROVED
 - 3. APPROVED AS CORRECTED
 - 4. REVISE AND RESUBMIT
 - 4. REJECTED.
- 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

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 PROJECT CONDITIONS

- A. This Section is not intended to limit types and amounts of temporary construction facilities and controls required. Omission from this Section will not be accepted as an application that such temporary activity is not required for successful completion of the work and compliance with requirements of the Contract Documents.
- B. Provide and maintain each temporary construction facility and control when required for proper performance of the work. Terminate and remove when no longer needed or when permanent facilities, with proper authorization, are available for use.
- C. Obtain and pay for all required applications, fees, permits and inspections required for temporary construction facilities and controls.
- D. Install, operate, maintain and protect temporary construction facilities and controls in a manner and at locations which are safe, non-hazardous, sanitary and adequately protect project work, workmen and the public.

1.02 COST OF CONSUMED UTILITIES

- A. Water Service Use Charges: Water consumed during construction from the Owner's existing system is to be used without metering and without payment of use charges.
- B. Electric Power Service Use Charge: Electric power consumed during construction from the Owner's existing system is to be used without metering and without payment of use charges.

1.03 REQUIREMENTS OF REGULATORY AGENCIES

- A. Provide and maintain all temporary facilities in compliance with governing rules, regulations, codes, ordinances and laws of agencies and utility companies having jurisdiction over work involved in project.
- B. Be responsible for all temporary work provided, and obtain any necessary permits and inspections for such work.
- C. Contractors shall confine equipment, storage of materials, and operation of workmen to the limits indicated or directed and shall abide by law, ordinances,

conditions stated in permits and directions of the Architect.

- D. Do not interfere with normal use of roads in vicinity of project site except as indicated or as absolutely necessary to execute required work, and then only after proper arrangements have been made with authorities having jurisdiction, including traffic control as applicable.

1.04 SPECIAL PRECAUTIONS AND REQUIREMENTS

- A. Do not interfere with normal use of occupied areas in existing buildings, existing driveway access to existing building and existing building utility services, except as absolutely necessary to execute required work involving such facilities, and then only after proper arrangements have been made through the Owner with persons in charge of existing facilities.
- B. Do not block required exits from existing buildings.

1.05 TEMPORARY FIELD OFFICES, TRAILERS AND TELEPHONE

- A. General: Provide and maintain clean field office area for his use, his Subcontractor's Agents and the Architect, at which location he/she or his/her authorized agent shall be present, or to which either may be readily called at all times while the work is in progress. Located where directed by the Architect.
- B. Copies of permits, approved shop drawings, plans and specifications marked up-to-date with all revisions and all addenda shall be kept at said offices areas ready for use at all times.
- C. All expenses in connection with Contractor's field offices, including the installation cost and use of telephones, shall be borne by the Contractor.
- D. Maintain field office areas until final acceptance and then remove, unless the Architect orders or approves earlier removal.
- E. Pay all costs, including utility installation costs to the field office.
- F. Provide and maintain such additional storage trailers on the project as required. Located where directed by the Architect.
- G. Contractor may be required to relocate their offices, as directed by Architect, during construction as work progresses.

1.06 TEMPORARY SANITARY FACILITIES

- A. Provide temporary portable toilets, acceptable to public health authorities, as required to service the project. Maintain in a clean, sanitary condition. Locate as directed by Architect.

1.07 TEMPORARY LIGHT AND POWER

- A. Provide necessary temporary electrical service and temporary wiring and outlets as required to meet project needs for temporary lighting and power at the start of the project, as work progresses and until acceptance by the Owner, excluding power to individual contractor's trailers.

1.08 CONSTRUCTION AIDS

- A. Shoring and Bracing: Provide all shoring and bracing required for safety and proper execution of their work. Remove these items when the work is completed.

1.09 WATCHMAN SERVICE

- A. If Contractor considers watchman services necessary or desirable for protection of his/her own interest, such services may be employed at his/her own complete expense.

1.10 SAFETY

- A. Safety requirements shall be in accordance with the General Conditions.
- B. Provide and maintain guard lights at all barricades, railings, obstructions in the roadways or sidewalks and at all trenches or pits adjacent to walks or roadways.
- C. Strict attention and full adherence must be given the Williams-Steiger Occupational Safety and Health Act of 1970, U.S. Department of Labor.

1.11 SECURITY CONDITIONS

- A. Security of building must be maintained during "non-standard" working hours (premium time). This includes, but is not necessarily limited to, verifying all entrance doors and windows are secured.
- B. Contractor shall be responsible for all infractions of rules and regulations by his workers.
- C. Loitering or wandering through not connected with the project or into other buildings on site will not be permitted.

1.12 DUST CONTROL

- A. Control dust originating within project limits using water or a dust palliative acceptable to the Architect. When conditions create blowing dust and dirt that is considered higher than that normally encountered, Contractor shall cooperate with Architect in determining methods to help minimize blowing. This may involve, as a minimum, more frequent applications of dust palliative. Calcium chloride may not be used.

1.13 PARKING

- A. Employees of Contractors and subcontractors must park vehicles in areas assigned to them. Parking on streets or in restricted areas is prohibited.

END OF SECTION

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.

1.02 RELATED SECTIONS

- A. 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.

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.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected. Reject damaged and defective items.

- B. 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.

C. 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.

- D. 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.
- E. 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.
 - 2. 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.

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.
 - 1. 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.
 - 2. 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.
 - 3. 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.

Architect will determine whether the proposed comparable product is acceptable. Architect is not obligated to prove non-equivalence of proposed comparable products.

- F. 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.
- G. 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.
- H. 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.

2.03 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.

PART 3 EXECUTION

Not Applicable

END OF SECTION

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.

1.02 RELATED SECTIONS

- A. Cutting and Patching: Section 01 73 29.
- B. Shop Drawings, Product Data and Samples: Section 01 33 23.
- C. 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.

1.05 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.

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 be 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.

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.

END OF SECTION

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.
- D. Do not cut or alter Work of another Contractor without written consent of Architect.

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: Cut or drill from the exposed or finished side into concealed surfaces.
- 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.
 2. 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.
 3. 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. 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.

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.

SECTION 01 74 00

CLEANING

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

- A. Refer to General Conditions for additional 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 Prime 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. 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.
- E. 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.

- F. Clean interior surfaces before start of finish painting and continue cleaning on an as-needed basis until painting is finished.
- G. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces.
- H. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.
- I. 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.
- J. Protect interior of ductwork during construction from accumulation of dirt, dust or debris.
- K. Clean trash from all chases and concealed spaces before final enclosure.

3.01 PROGRESS CLEANING

- A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
- B. General Contractor
 - 1. Provide, maintain and empty 55 gallon metal and dumpster type containers for collection of waste materials, debris and rubbish. Locate containers as directed in General Conditions. These containers will be utilized by all Prime Contractors and their subcontractors.
 - a. 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.
 - 2. At reasonable intervals during progress of Work, but in no case less than once a week, dispose of waste materials, debris and rubbish.
 - 3. Direct Special Attention To:
 - a. Provide non-staining layout lines and other markings on masonry and concrete. Use chalk lines wherever possible and remove when no longer needed.
 - b. Remove all stains from concrete surfaces, including floors.
 - c. Shop marks shall not appear on exposed surfaces of any item.
 - d. Remove concrete, mortar and paint spatters.
 - e. Clean both brick and concrete unit masonry.
 - f. Protect aluminum frames during construction and thoroughly clean upon completion of the installation.
 - 4. Clean interior surfaces before start of finish painting and continue cleaning on an as-needed basis until painting is finished.
 - 5. 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.

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

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. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
- G. 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.
- H. Remove temporary protection and labels not required to remain
- I. Clean surfaces of equipment; remove excess lubrication.
- J. Remove debris, rubbish, dirt, etc. from open concealed spaces, chases and above ceilings.
- K. Repair, patch and touch-up marred surfaces to specified finish, to match adjacent

surfaces.

- L. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.
- M. Remove waste, foreign matter, and debris from roofs, gutters, areaways, and drainage systems.
- N. Clean plumbing fixtures to a sanitary condition.
- O. Clean light fixtures and lamps; polish lenses.

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. Contractor Requirements
 - 1. Conform to requirements of General Conditions.
 - 2. Employ experienced workmen, or professional cleaners for final cleaning.
 - 3. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.
 - 4. 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.
 - 5. 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.
 - 6. Sweep concrete floors broom clean in unoccupied spaces.
 - 7. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - 8. 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.
 - 9. Clean finishes free of dust, stains, films and other foreign substances.
 - 10. Clean transparent and glossy materials to a polished condition; remove foreign substances. Polish reflective surfaces to a clear shine.
 - 11. Remove temporary protection and labels not required to remain
 - 12. Clean surfaces of equipment; remove excess lubrication.
 - 13. Remove debris, rubbish, dirt, etc. from open concealed spaces, chases and above ceilings.
 - 14. Repair, patch and touch-up marred surfaces to specified finish, to match

- adjacent surfaces.
 - 15. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.
 - 16. Remove waste, foreign matter, and debris from roofs, gutters, areaways, and drainage systems.
 - 17. Clean plumbing fixtures to a sanitary condition.
- C. 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

SECTION 02 41 19

SELECTIVE BUILDING DEMOLITION

PART 1 GENERAL

1.01 SUMMARY OF WORK

- A. Work Included: The extent of demolition work is indicated on drawings, and includes, but is not necessarily limited to, the following:
1. Selective breaking up, dismantling and/or removal of existing building items.
 2. Salvage of selected existing materials to be turned over to Owner as may be determined by the Owner or to be reused in the project.
 3. Cutting and patching.
 4. Clean up.
- B. Removal of asbestos and other hazardous materials is not a part of this Contract. If asbestos or other hazardous materials are encountered during demolition, Contractor shall halt demolition operations in that area and notify Architect.

1.02 RELATED SECTIONS

- A. Cutting and Patching: Section 01 73 29.

1.03 PROJECT CONDITIONS

- A. Condition of Structures: The Owner assumes no responsibility for actual condition of structures to be demolished.
1. Conditions existing at time of inspection for bidding purposes will be maintained by Owner insofar as practicable. However, variations within the structure may occur by Owner's removal and salvage operations prior to the start of the Demolition work.
 2. It is solely the Contractor's responsibility to determine demolition procedure and sequence and to insure the safety of the building and its component parts during demolition. This includes the addition of whatever shoring, sheeting, temporary bracing, guys or tie-downs which might be necessary. Such material shall maintain the Contractor's property after completion of the project.
 3. It is solely the Contractor's responsibility to follow all applicable safety codes and regulations during all phases of the work.
 4. Existing Building: Provide temporary supports and other measures as required to prevent damage to the existing building during construction. Field verify all existing dimensions which affect the new construction.

B. Coordination

1. Demolition sequence, phasing and methods must be approved by Architect prior to start of demolition work.
2. Coordinate shoring with structural modifications. Shoring to be left in place until completion of structural work permits its removal.

C. Title to Removed Property

1. All removal items, unless otherwise indicated for salvage or reuse will become the property of the Contractor and shall be removed from the Site. During the demolition operations, Owner reserves the right to add to, or delete from, the list of items designated for reuse or salvage.
2. Items to be salvaged for the Owner or for reinstallation are as indicated on the drawings.
3. Site storage or sale of Contractor owned removed items will not be permitted.

D. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

E. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

F. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

G. Traffic: Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks and other adjacent occupied or used facilities.

1. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.
- H. Protections: Ensure safe passage of persons around area of demolition. Conduct operations to prevent injury to adjacent buildings, structures, other facilities, and persons.
- I. Damages: Promptly repair damages caused to adjacent facilities by demolition operations at no cost to Owner.
- J. Utility Services
 1. Locate and identify electrical and mechanical services passing through or located within affected area and serving areas outside the work limits.
 2. Maintain existing utilities and protect against damage during demolition operations.
 3. Shut-down periods
 - a. Arrange timing of shut-down periods of all in-service utilities with the Owner. Do not shut down any utility without prior written approval.
 - b. Keep shut-down period to a minimum or use intermittent period as directed.
 - c. Some shut-down hours may be required after normal working hours. No extra compensation will be made for Work after normal working hours, weekends or holidays.
- K. Scheduling: Conduct work so as to avoid interference with operations and work in areas of building which are to remain in service.
- L. Permits, Fees and Inspections: Obtain and pay for all permits, fees and inspections required by governing authorities.

PART 2 PRODUCTS

2.01 MATERIALS

- A. The Contractor shall furnish all materials, tools, equipment, supplies and labor required to perform the work in accordance with the Drawings and Specifications and within the time limits as specified. All work done under this contract shall conform to all current standards, building codes and ordinances. American National Standard for Demolition Operations – Safety Requirements, ANSI A10.6 (latest edition), is included by reference.
- B. Shoring Materials: As determined by Contractor.

PART 3 EXECUTION

3.01 PROTECTION

- A. Use water sprinkling, temporary enclosures and other approved methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level. Comply with governing regulations pertaining to environmental protection.
 - 1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, pollution and electrical shock.
 - 2. Clean adjacent structures and improvements of dust, dirt and debris caused by demolition operations, as directed by the Architect. Return adjacent areas to conditions existing prior to the start of the work.
- B. In removal of existing materials, take care not to damage work remaining in place, salvageable materials or equipment. Repair or replace any existing construction, materials or equipment damaged during demolition to Owner's satisfaction at no additional cost.
- C. Erect dust chutes and use for removal of materials, rubbish and debris.

3.02 DEMOLITION

- A. Building Items Demolition
 - 1. General
 - a. Items specified herein or indicated on drawings.
 - b. Where indicated to be removed and either turned over to Owner or reinstalled, use methods for removal which will provide the least potential adjacent materials to remain.
 - c. Miscellaneous Items: Material or equipment encountered during construction which must be removed to aid in construction
- B. Electrical
 - 1. Disconnect or shut off service to areas where electrical work is to be removed.
 - 2. Remove all electrical fixtures, equipment and related switches, outlets, conduit, wiring and appurtenances as indicated, except conduit in walls and ceilings not being removed may remain. If these conduits are left in place, cut ends are to be permanently sealed.

3.03 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Remove from site, debris, rubbish and other materials resulting from demolition operations.
- B. Removal: Transport materials removed and dispose of off site except as follows:
 - 1. Transport material indicated to be "salvaged" to storage areas as directed by Architect. Storage areas are located on-site.
 - 2. Store salvaged materials, protected from dirt and damage.

C. Clean Up

1. Leave interior areas "broom clean".
2. Remove barricades as directed.
3. Remove shoring.

END OF SECTION

SECTION 06 65 00

PLASTIC 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): 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.
 - d. 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 D 570
 - b. Tensile Strength psi: 3500 ASTM D 638
 - c. Tensile Modulus psi: 100,000 ASTM D 638
 - d. Flexural Strength psi: 5100 ASTM D 790

- e. Flexural Modulus psi: 215,000 ASTM D 790
- f. Nail Hold Lbf/in of penetration: 300+ ASTM D 1761
- g. Screw Hold Lbf/in of penetration: 240+ ASTM D 1037
- h. Staple Hold Lbf/in of penetration: 69+ ASTM D 1037
- j. 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 undamaged. 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

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 REFERENCES

- A. American Society for Testing and Materials
 - 1. ASTM D 1970 - Standard Specification for Self-Adhering Modified Bituminous Steep Roofing Underlayment.
 - 2. ASTM D 3018 - Standard Specification for Class A Shingles Surfaced with Mineral Granules.
 - 3. ASTM D 3161 - Standard Test Method for Wind-Resistance of Asphalt Shingles.
 - 4. ASTM D 3462 - Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.
 - 5. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
 - 6. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings.
 - 7. ASTM E 2178 - Standard Test Method for Air Permeance of Building Materials
- B. International Code Council (ICC)
 - 1. AC 48 - Acceptance Criteria For Roof Underlayment For Use In Severe Climate Areas.
 - 2. AC 207 - Acceptance Criteria for Polypropylene Roof Underlayments.

1.04 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 E 108/UL 790 Class A Fire Resistance.
 - 2. ASTM D 3161/UL 997 Type I Wind Resistance.
 - 3. ASTM D 3462.
- 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.

1.05 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.

PART 2 PRODUCTS

2.01 ASPHALT GLASS FIBER ROOFING SHINGLES

- A. Type: Glass fiber mat base; ceramically colored/UV resistant mineral surface granules across entire face of shingle; self-sealing type.
- B. Conformance: ASTM D3018 Type I - self-sealing; UL Certification of ASTM D3462; UL 997 Wind Resistance and UL Class A Fire Resistance.
- C. Color: As selected by Architect.
- D. Warranty: 40 year minimum.
- E. Style and Manufacturer: Dimensional style - Timberline 40 by GAF with Timbertex hip and ridge. Products by CERTAINTEED, GEORGIA-PACIFIC or ELK CORPORATION are acceptable providing they meet the requirements specified.

2.02 ROOFING FELT - UNDERLAYMENT

- A. Type: Asphalt-saturated felt. ASTM D4869, Type I.
- B. Weight: 15 lbs per 100 square feet.
- C. Size: 36 inch minimum roll width.

2.03 SELF-ADHERED UNDERLAYMENT

- A. Material: Polyethylene sheet backed rubberized asphalt membrane, 40 mils thick.

Provide primer as recommended by membrane manufacturer.

- B. Conformance: ASTM D1970.
- 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.

2.04 ACCESSORIES

- A. Nails: 11 ga., 1-1/4 inch long (ridge 1-1/2 inch long), 7/16 inch diameter head, galvanized. Use longer nails where additional roofing material is used or if required by manufacturer. Staples not permitted.
- B. Roofing Cement: Asphalt roofing cement as recommended by roof product manufacturer; ASTM D4586.

2.05 SHINGLE RIDGE VENT

- A. Vent Material: High density linear polyethylene; .08" thick with weather filter.
- B. Length: Continuous along each ridge, unless otherwise indicated on drawings.
- C. Color: As selected by Architect.
- E. High Point Roof Vent System by NORTH AMERICAN BUILDING PRODUCTS or Shinglevent by AIR VENT, INC. (CERTAINTEED) or equal.

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. Secure flange with nails spaced 8 inches on center.
- B. Apply eave protection shingle underlayment in accordance with manufacturer's instructions.
- C. Extend eave protection membrane minimum 24 inches 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. 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; end laps a minimum of 4 inches, and hips a minimum of 6 inches.
 - b. Secure felt underlayment to deck with roofing nails 1 inch in from edge and 12 inches 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.
 - 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. Lap ends not less than 6 inches staggered 24 inches 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 beyond interior face of exterior wall.
 - b. Rakes: Extend from edges of rake 24 inches beyond interior face of exterior wall.
 - c. Valleys: Extend from lowest to highest point a minimum of 18 inches on each side.
 - d. Hips: Extend 18 inches on each side.

- e. Ridges: Extend 36 inches on each side without obstructing continuous ridge vent slot.
- f. Sidewalls: Extend beyond sidewall 18 inches, and return vertically against sidewall not less than 4 inches.
- g. Dormers, Chimneys, Skylights, and Other Roof-Penetrating Elements: Extend beyond penetrating element 18 inches, and return vertically against penetrating element a minimum of 4 inches.
- h. Roof Slope Transitions: Extend 18 inches 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 prefabricated metal flashing material.

3.06 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 per shingle as recommended by shingle manufacturer. Should any nail fail to penetrate solid decking, drive an additional one nearby.]
- 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

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 as indicated on drawings or required for a complete installation.
 - 1. Types: As indicated on Drawings
 - 2. Accessories: Gable louvers

1.02 RELATED SECTIONS

- A. Flashing: Section 07600.
- B. Fiber Cement Siding: Section 07463.

1.03 REFERENCES

- A. ASTM: American Society for Testing and Materials.

1.04 SUBMITTALS

- A. Samples: Submit minimum 9" long by full width sample of siding showing finish, pattern, color, gage and profile.

1.05 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.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Specifications and Drawings based on CERTAINTEED.

2.02 SIDING, SOFFIT AND TRIM

- A. Siding and Soffit - General Requirements: Polyvinyl chloride products with the following characteristics:
 - 1. Siding: Comply with ASTM D 3679, Class 2.

2. PVC cell classification in accordance with ASTM D 1784: 13334.
3. Coefficient of linear expansion in accordance with ASTM D 696: .000029 inch per inch per degree F.
4. Tensile strength when tested in accordance with ASTM D 638: Minimum 7,100 pounds per square inch.
5. Modulus of elasticity when tested in accordance with ASTM D 638: Minimum 360,000 pounds per square inch, average.
6. Izod impact, standard 1/8 inch bar when tested in accordance with ASTM D 256: 3.30 foot-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 D 648: 170 degrees F, 264 pounds per square inch.
10. Smoke density rating when tested in accordance with ASTM D 2843: 48 percent, average.
11. Horizontal flammability, when tested in accordance with ASTM D 635:
 - a. Burn distance: 20 mm.
 - b. Burn time: Less than 5 seconds.
12. Surface burning characteristics when tested in accordance with ASTM E 84: Flame spread less than 20, fuel contribution 0, smoke density 400.
13. Fire Resistance - Siding: 1 hour, when tested in accordance with ASTM E 119, 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 and Type: Match existing adjacent.

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.

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 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.
- B. 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

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide flashing and sheet metal work as shown and specified. Work includes:

1. Gutters, and downspouts including brackets and supports.
2. Fasteners, sealants, solder and accessories to complete the work.
3. Gutterguards

1.02 QUALITY ASSURANCE

A. Comply with Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) "Architectural Sheet Metal Manual" recommendations for fabrication and installation of the work.

B. Reference Standards

1. American Society for Testing and Materials (ASTM).
2. American Architectural Manufacturers Association (AAMA)
 - a. AAMA 2605; Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing High Performance Organic Coatings on Architectural Extrusions and Panels.
3. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA):
 - a. SMACNA "Architectural Sheet Metal Manual".
4. Single Ply Roofing Industry: SPRI ES-1, Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.

C. Subcontractor: Subcontract sheet metal associated with roofing as a part of the roofing contract for undivided responsibility.

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.

F. 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.

1.03 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. Gutter and downspout construction, including brackets, supports and gutter expansion joints.
- 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.

1.04 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.

1.05 WARRANTY

- A. Contractor's warranty required for roofing system work shall include all related roof flashing and sheet metal work.
- 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 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
 - 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.
- b. Concealed Surfaces: Can be manufacturer's standard coating for concealed surfaces.
3. 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. Miscellaneous Flashing (not otherwise identified): .032".
- B. Miscellaneous Flashing - Not Exposed to View: Galvanized steel, ASTM A653 G60. Mill phosphatized for paint adhesion. 0.0276". minimum unless otherwise indicated.
- C. Gutterguards: 024" solid aluminum interlocking panels with nose-forward channels designed to fit directly to any standard 5" or 6" gutter. Provide all accessories for complete installation.
1. Finish: Baked on powder coat enamel
 2. Drainage Capacity 6-8 inches rainfall/hour
 3. Basis of Design: EGUTTER LeafPro XL

2.03 FABRICATION

- A. Shop fabricate sheet metal work to comply with standard industry standards as shown by SMACNA in the "Architectural Sheet Metal Manual."
- 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.
 2. Provide downspout outlets as indicated on drawings.
- H. Downspout: Form to size and shape detailed or comply with (SMACNA) recommendations if not indicated.

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.

END OF SECTION

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. around exterior trim, windows, door frames and other penetrations or openings in exterior walls
 - 2. threshold bedding
 - 3. 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.
- F. Sealing between wall and wall mounted plumbing fixtures and floor and floor mounted plumbing fixtures.
- G. Latex type caulking of interior static joints.

1.02 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.

1.03 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.

B. Submit manufacturer's color chart for color selections.

C. 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.

1.04 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.

1.05 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.
- C. Comply with these specifications for repair or replacement of work.

1.06 TESTING

- A. 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.
- B. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
- C. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with masonry substrates.
- D. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

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:
 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.
 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: BOSTIK; DOW CORNING CORPORATION; EUCLID CHEMICAL; TREMCO MANUFACTURING COMPANY; GENERAL ELECTRIC COMPANY/MOMENTIVE; SIKA CHEMICAL CO.; MAMECO INTERNATIONAL; MASTER BUILDERS SOLUTIONS; VULCHEM: SOPREMA CHEMLINK.

1. 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. 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. SIKA SL 2
 - d. TREMCO THC 900/901

- C. 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

- D. 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

E. 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. TREMCO Tremsil 200
 - e. PECORA 898 Sanitary Sealant

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 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.

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

SECTION 08 36 13

SECTIONAL DOORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Section includes:

1. Steel sectional overhead doors, motor operated.
2. Operating hardware, tracks and supports.
3. Electric operators and controls.
 - a. Wireless remote controls.

1.02 RELATED SECTIONS

A. Unit Price: Section 01 22 00

B. Electrical: Division 26.

1.03 REFERENCES

A. American National Standards Institute (ANSI)

1. ANSI/DASMA 102 Specifications for Sectional Overhead Type Doors (ANSI A216.1 published in National Garage Door Manufacturers Association Bulletin 102).

B. American Society for Testing and Materials (ASTM)

1. ASTM A653: Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM B221: Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire

1.04 SYSTEM DESCRIPTION

A. Design Requirements

1. Furnish sectional overhead doors that comply with ANSI/DASMA 102.
2. Wind Loading: Design and reinforce sectional overhead doors to comply with ANSI/DASMA 102 criteria for wind loading.

1.05 SUBMITTALS

- ###### **A. Shop Drawings: Fully dimensioned and detailed drawings showing complete installation with components, materials and finishes, and accessories indicated.**

- B. Samples for Color Selection: Submit samples of door manufacturer's full range of metal finish colors on 4" x 6" piece of standard base metal.
- C. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- D. Quality Control Submittals
 - 1. Certificates: For review and approval, submit manufacturer's written certificates indicating that doors comply with specified design criteria of ANSI/DASMA 102.
 - 2. Installer Qualifications: For review and approval, submit installer's written statement of compliance with installation experience requirement.

1.06 QUALITY ASSURANCE

- A. Provide each sectional overhead door as a complete unit produced by one manufacturer, including frames, sections, brackets, guides, tracks, counterbalance mechanisms, motor operator, controls, hardware and installation accessories to suit openings and allowable headroom.
- B. Provide sectional overhead door units by one manufacturer for entire project.
- C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- D. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.07 WARRANTY

- A. Provide manufacturer's standard 2-year product warranty covering door sections.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Warranty Period: 10 years.

PART 2 PRODUCTS

2.01 RESIDENTIAL GRADE STEEL DOOR SECTIONS

- A. Construct door sections including face sheets and frames from zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A653, minimum G60 coating designation.
- B. Door Assembly:
 - 1. 24 or 25 gauge one layer steel construction
 - 2. Tongue-and-groove/shiplap section joints
 - 3. Replaceable bottom weatherseal in a corrosion-resistant retainer
 - 4. Nylon rollers are smooth and quiet.
 - 5. Galvanized steel hinges
- C. Reinforce sections with reinforcement, as required to stiffen door and for wind loading. Provide galvanized steel bars, struts, trusses, or strip steel, formed to depth and bolted or welded in place.
- D. Provide reinforcement for hardware attachment.
- E. Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints and free of warp, twist, and deformation.
- F. Door Finish:
 - 1. Baked-Enamel or Powder-Coated Finish: Color and gloss as selected by Architect from manufacturer's full range .
 - 2. Finish of Interior Facing Material: Finish as selected by Architect from manufacturer's full range .
- G. Basis of Design: CLOPAY Classic

Other Manufacturers: Subject to compliance with requirements, provide doors by OVERHEAD DOOR COMPANY, HAAS, COOKSON, WAYNE DALTON or ARM-R-LITE.

2.02 ACCESSORIES

- A. Hardware: Provide duty, rust-resistant hardware, with galvanized, cadmium plated, or stainless steel fasteners, to suit type of door.

2.03 ELECTRIC DOOR OPERATOR

- A. General: Provide electric door operator assembly of size and capacity recommended and provided by door manufacturer; complete with electric motor and factory-prewired motor controls remote control stations and accessories required for proper operation.

- B. **Door Operator Type:** Chain Drive Wi-Fi Garage Door Opener with Integrated Bluetooth Technology. 1/2 Horsepower AC, 1,625 RPM, automatic thermal protection, permanent lubrication
- C. **Mechanics**
 - 1. Steel chassis, T-rail and trolley, full chain drive mechanism (16:1 gear reduction and adjustable door arm)
 - 2. Auto-force adjustment for changing weather and environmental conditions
 - 3. Electronic limits for easy setup
 - 4. AC Wi-Fi logic board with built-in surge suppressor (for replacement logic boards, order part 050ACTB)
- D. **Power:** 120V AC, 60 Hz voltage, 2.7A current rating, UL® Listed, 4' power cord
- E. **Speed:** 7" per second upward, 7" per second downward
- F. **Lighting:** Max. 2 100-watt lightbulbs; Solid-state light delay; Adjustable time; Enhanced CFL (compact fluorescent) compatible, max. 26 watts.
- G. **Controls**
 - 1. Provide momentary-contact, 3-button control station labeled "open", "close" and "stop" installed at location shown.
 - 2. Provide remote control units to operate door.

PART 3 EXECUTION

3.01 INSPECTION

- A. Installer must examine the supporting structure and the conditions under which the work is to be performed and notify the General Contractor in writing of conditions which are detrimental to proper and timely completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.02 INSTALLATION

- A. Install door and operating equipment complete with necessary hardware, tracks, anchors, inserts, hangers and equipment supports in accordance with drawings and manufacturer's instructions and recommendations.

3.03 FIELD ADJUSTMENT

- A. Upon completion of installation including the work by other trades, test and adjust doors to operate easily, free from warp, twist or distortion.

END OF SECTION

SECTION 08 53 13

VINYL WINDOWS

PART 1 GENERAL

1.01 SCOPE

- A. Provide exterior vinyl single hung windows. Types include fixed and sliding.
 - 1. Glass and glazing.
 - 2. Anchors, fasteners, flashings, trim and accessories to complete the work.
- B. Work includes removal of existing windows, preparation of existing substrates and flash new window to existing construction.

1.02 RELATED SECTIONS

- A. Sealant: Section 07 92 00.

1.03 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. Reference Standards: Wherever the following abbreviations are shown herein, they shall refer to the corresponding standard:
 - 1. AAMA: American Architectural Manufacturers Association.
 - 2. ASTM: American Society for Testing and Materials.
- C. Manufacturer: Minimum 5 years experience in manufacture of heavy intermediate steel windows similar to type required for this project.
- D. Existing Conditions: Installer shall visit project site and measure each opening slated for installation of new sash. Size of unit to be reinstalled into existing opening shall be determined by installer and manufacturer based on actual field conditions.
- E. Certification: All windows to be National Fenestration Rating Council (NFRC) certified.
- F. All windows to be Energy Star-rated

1.04 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.

1.05 SAMPLE INSTALLATION

- A. Provide sample installations at 2 locations (1 at siding and 1 at brick) to determine acceptability of installation methods and quality of workmanship. Adjustments in materials and methods may be required by the Owner for compliance with the intent of the Contract Documents and existing opening conditions.
- B. Once the approval process is complete, the approved sample installation, modified as needed, will represent minimum installation quality for the work.
- C. Sample installation can be used in the finished work, when approved as such by the Owner.
- D. Window unit used for sample installation to be selected by Owner.

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 SLIDING WINDOW

- A. Manufacturer: Drawings and specifications are based on SIMONTON Series 5500 Reflections windows.
 - 1. Other Manufacturers: Vinyl windows by others are acceptable provided the type and performance are an acceptable match as approved by the OWNER 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.
- B. Type: Units complying to AAMA 101 for R50 specifications.
 - 1. Design Pressure (Performance Class): 40 psf.

2. Structural Test Pressure (Design Pressure x 1.5): 75 psf.
3. Water Resistance Test Pressure - ASTM E547: 7.5 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.
 - a. Mullions: Factory mullied.
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 minimum 3/4 inch thick insulating glass.
5. Weatherstripping: Provide around entire perimeter of all operating sash.
6. Screens:
 - a. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
 - 1) Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.
 - b. Base Bid: 18-by-16 mesh fiberglass fabric, roll formed aluminum frame, finish to match window. Comply with ASTM D 3656.

D. Hardware

1. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
2. Limit Devices: Limit devices designed to restrict sash opening. Provide at 2nd floors.
 - a. Limit clear opening to 4 inches

E. Colors:

1. Exterior: Black
Interior: White or tan

F. Flexible Flashing: Provide as required.

1. Material: Polyethylene sheet backed rubberized asphalt membrane, 40 mils thick. Provide primer as recommended by membrane manufacturer.
2. 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.

G. Flashings and Trims: Types and thickness recommended by manufacturer for opening conditions and substrates encountered.

- H. Attachment: Nailing fin on wood framed areas and without fin on masonry areas

2.02 GLAZING

- A. Factory glaze sash.
- B. General: Low E coated clear insulated, preassembled units consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E774 for performance classification indicated as well as with other requirements specified for thermal glass characteristics, air space, sealing system, sealant, non metallic spacer material, corner design and desiccant.
- C. Glass Type: Type I, Class 1 for clear glass, Quality q³, conforming to ASTM C1036. Provide tempered at operating units and where required by codes.
 - 1. U Value: <0.30
 - 2. SHGC: <0.3

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.
- C. Verify size of window openings prior to fabrication of windows.

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 specifications for the installation of window components and final shop drawings.
- 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

SECTION 09 91 00

PAINTING

PART 1 GENERAL

1.01 SCOPE

A. Work Included

1. 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. Existing steel sectional doors.
 - b. Exterior trim
 - c. Other items noted or specified.
2. 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. 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 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.

<u>Code</u>	<u>Method</u>
SP-1	Solvent Cleaning
SP-2	Hand Tool Cleaning

1.03 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
- C. 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.
- D. 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.

E. 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.

F. Special Environmental Requirements': Submit the following in accordance with Section 01 81 13:

1. Product Data: For painting and coatings, documentation indicating VOC Content

1.05 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 50° 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.

1.06 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° 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; AKZO NOBEL (GLIDDEN PROFESSIONAL and DEVOE COATINGS); MARTIN SENOUR; PPG; PRATT AND LAMBERT; PORTER; CORONADO PAINT COMPANY, SHERWIN WILLIAMS are acceptable upon proof of satisfactory experience records for the intended use and compliance with specified VOC content.
 - 1. Colors: As indicated on drawing; colors not indicated to be as selected by Architect.

2.02 MATERIAL GENERAL

- A. VOC Content: The volatile organic compound (VOC) content of adhesives shall not exceed the limits defined in Rule #1113 of the South Coast Air Quality Management District (SCAQMD), of the State of California.
- 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.

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. Finish: S-W Direct-to-Metal DTM Acrylic Semi-Gloss Coating, B66-200. Two (2) coats.
 2. PPG
 - a. Finish: Pitt-Tech Plus Interior/Exterior Semi-Gloss DTM Industrial Enamel 90-1210 Series. Two (2) coats.
 3. GLIDDEN PROFESSIONAL
 - a. Finish: Ultra-HideDurus Exterior Acrylic Semi-Gloss #2416 Series; Two (2) coats.
 4. Galvanized Metals: Provide pretreatment as specified herein.
- C. Metal – Ferrous: Unprimed (Semi-Gloss).
 1. SW
 - a. Primer: DTM Acrylic Primer B66W1. One (1) coat.
 - b. Finish: S-W Direct-to-Metal DTM Acrylic Semi-Gloss Coating, B66-200. Two (2) coats.
 2. PPG
 - a. Primer: Pitt-Tech Plus Interior/Exterior DTM Industrial Primer 90-912 Series. One (1) coat.

- b. Finish: Pitt-Tech Plus Interior/Exterior Semi-Gloss DTM Industrial Enamel 90-1210 Series. Two (2) coats.
 - 3. GLIDDEN PROFESSIONAL
 - a. Primer: Devflex 4020 Direct to Metal Primer; One (1) coat.
 - b. Finish; Devoe Coatings Devflex 4216HP High Performance Acrylic Semi-Gloss 4216L Series. Two (2) coats.

G. Trim:

- 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.

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.

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.

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.

END OF SECTION

SECTION 10 73 13

AWNINGS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Provide awnings as indicated on drawings

1.02 RELATED SECTIONS

- A. Canopies: Section 107316:

1.03 SUBMITTALS

- A. Shop Drawings: Submit manufacturer's product data and layout drawings.
 - 1. Include engineering calculations showing wind load requirements of the local Building Department and include fastener and erection details, signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Color Samples: Submit for selection.

1.04 QUALITY ASSURANCE

- A. Have been in continuous operation as a professional fabric awning manufacturer for a minimum of ten (10) years prior to this contract.
- B. Welder Qualifications: The personnel manufacturing the metal awning frames must certified welders.

1.05 WARRANTY

- A. Provide manufacturer's five (5) year warranty against failure of frame materials and failure or fading of fabric.

PART 2 PRODUCTS

2.01 AWNING

- A. Type: Stationary standard, with fabric covered top, front and sides.
- B. Frame: Extruded aluminum tubing, 6063-T6 alloy, minimum 30,000 psi tensile strength.

1. Gage: Minimum 16.
 2. Fittings: Manufacturer's standard type. Cast aluminum.
 3. Miscellaneous Items: Provide all miscellaneous mounting plates, shapes, fasteners and inserts indicated on the drawings or required to install awning framework at the proposed location.
 4. All corners to mitered, ground smooth and completely mitered to AWS standards.
 5. Fasteners: Stainless steel 3/8" minimum
- C. Fabric: Vinyl laminated polyester. Consisting of vinyl top and bottom layers with woven polyester scrim middle layer.
1. Weight: Minimum 14 ounce per square yard.
 2. Provide flame resistant.
 3. Colors/Pattern: As selected by Architect.
 4. Seams: No horizontal seams permitted within sloped surface of awning.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Field verify all conditions and dimensions prior to fabrication.
- B. Install in accordance with manufacturer's instructions and approved shop drawings.

END OF SECTION

SECTION 10 73 16

CANOPIES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Provide system engineering, design and manufacture of canopies to the profiles and limits indicated on the drawings. Provide entire system including, beams, fascia, roof deck, drainage system, finish materials, trims, flashings and all accessories for complete installations.
 - 1. Manufacturer's standard components and accessories may be used, provided components, accessories, and complete structure conform to design indicated and specified requirements.
- B. Design for live loads and wind loads as indicated on the Drawings and in accordance with local governing codes.

1.02 RELATED SECTIONS

- A. Painting: Section 09 91 00.
- B. Miscellaneous Metals: Section 05 50 00.

1.03 QUALITY ASSURANCE

- A. Manufacturer must have a minimum of ten years experience in the field of manufacturing and installing extruded aluminum walkway cover systems.
- B. Installer: Approved or certified by manufacturer.
- C. Verify all dimensions and provide elevations at each column and related soffit prior to releasing for fabrication.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes of 120 deg F ambient; 180 deg F, material surfaces.

1.04 SUBMITTALS

- A. Certifications: Provide design calculations or a letter of design certification signed and sealed by an engineer registered by the State of Ohio for the structural framing system, roof covering panels and foundation design.
- B. Shop Drawings: Submit anchor bolt layouts, framing plans and necessary sections and details. Provide metal framing system, and other metal system components and accessories that are not fully detailed or dimensioned in manufacturer's

product data. Include dimensions, elevations, and details.

1. Provide erection drawings bearing the seal of a professional engineer registered in the State of Ohio.
2. Provide layouts of roofing panels, edge conditions, panel joints, corners, trims and flashing.

C. Product Data: Submit for system.

D. Samples for initial selection purposes in form of manufacturer's color charts or chips showing full range of colors, textures, and patterns available for awning with factory-applied finishes

1.05 DESIGN LOADS

A. The following design loads shall be used in addition to the building dead load:

1. Snow Load: As indicated. Comply with OBC.
2. Wind Load: As indicated and required by OBC.
3. Dead Load: Weight of metal canopy materials.

B. Load Application

1. Live Loads: Applied on the horizontal projection of the roof in accordance with the OBC.
2. Wind Loads: Applied as pressure and suction in accordance with the OBC.

C. Combination of Loads: Design building for the following load combinations:

1. Dead load and live load.
2. Dead load and wind load.

D. Deflection of structural members due to live load: Maximum $L/240$.

E. Deflection of roofing panels: Maximum $L/240$ due to live load or wind load.

1.06 WARRANTY

A. Provide canopy manufacturer's warranty guaranteeing the system against defects in material or workmanship for two years from date of acceptance and shall repair or replace as required within that time period.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened and labeled packages.

B. Comply with manufacturer's recommendations for handling and protection during installation.

PART 2 PRODUCTS

2.01 DESCRIPTION

- A. As indicated on drawings.

2.02 MATERIALS

- A. Structural Sections

1. Steel

- a. Steel Shapes, Bars and Plates: ASTM A36.
- b. Steel Plates to be Bent or Cold Formed: ASTM A283, Grade C.
- c. Steel Tubing: ASTM A500, Grade A, cold-formed; or ASTM A501, hot-formed.

- B. Supports and Bracing: Manufacturer's metal supports and bracing sized and designed to support the specified live and dead loads including additional loads. Finish supports to match canopy.

- C. Fasteners: Self-tapping stainless steel screws, bolts, nuts, self-locking rivets, self-locking bolts, end welded studs, and other suitable fasteners designed to withstand design loads.

1. Provide metal-backed neoprene washers under heads of fasteners bearing on weather side of panels.
2. Locate and space fastenings in true vertical and horizontal alignment.
3. Provide fasteners with heads matching color.
5. Concealed drainage system to match finish system of the canopy.

2.03 FINISH

- A. Shop paint special coating:

1. Coating Manufacturer: TNEMEC

2.04 FABRICATION

- A. General: Design prefabricated components and necessary field connections required for erection to permit easy assembly and disassembly. Design of joints and transition to gutter and drainage shall be such to allow complete and positive drainage, not block or interfere with drainage, and to prevent water from leaking and running down the outside of the supports.

1. Fabricate components with wall thicknesses to meet code and specified loads; however not thinner than the following minimum wall thicknesses:
2. Fabricate components in such a manner that once assembled, they may be disassembled, repackaged, and reassembled with a minimum amount

- of labor.
3. Clearly and legibly mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instructions manuals.
 4. Factory-weld components with neatly mitered corners, into one-piece rigid bents.
 5. Make all welds smooth and uniform using inert gas shielded arc. Prepare all edges to ensure 100 percent penetration.
 6. Grind welds only to prevent interference with adjoining structure and preventing a flush connection.
 7. Provide all-welded construction to the greatest extent possible.

PART 3 EXECUTION

3.01 ERECTION

- A. Erect awnings, supports, and bracing according to reviewed shop drawings and at the desired angle. Install in locations and at angle indicated on the Drawings
 1. Erect true to line, level, plumb, rigid, and secure.
 2. Tie into structure and flash to form a leak proof installation
 3. Installation shall not wobble or whistle or, rattle in the wind,
 4. Provide for proper drainage.
 5. Provide for proper thermal movement of sheet metal and dissimilar materials.
 6. Separate dissimilar metals to prevent galvanic action.
- B. Cleaning and Touch-Up: Clean component surfaces of matter that could preclude paint bond. Touch up abrasions, marks, skips, or other defects to finish.

END OF SECTION

SECTION 12 21 13

HORIZONTAL LOUVER BLINDS

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 SUBMITTALS

- A. Submit manufacturer's product data and full range of color samples.

1.04 QUALITY ASSURANCE

- A. Safety Certification: WCMA A100.1 - Safety of Window Covering Products; Window Covering Manufacturers Association. (ANSI/WCMA A100.1-2018)

1.05 EXTRA MATERIAL

- A. Provide (3) full-size units for each blind type, size and color installed.

PART 2 PRODUCTS

2.01 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.
 - 3. Color: clear.
- E. Type A - Accessible Units: Provide battery powered and independent remote-controlled blind tilting devices at each blind.
 - 1. Manufacturer: SWITCHBOT 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

PLUMBING SPECIFICATIONS

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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. State of Ohio 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 Canal Winchester water utility provider.
 - 6. City of Canal Winchester sewer utility authority.
 - 7. Columbia Gas natural gas provider.
 - 8. American National Standards Institute (ANSI) standards for materials and construction.
 - 9. American Society of Mechanical Engineers (ASME) standards for materials and construction.
 - 10. American Society of Sanitary Engineering (ASSE) standards for performance and testing.
 - 11. American Society for Testing and Materials (ASTM) standards for materials, construction and testing.
 - 12. American Water Works Association (AWWA) standards for materials, construction and disinfection procedures.

13. National Sanitation Foundation (NSF) standards for materials and construction.
14. Cast Iron Soil Pipe Institute (CISPI) standards for materials and construction.
15. Underwriter's Laboratories (UL) standards for materials and construction.
16. The manufacturer's installation guidelines and recommendations for individual items, elements and/or systems indicated herein.
17. 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.
- 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.

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 to the requirements of the review and inspection authorities:
- A. Plastic pipe, fittings and joining methods; per applicable ASTM/ANSI/ASME/AWWA/NSF standards.
 - B. 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).

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 pipe and insulation
Valves and fittings
Domestic Hot Water Heaters

- 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 Engineer 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.

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 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

1.04 GENERAL REQUIREMENTS

- 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

10/31/2025

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 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 Valves in Water Lines:
 - A. 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.
 - B. Drain valves shall be ball valves as specified above with hose end connection and cap.
 - C. Check Valves
 - 1. 2-1/2" and smaller - all bronze, horizontal swing check with bronze or TFE disc, screwed, 125 lb. S.W.P.
 - 3. 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 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. When copper lines are insulated and hangers are sized for outside of insulation, provide steel hangers as described below.
 - C. Support for CPVC lines as recommended by the manufacturer.
- 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 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 23 - VALVES
- B. Section 22 05 29 - INSERTS, PIPE HANGERS AND SUPPORTS
- C. 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 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 so 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.
- 3.04 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 07 00

PLUMBING INSULATION

PART 1 GENERAL

1.01 REFERENCE

- A. Section 22 05 29 – INSERTS, PIPE HANGERS AND SUPPORTS
- B. Section 22 00 00 – PLUMBING GENERAL
- C. Section 22 11 16 –DOMESTIC WATER PIPING SYSTEMS

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.

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 ft²/Btu to 4.6 HR F ft²/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 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 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

10/31/2025

SECTION 22 11 16

DOMESTIC WATER PIPING SYSTEMS

PART 1 GENERAL

1.01 SCOPE

- A. Provide a complete domestic cold water and hot water connections as shown on plans and as necessary to serve all items/elements requiring same. Match existing water piping material where practical.
- B. The domestic water piping system shall include, but not be limited to the following:
 - 1. Cold water supply
 - 2. Hot 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 wrought copper fittings and socket solder joints and connections. Completed installation to be rated for 125 psig working pressure.
 - 2. 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.
- B. Solder, flux and all other pipe joining materials shall be certified "lead free" and listed for use with potable water service.

PART 3 EXECUTION

- 3.01 Run all water piping level and conceal wherever possible. Piping to be installed to allow complete drain down of system back to main riser(s) at base of system whenever possible.

- 3.02 Coordinate installation with structure, site conditions and work of other trades at and adjacent to domestic water service piping installation.
- 3.03 Maintain necessary clearance from structural support elements as required for installation of domestic water service piping outside of support/bearing zones.
- 3.04 Piping shall be installed according to the pipe manufacturer's specifications & recommendations.

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. Remove existing gas-fired water heater and replace with new as noted on drawings. Reconnect domestic cold and hot water lines and gas line. Connect to existing flue.

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 minimum three year limited warranty against corrosion.
- E. 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 63 13

HOUSE LINES - GAS

PART 1 GENERAL

1.01 REFERENCE

- A. Section 22 00 00 – PLUMBING GENERAL

1.02 SCOPE

- A. Extend existing gas piping from existing gas branch in mechanical closet 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 1/4" 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 1/2" 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

MECHANICAL SPECIFICATIONS

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SECTION 23 01 05

MECHANICAL GENERAL PROVISIONS

PART 1 GENERAL

1.01 REFERENCE

- A. The Contractor for this work is referred to Instructions to Bidders, General Conditions and Division 1 - General Requirements, as a part of this Contract.

1.02 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. All questions shall be referred to the owner's representative in the form of RFI's as set forth in the General Conditions.
- F. Other than minor adjustments shall be submitted to the Architect/Engineer for approval before proceeding with the work.
- G. The Contractor shall submit on the "Form of Proposal", 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 Engineer 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 Architect/Engineer.
- I. This Contractor shall furnish to the Architect/Engineer 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. Arrangements for storage of tools and material, removal of debris, and interruptions of services shall be made with the Building Foreman.
- K. All connections to, or revisions in, existing piping or facilities shall be done at such time as agreed to by the Engineer and Owner and all work shall be scheduled as required under "General Conditions". Revisions to the existing piping systems must be done with the minimum of shutdown time. All piping shall be run to the point of new connections and new equipment installed and ready to operate before any connections are to be made.
- L. Extreme care shall be taken to avoid interference with the Owner's equipment, especially in the existing portion of the building. Consult with the Architect/Engineer regarding any points where interference is likely to occur and follow dimensions carefully where given 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 Telephone Company 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 Architect/Engineer 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. This includes using a vacuum cleaner as required.
- O. At the completion of the project, this Contractor shall promptly clean up and remove from the site, all debris and excess materials.
- P. All manufactured products must be in compliance with Section 1605 of the American Recovery Act of 2009, Subpart B, Buy American Requirement.

1.03 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 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 the coordination of all work with piping and equipment included under other Divisions of the Specifications.

- C. 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.
- D. 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.
- E. 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.
- F. Install all work as close as possible to walls, structural members, etc., consistent with the proper space for covering, access, etc., so as to occupy the minimum of space and allow as much space as possible between ductwork, piping, etc. and the ceiling.
- G. Actual dimensions shown on the Drawings and field dimensions shall take precedence over scaled dimensions.

1.04 PERMITS, INSPECTIONS AND CODES

- A. The HVAC Contractor 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, as administered by the City of Columbus Building Department.
 - 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 Mechanical Refrigeration Systems and Equipment, Industrial Commission and Department of Industrial Relations, State of Ohio.
 - 4. National Electrical Code, Bulletin No. 70, National Fire Protection Association.
 - 5. Air Conditioning and Ventilating, Bulletin No. 90 A, National Fire Protection Association.

6. Life Safety Code, Bulletin No. 101, National Fire Protection Association.
 7. All Work Under Jurisdiction of Local Fire Prevention Authority/Fire Department shall conform to requirements set forth by that office and the National Fire Protection Association.
 8. State of Ohio Environmental Protection Agency (EPA) guidelines.
 9. City of Columbus Building Code.
- 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.
- D. When the work is completed, the Contractor shall furnish the Owner's Representative (through the HVAC Contractor) a Certificate of Inspection and Approval from the Local Board of Health before final payment of the Contract will be allowed.

1.05 OHIO ENERGY CODE

- A. The Mechanical System must comply with all requirements of the State of Ohio "Code of Energy Conservation". This includes, but is not limited to, efficiencies, power factors, insulation thickness, etc.

1.06 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 (telephone 800-362-2764 - toll- free) 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.

1.07 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 or his representative and for notifying the Owner's Representative of the time at least 48 hours in advance. All training and instruction shall be coordinated through the HVAC Contractor

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 Owner.
- B. This Contractor shall furnish three (3) copies of the printed Operating and Maintenance Instructions for the Mechanical Systems for review. 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 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.

1.08 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's Representative through the HVAC Contractor. See General Conditions for further requirements.

1.09 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 HVAC Contractor or Architect 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 HVAC Contractor or Architect additional services made necessary thereby.
- C. During the course of construction, the Engineer 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 Engineer 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 Engineer.

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

SECTION 23 01 10

MANUFACTURER'S DRAWINGS

PART 1 GENERAL

1.01 SCOPE

- A. The Contractor shall submit to the Owner's representative for review, within one week after date of contract, ten (10) copies of manufacturer's drawings, wiring diagrams, pump and fan curves 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 General Contractor, 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:

Heating, Ventilating and Air Conditioning Contract

Condensing units
Condensing unit Hail Guard
Cooling Coil
Furnace
Ductwork

- 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 Ohio Energy Code. This previously relates to high efficiency motors, EER's, COP's, etc. If this is not done, submittals will be rejected.

- E. Engineer's review of manufacturer's drawings or schedules shall not relieve the Contractor from compliance with the requirements of the plans and specifications.

1.02 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

END OF SECTION

SECTION 23 05 13

ELECTRICAL WORK

PART 1 GENERAL

1.01 REFERENCE

- A. Section 23 01 05 - Paragraph 1.05 - OHIO ENERGY CODE
- B. Division 26 - ELECTRICAL

1.02 SCOPE

- A. Electrical components and connections required for replacement of condensing units 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 control wiring unless otherwise specified.
- B. 120 volt wiring required for mechanical equipment when not shown or specified elsewhere.

1.04 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 by the Heating Contractor, except wiring as indicated on the Electrical Drawings will be by the Electrical Contractor.

1.05 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 15005 - Paragraph 1.05 for "Energy Code" requirements (Particularly power factor correction)
- 2.02 Refer to Division 26 - ELECTRICAL.
- 2.03 Disconnects are provided and installed by the Electrical Contractor, unless part of packaged equipment furnished by this Contractor, or otherwise specified.

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 16, Electrical specification.
- 3.02 Low voltage wiring may be size and type recommended by the Manufacturer of the equipment for which the wiring is used.

END OF SECTION

SECTION 23 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 manufactured in the USA and shall all be by the same manufacturer.

2.02 Ball valves shall be as manufactured in the USA. All ball valves to be by the same manufacturer.

2.03 BALL VALVES

- A. 2-1/2" size and smaller shall be two-piece bronze body ball valve, screwed piping connections, union connection body, teflon seats, conventional 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.

2.04 Drain valves shall be ball valves as specified above.

2.05 Check Valves

- A. 2-1/2" and smaller - all bronze, horizontal swing check with bronze or TFE disc, screwed, 125 lb. S.W.P.
- B. Clow, McAlear, Mueller or Metraflex non-slam check valves are acceptable manufacturers as well as previously listed manufacturers.

2.06 Combination Balance and Stop Valve - Bell and Gossett "Circuit Setter Plus", bronze body, screwed combination balance and stop ball valve. Valves to have readout ports, 1/4" drain port, memory stop indicator, calibrated nameplate, 300 lb. W.O.G. Same type USA manufactured stop and balance valves may be furnished at the Contractor's option.

PART 3 EXECUTION

3.01 This Contractor shall install all valves in strict accordance to the manufacturer's recommendations.

- 3.02 Where the Drawings call for both a shut-off valve and a balance valve or fitting, the Contractor may, at his option, furnish a combination balance and stop valve.
- 3.03 Where drain lines are not piped to floor drains, furnish hose end adapters. Provide caps for all hose end adapters. Hose thread outlets connected to domestic/potable water piping systems shall be provided w/ permanently affixed listed backflow assemblies.

END OF SECTION

SECTION 23 05 28

SLEEVES AND COLLARS

PART 1 GENERAL

1.01 SCOPE

- A. This Contractor shall furnish sleeves for his work to the General Contractor, who installs where directed by this Contractor. Coordinate carefully.
- B. Sleeves shall be provided through all new masonry construction.

PART 2 PRODUCTS

- 2.01 Sleeve material: 22 gauge galvanized sheet metal sleeves large enough to allow 1/4" clearance all around pipe (around pipe covering refrigerant suction line), except use machine cut copper sleeves for uninsulated copper pipe.

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 1/8" 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, the space between the pipe and sleeve shall be filled with packing to maintain fire integrity.
- 3.03 All insulated pipes passing through floors in exposed locations shall have 20 gauge galvanized sheet metal insulation protectors from floor to 12" above floor.
- 3.04 Cutting required of any masonry wall or floor after it is in place shall be done by core drilling.
- 3.05 Piping not allowed to bear on sleeves.
- 3.06 Sleeves shall be installed plumb and true to line, grade, and position.
- 3.07 Unused sleeves shall be plugged and finished to match adjacent surface.

END OF SECTION

SECTION 23 05 29

INSERTS, PIPE HANGERS AND SUPPORTS

PART 1 GENERAL

1.01 SCOPE

- A. Furnish and install all necessary inserts, 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. When copper lines are insulated and hangers are sized for outside of insulation, provide steel hangers as described below.
 - C. 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.
 - D. Hangers for refrigerant suction lines shall be sized for outer diameter of insulation. Furnish half round 20 gauge galvanized sheet metal insulation protectors at least 12" long similar to Grinnell Fig. 167 on bottom half of insulation for suction lines at each pipe hanger.
- 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 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. If the piping manufacturer recommends more stringent (closer spaced) requirements than those indicated herein, the manufacturer's recommendations shall be followed. No pipe shall be supported from another pipe. All hangers shall be plumbed before insulation is applied and all hangers shall be double nutted.

<u>SPACING</u>					
<u>(1) Steel Pipe</u>			<u>(2) Copper Pipe</u>		
<u>Pipe Size</u>	<u>Rod</u>	<u>Spacing</u>	<u>Pipe Size</u>	<u>Spacing</u>	
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"
2"	3/8"	10'0"	2"		9'0"

- 3.07 Support piping at equipment from floor, ceiling, or walls, so that piping weight is not supported directly from equipment.

END OF SECTION

SECTION 23 05 90

INSTALLATION OF PIPING

PART 1 GENERAL

1.01 REFERENCE

- A. Section 23 05 28 - SLEEVES AND COLLARS
- B. Section 23 05 29 - INSERTS, PIPE HANGERS AND SUPPORTS

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 Owner's Representative.
- 3.02 Make proper connections to all items of equipment in the Contract as recommended by the Manufacturer or as detailed on the Drawings.
- 3.03 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.
- 3.04 Ream ends of pipe and clean before installing.
- 3.05 All joints in copper piping shall be made with 95-5 solder. Solders and fluxes containing lead are prohibited.
- 3.06 Make all changes of direction with fittings, rather than bending.
- 3.07 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.

- 3.08 At the end of each day's work and otherwise as required for the safety of the tenants or as 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.

END OF SECTION

SECTION 23 05 94

PROTECTION AND CLEANING

PART 1 GENERAL

Not Applicable.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

- 3.01 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.
- 3.02 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, and primed (where necessary), ready for painting.
- 3.03 Repair all dents and scratches in factory prime or finish coats on all mechanical equipment, including plumbing fixtures.
- 3.07 Cover all motors, fans, open pipes, etc., to keep out dirt, water and weather during construction.
- 3.08 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 23 05 97

REMODELING

PART 1 GENERAL

1.01 REFERENCE

- A. Division 1 - GENERAL REQUIREMENTS
- B. Section 23 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 Mechanical Drawings and in all areas affected by the above. All necessary or required remodeling or additions to the present mechanical work shall be included in this Contract.
- B. All mechanical penetrations in exterior and demising walls to be sealed.
- C. All mechanical penetrations in attic to be sealed.
- D. Seal air tight with caulk all duct boots in walls to drywall.
- E. All new ductwork must be sealed with duct tape per UL 181 A or UL 181 B.

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 All piping and ductwork installed in the remodeling work shall be installed as shown on drawings. This Contractor shall do all cutting and patching required.

END OF SECTION

SECTION 23 05 98

DEMOLITION

PART 1 GENERAL

1.01 SCOPE

- A. This Contractor shall be responsible for removal of and modifications to the existing piping and equipment as hereinafter noted and as shown on the Drawings. All material removed and not reused in remodeling shall become the property of this Contractor and promptly removed from the site unless the Owner specifically asks to retain certain equipment. This Contractor is responsible for determining if the Owner wishes to retain the existing equipment before it is removed from the site. Coordinate with the Owners representative.
- B. This Contractor shall remove existing piping, equipment and appurtenances, etc., as shown on the Drawings and as specified.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

- 3.01 Relocate existing equipment as shown on the Drawings.

END OF SECTION

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SECTION 23 07 00

HVAC INSULATION

PART 1 GENERAL

1.01 REFERENCE

- A. Section 23 01 00 - Paragraph 1.5 - ENERGY CODE
- B. Section 23 22 00 - CONDENSATION DRAIN AND DRAIN PIPING SYSTEM
- C. Section 23 23 00 - REFRIGERANT PIPING SYSTEM
- D. Section 23 31 13.13 - LOW PRESSURE DUCTWORK

1.02 SCOPE

- A. Extent of Work - Insulate pipes and other surfaces as follows:

Outside Air Ductwork
Condensation Drain Piping
Refrigerant Suction Piping

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 developed rating not to exceed 50.
- 2.02 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.
- 2.03 Pipe insulation inside the building 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.
- 2.04 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.
- 2.05 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.
- 2.06 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.
- 2.07 Refrigerant pipe insulation shall be 25/50 rated flexible closed cell, elastomeric Armaflex AP rated for -40°F to 220°F. Insulated located within return air plenum spaces and shafts shall be plenum rated.

- 2.08 All refrigerant cover above shall be by Armstrong. Equivalent type thickness and conductivity insulation by Aerotube, Halstead, Imcoa or Rubitex meeting all requirements may be furnished at the Contractor's option.
- 2.09 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.
- 2.10 All ductwork located in attic spaces shall have a minimum "R" value of 8 or greater.

PART 3 EXECUTION

- 3.01 Cover condensation drain piping as follows:
- A. Cover all piping with 1/2" thickness glass fiber pipe insulation.
 - B. Seal all laps and butt strips with white vapor barrier cement or factory self-sealing laps.
 - C. Fittings shall be wrapped with compressed fiberglass to same thickness and density as adjacent pipe insulation and covered with a molded plastic fitting.
- 3.02 Cover refrigerant suction piping as follows:
- A. Insulate with 1" thick elastomeric pipe insulation.
 - B. Cover valves (including bonnet), unions, flexible connections and appurtenances in cold lines.
 - C. Seal all butt joints with Armstrong No. 520 adhesive.
 - D. Fittings shall be covered with elastomeric insulation to the same thickness as adjacent pipe. Seal all joints with Armstrong No. 520 adhesive.
 - E. 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.
 - F. Pipe covering outside of building shall be coated with Armstrong Type WB finish to make weather resistant.
- 3.03 Cover Outside air ducts not exposed as follows:
- A. All unlined low pressure supply air ducts shall be insulated 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.
- 3.04 Application shall be made on clean, dry surfaces with all joints butted firmly together.
- 3.05 All duct and pipe insulation to be continuous through floors, walls, ceilings, roofs and pipe hangers.
- 3.06 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.
- 3.07 Install 20 gauge galvanized steel insulation protectors on all insulated exposed pipes passing through floor. Sleeves to be 12" above the floor.
- 3.08 Hanger rods must be perpendicular before insulation is installed.
- 3.09 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

SECTION 23 21 13.33

CONDENSATION DRAIN AND DRAIN PIPING SYSTEMS

PART 1 GENERAL

1.01 REFERENCE

Section 23 05 00 - COMMON WORK RESULTS FOR HVAC
Section 23 07 00 - HVAC INSULATION

1.02 SCOPE

- A. Provide condensation drain piping from outlets on drain pans of all cooling coils, and run indirect to floor drains and elsewhere as shown on the Drawings.
- B. Provide drain piping from drain valves and overflows to floor drains and elsewhere as indicated.

PART 2 PRODUCTS

2.01 PIPE

- A. Type "L" hard copper, minimum size 3/4 inch. Specify that wrought copper fittings with sweat joints of 95-5 solder be used. Trap drain lines and run to suitable drains.

2.02 Fittings cast brass drainage fittings.

PART 3 EXECUTION

- 3.01 Provide cleanouts at traps and in the piping system where pipe changes direction.
- 3.02 Pitch all condensation and other drain lines down a minimum of 1/8" per foot in the direction of flow.
- 3.03 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

SECTION 23 23 00

REFRIGERANT PIPING SYSTEM

PART 1 GENERAL

1.01 REFERENCE

- A. Section 23 05 30 - INSTALLATION OF PIPING

1.02 SCOPE

- A. Provide a complete system of refrigerant piping from outdoor split system condensing units to the associated air handling units as shown on the Drawings.
- B. All refrigerant piping shall be installed for minimal pressure drop.

PART 2 PRODUCTS

- 2.01 Pipe - Type L-ACR hard dehydrated scale free copper tubing. Per manufacturer's recommendation.
- 2.02 Fittings - wrought copper, solder type.
- 2.04 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

- 3.01 Install all refrigerant piping according to ASHRAE 15.
- 3.02 Install piping in short and direct arrangement, with minimum number of joints, elbows, and fittings.
- 3.03 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.
- 3.04 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%
- 3.05 Properly clean ends of all tubing before soldering or brazing.
- 3.06 All joints in split system refrigerant piping shall be made with 95/5 solder.

- 3.07 Brazing Filler Metals: AWS A5.8, Classification BAg-1 (Silver).
- 3.08 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.
- 3.09 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 manufacturer recommendation. 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 Refrigerant pipe size and configuration for the VRV systems shall be coordinated with the VRV equipment manufacturer.
- 3.12 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.
- 3.13 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 with nail plates or other methods to protect piping.
- 3.14 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.
- 3.15 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.
- 3.16 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. Per manufacturer's recommendation.
- 3.17 Use fittings for changes in direction and branch connections.
- 3.18 Reduce pipe sizes using eccentric reducer fittings installed with level side down.
- 3.21 When brazing, remove solenoid-valve coils; remove sight glasses; and remove stems, seats, and packing of valves, and accessible internal parts of refrigerant specialties. Do not apply heat near bulb of expansion valve.

- 3.22 Charge and purge systems, after testing, dispose of refrigerant following ASHRAE 15 procedures.
- 3.23 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.
- 3.24 Install permanent filter dryers in low-temperature systems using hermetic compressors, and before each solenoid valve.
- 3.25 Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide) during brazing to prevent formation of scale.
- 3.26 Install refrigerant valves according to manufacturer's written instructions.
- 3.27 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.
- 3.28 Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.
- 3.29 Adjust thermostatic expansion valve to obtain proper evaporator superheat requirements.
- 3.30 Before installation of copper tubing other than Type ACR, clean tubing and fittings with trichloroethylene.
- 3.31 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

SECTION 23 31 13.13

LOW PRESSURE DUCTWORK

PART 1 GENERAL

1.01 REFERENCE

- A. Section 23 07 00- HVAC INSULATION
- B. Section 23 37 00 - REGISTERS, GRILLES AND DIFFUSERS
- C. Section 23 33 13 - DAMPERS

1.02 SCOPE

- A. Furnish, install and insulate low pressure sheet metal work and appurtenances with sizes as shown on 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. This Contractor is to provide 1/4" scale reproducible sepias of sheet metal drawings for use in coordinating work of Plumbing, and Electrical with layout of air distributions system and related work. Lighting, ceiling grid and all ceiling access doors will be shown lightly to verify coordination. All valves shall be shown on the coordination drawings. 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 Associate.
- D. All ducts joists shall be sealed with duct sealer.
- E. The use of duct liner is expressly prohibited.

PART 2 PRODUCTS

2.01 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.

- B. Flexible duct shall comply with NFPA requirements, Pamphlet 90A, and shall be UL listed with flame spread rating of 25 or less and smoke developed rating of 50 or less. Duct shall be a factory fabricated assembly composed of: an inner duct of woven and coated fiber glass providing an air seal and bonded permanently to corrosion resistant coated steel wire helix and 1" thick fiber glass insulating blanket and low permeability outer vapor barrier of fiber glass reinforced metallized film laminate.

Flexible duct shall be terminal duct for air system and shall not exceed 5 feet in length. Do not make more than one (1) 90 degree bend with flexible duct. Bend radius shall be minimum of two (2) times duct diameter.

1. Flexible duct shall be Thermaflex MKC.
 2. Duct shall be rated for minimum 10" W.G. internal working pressure, for all duct sizes.
 3. Vinyl, clear plastic or mylar type liners are expressly prohibited.
 4. Flexmaster Type 3M insulated flexible duct meeting all specified requirements may be furnished at the Contractor's option.
- C. All fan flexible connections shall be made with commercial grade neoprene coated glass fabric (heavy duty).
- D. 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.
- E. 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.
- F. Sealer for ducts shall be equal to 3M Model EC-800.
- G. Exhaust ducts designated on the Drawings as stainless steel construction shall be fabricated from Type 316, 18-8 stainless steel, Class A welded longitudinal seam. Metal gauges shall be one size smaller than specified for steel ducts, all dampers in stainless steel ductwork to be stainless steel.
- H. Duct and fittings in areas listed on drawings to be United Sheet Metal Company Type "P" Acousti-K27, 3" thick for exterior ductwork and 1-1/2" thick for interior ductwork, with inner and outer walls of zinc-coated steel spaced one inch apart with annular space uniformly packed with fiber glass insulation. Inner wall to be perforated for sound control. Provide with mylar cover over the fiber glass insulation to minimize insulation erosion. Mylar cover to enclose all surfaces of the insulation which is exposed to the airstream.

- A. All supply and exhaust/return air ductwork cross-hatched on the drawings. The double wall duct shall extend from the air conditioning unit on grade connection to the points indicated on the drawings for noise control. The double wall duct shall extend from the existing exhaust duct shown on drawings.

PART 3 EXECUTION

3.01 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 hinged access doors where shown on the Drawings. Provide close off sheet metal as required. Provide neoprene sponge gaskets between filter frames and housing for mixed air plenums. Gauges same as specified for ducts, unless otherwise noted. At the Contractor's option, sheet metal ducts and plenums may be put together using "Ductmate" or "TDC Lockformer" couplings.
- D. Seal all seams and joints in outside air plenums. Pitch plenums to low points and drain all low points in the system. All plenums to be watertight.

3.02 FLEXIBLE AND ROUND DUCT CONNECTIONS

- A. Connection of flexible and round ducts to rectangular ducts to be made with spin-in type fittings complete with damper with locking operator.

3.03 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. 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 fire dampers and elsewhere as shown on drawings 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 sealer shall be used to seal joints.
- F. All other round ductwork and fittings not mentioned shall be spiral lockseam construction equivalent to United Sheet Metal.
- F. The use of multi-piece adjustable angles and elbows is prohibited.

End of Section

SECTION 23 33 13

DAMPERS

PART 1 GENERAL

1.01 REFERENCE

- A. Section 23 31 13.13 - LOW PRESSURE DUCTWORK

1.02 SCOPE

- A. Furnish and install dampers and appurtenances with size and capacities as shown on the drawings.

PART 2 PRODUCTS

2.01 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.

2.02 MOTOR OPERATED DAMPERS

- A. Based on 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.

2.03 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 1 1/2 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.

2.04 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.

2.05 Manual balance damper, motor operated dampers and fire 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

- 3.01 Install dampers as recommended by manufacturer.
- 3.02 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.
- 3.03 Install dampers at locations indicated on the drawings and in accordance with manufacturer's UL approved installation instructions.
- 3.04 Install dampers square and free from racking with blades running horizontally.

- 3.05 Do not compress or stretch damper frame into duct or opening.
- 3.06 Handle damper using sleeve or frame. Do not lift damper using blades, actuator, or jackshaft.
- 3.07 Install bracing for multiple section assemblies to support assembly weight and to hold against system pressure. Install bracing as needed.
- 3.08 All dampers and damper operators shall be checked and adjusted for proper operation and travel.
- 3.09 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 Where damper actuators are located inside of shafts, coordinate the position of the damper actuators with the shaft access panel locations indicated on the architectural drawings.

END OF SECTION

SECTION 23 34 20

INLINE CEILING CABINET FANS

PART 1 GENERAL

1.01 REFERENCE

- A. Section 23 01 05, Paragraph 1.05 - ENERGY CODE
- B. Section 23 05 13 - ELECTRICAL WORK
- C. Section Section 23 31 13.13 - LOW PRESSURE DUCTWORK

1.02 SCOPE

- A. Furnish and install duct mounted inline exhaust fans and appurtenances with sizes and capacities as shown on the drawings.

PART 2 PRODUCTS

- 2.01 Inline ceiling cabinet fans based on Greenheck SP / 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.
- 2.02 Fan ratings shall be AMCA certified and fan shall bear AMCA seals and shall be U.L. Listed.
- 2.03 Motor shall be 115/60/1 with built in thermal overload protection. The motor shall be mounted on vibration isolators.
- 2.04 Furnish fans with a factory mounted variable speed switch for balancing the fan system airflow.
- 2.05 Inline cabinet exhaust fans by ACME, Cook, Carnes or Twin City of the same type, size, capacity and meeting other specified requirements, may be furnished at the Contractor's option.

PART 3 EXECUTION

- 3.01 Provide flexible connections at inlet and discharge ducts.
- 3.02 Mount unit from vibration isolators furnished with the unit minimum 90% efficient.
- 3.03 Auxiliary steel for supporting units to be furnished and installed by the HVAC Contractor.

- 3.04 HVAC Contractor shall provide line voltage thermostats or humidistats for fan control where specified on the drawings.
- 3.05 Wiring of fans, line voltage thermostats and line voltage humidistats by the Electrical Contractor.
- 3.06 All ductwork for fans that discharge into the ceiling plenum space shall be lined.

END OF SECTION

SECTION 23 54 16.13

GAS-FIRED FURNACES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 23 05 60, "Requirements for Completion of HVAC Work."

1.03 DESCRIPTION

- A. Provide a furnace with a 95% or greater single stage gas-fired multi-position gas furnace as noted on drawings.
- B. Coordinate equipment selection with the cooling coil and condensing unit.

1.04 RATINGS AND CAPACITY

- A. Size, capacity, arrangements, and location as indicated on the Drawings.

1.05 MOTORS

- A. Unless otherwise noted, high-efficiency motors shall be National Electrical Manufacturers Association (NEMA) Design B, continuous rated with 1.15 service factor, with Class F insulation and Class B temperature rise, copper windings and leads, 1,750 RPM with the horsepower indicated on the Drawings. All motors shall be equipped with ball bearings.

PART 2 PRODUCTS

2.01 UP-FLOW FURNACE

- A. Heavy-gauge cold roll steel cabinet, phosphatized, baked enamel finish, complete with foil-faced fiberglass insulation in heat exchanger section, large removable access doors, exhaust outlet, combustion air inlet, and filter rack with disposable filters. (Filters shall be easily removed without using screws. Quick-opening latches are acceptable.)
- B. Heat Exchanger Assembly: Entire assembly shall have a minimum 20-year warranty.
 - 1. Optional condensing furnace heat exchangers:
 - a. Primary: Aluminized steel.
 - b. Secondary: Corrosion-resistant polyethylene-coated or stainless steel, multi-pass, condensation chamber, with 3/4 in. condensation drain connection.
- C. Evaporator Section: Copper tube/aluminum fin evaporator coil, insulated galvanized steel drain pan, with 3/4 in. drain connection.

- D. Blower: Centrifugal type connected to multi-speed direct drive motor mounted resiliently to fan housing.
- E. Intake and Exhaust Piping: Schedule 40 PVC, including mufflers. Size as recommended by Manufacturer for longer runs. Pitch all horizontal runs upward away from equipment, at a minimum of 1/4 in. per ft. Provide roof termination kit.
- F. Controls: 24 volt, wiring junction box, step-down transformer, combination gas control valve, 7-day programmable room heating/cooling thermostat with FAN/OFF/AUTO and HEAT/AUTO/COOL subbases, and fan relay, fan, and high limit controls. Thermostat shall be compatible with the heat pump unit and that the heat pump is primary source of heat and the gas furnace as the backup with automatic change over.
- G. Acceptable Manufacturers: York, Lennox, Rheem, Bryant, or Trane.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Mount furnace on neoprene rubber pads.
- B. Secure unit to building structure.
- C. Provide all code-required clearances to combustibles.
- D. Plumbing Contractor shall provide gas piping final connection.
- E. Plumbing Contractor shall provide shut-off valve, dirt leg, and union for equipment connection.
- F. Install exhaust vent and combustion air intake pipe as recommended by Manufacturer.
- G. Provide roof penetration, and flashing.
- H. Oversize piping as recommended by Manufacturer for long runs.
- I. Adjust blower speed.
- J. Install flexible duct connections at supply and return connections to furnace.
- K. Install a set of filters for use during construction. Install a new set of filters at Contract Completion. Furnish a third set of filters to the Owner at Contract Completion. Filters shall be MERV 8.

3.02 EQUIPMENT ACCESS

- A. Locate all units to provide sufficient access to change filters, pull coils, or service other items requiring periodic maintenance.

3.03 WIRING

- A. Electrical Contractor shall provide disconnect switch and power wiring.
- B. Electrical Contractor shall provide control wiring.

END OF SECTION

SECTION 23 62 13

PACKAGED AIR-COOLED REFRIGERANT COMPRESSOR AND CONDENSER UNITS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

1.02 DESCRIPTION

- A. Provide factory-assembled and factory-tested air-cooled condensing units as scheduled on the Drawings, complete with compressors, refrigeration circuits, condensing coils, fans, and controls.
- B. Condensing unit shall be system seer as noted on drawings.

1.03 QUALITY ASSURANCE

- A. Standards:
 - 1. Underwriters Laboratories, Inc. (UL).
 - 2. Air-Conditioning and Refrigeration Institute, ARI 210-75, "Certified Unitary Air-Conditioner Equipment," and ARI 270-75, "Certified Sound-Rated Outdoor Unitary Equipment."

1.04 RATINGS AND CAPACITY

- A. Size, capacity, arrangements, and location as indicated on the Drawings.

1.05 ACCEPTABLE MANUFACTURERS

- A. York, Lennox, Bryant, , Rheem, Trane or National Comfort.

PART 2 PRODUCTS

2.01 AIR-COOLED CONDENSING UNITS

- A. Fully weatherproofed, galvanized steel, with zinc phosphate and baked-on enamel finish. Each unit shall match the capacity as required for its respective evaporator coil unit. Provide openings for all connectors and gasketed access panels for servicing and maintenance.
 - 1. Coil: Aluminum plate fins mechanically bonded to seamless copper tubing. Provide coil guard.
 - 2. Fans and Motors: Propeller-type vertical discharge, with permanently lubricated, resiliently mounted, direct-drive motors, UL-listed for outdoor use, with overload protection in windings, statically and dynamically balanced fans. Provide fan guard.
 - 3. Refrigerant: Unit shall utilize a non-CFC type refrigerant R-410A or an equivalent. R-22 is not acceptable.

4. Compressor: Direct-drive hermetic scroll compressors, external spring isolation mounts, crankcase heater, centrifugal oil pump, suction gas cooled, filter/dryer, and 5-year (parts-only) warranty.
5. Accessories:
 - a. Liquid line dryers.
 - b. Sight glasses.
 - c. Expansion valves.
 - d. Charging valves.
 - e. Suction and liquid line service valves.
6. Long Line Accessories:
 - a. Compressor start assist capacitor and relay.
 - b. Crankcase heater.
 - c. Hard shutoff thermostatic expansion valve.
 - d. Any additional accessories required for proper operation.
7. Provide with stamped louver hail guard.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Mount condensing units as shown on the Drawings.
- B. Provide 4" thick concrete pads. Pads to extend 6" in each direction beyond condensing unit.
- C. Make all refrigerant line connections and fully charge system. Install refrigerant piping and accessories as recommended by Manufacturer, (i.e. inverted vapor line trap at the indoor unit).

3.02 TEST

- A. Conduct leak test of the refrigerant piping system.

3.03 WIRING

- A. Electrical Contractor shall provide disconnect switches, and power and control wiring.

END OF SECTION

ELECTRICAL SPECIFICATIONS

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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:

ITEMSTYPE 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	<u>Sealed</u> 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 1/4" 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 all modifications required for his work, and work of all other trades 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

10/31/2025

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.
- 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:

	<u>120/240 Volt</u>
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.

3.04 MARKING

- E. All 48-volt DC conductors shall be black.
- 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 upon 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 1/4" 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 $\frac{3}{4}$ ", 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 $\frac{3}{4}$ ".

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 $\frac{3}{4}$ " 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 ($\frac{3}{4}$ "). 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 ³/₄ 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 1/2" 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 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 1/4" 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 1/4" 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 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. GFCI Tamper Resistant Receptacle - 20 Amp, 125 Volt - NEMA 5-20R
Hubbell – GFTRST20W
- I. Duplex Grounding Tamper Resistant Receptacle - 20 amp, 125 volt - NEMA 5-20R
Hubbell – HBLBR20TR
- J. GFCI Duplex Grounding Tamper Resistant Receptacle - 20 amp, 125 volt - NEMA 5-20R
Hubbell – GFTRST20W
- K. Single Pole Residential rocker switch – 20 amp, 120/277V
Hubbell – RSD115W
- L. 3-Way Residential Rocker Switch - 20 amp, 120/277V
Hubbell – RSD315W
- M. Single Pole Residential rocker switch with integral night light – 20 amp, 120/277V
Hubbell – RSD115ILW
- N. Duplex receptacle with USB-A and USB-C charger
Hubbell – USB20AC5W

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 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 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 32 12 00
FLEXIBLE PAVEMENT

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 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: Asphalt Concrete Surface Course, Type 1, medium or light traffic, PG 64-22 CCMS Item 441.
 1. Refer to drawings and details for extent of medium and light traffic designations.
- B. Intermediate Course: Asphalt Concrete Surface Course, Type 2, medium or light traffic, PG 64-22 CCMS Item 441.
 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: Asphalt Concrete Base, PG 64-22 CCMS Item 301.
- 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 ODOT 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 50° 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 ODOT CCMS 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 two coats with highway-type applicator machine as 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 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 CCMS 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 CCMS 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 32 12 00, "Flexible Pavement"

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. State of Ohio Department of Transportation Construction and Material Specifications (CMS) 2019.

N. City of Columbus, Ohio Construction and Material Specifications (CCMS) 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 CCMS 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. Lyntal 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 cementitious materials content 564 lbs./cu. yd.
 - Max water-cementitious 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 ODOT 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.

END OF SECTION

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Seeding.
 - 2. Sodding.
 - 3. Turf renovation.
- B. Related Requirements:
 - 1. Section 329300 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See drawing designations for planting soils.
- E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
 - 1. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.
- C. Product Certificates: For fertilizers, from manufacturer.
- D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.
 - 1. Professional Membership: Installer shall be a member in good standing of either the National Association of Landscape Professionals or AmericanHort.
 - 2. Experience: Three years' experience in turf installation in addition to requirements in Section 014000 "Quality Requirements."
 - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 4. Pesticide Applicator: State licensed, commercial.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.
- 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" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.
- C. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.

2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

1.7 FIELD CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.
 1. Spring Planting: March 15 to June 15.
 2. Fall Planting: August 15 to October 15.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species:
 1. Quality: Seed of grass species as listed below for solar exposure, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
 2. 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: Approved, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.
- B. Turfgrass Species: Turf-type tall fescue (*Festuca arundinacea*), shade tolerant blend.
- C. Turfgrass Species: Sod of grass species as follows, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:

2.3 FERTILIZERS

- A. 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 laboratory.
- B. 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 laboratory.

2.4 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- B. Sphagnum Peat Mulch: Partially decomposed sphagnum peat moss, finely divided or of granular texture, and with a pH range of 3.4 to 4.8.
- C. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
- D. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.
- E. Asphalt Emulsion: ASTM D977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

2.5 PESTICIDES

- A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 3. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
 - 2. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

- A. General: Prepare planting area for soil placement and mix planting soil.
- B. Placing Planting Soil: Place and mix planting soil in place over exposed subgrade.
 - 1. Reduce elevation of planting soil to allow for soil thickness of sod.
- C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- D. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
 - 1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 2. Do not use wet seed or seed that is moldy or otherwise damaged.
 - 3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a total rate of 5 to 8 lb/1000 sq. ft..
- C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- D. 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 thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
 - 1. Bond straw mulch by spraying with asphalt emulsion at a 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.

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 soil or sod during installation. Tamp and roll lightly to ensure contact with soil, 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.
- 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 turf where indicated.
- B. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
 - 1. Reestablish turf where settlement or washouts occur or where minor regrading is required.

2. Install new planting soil as required.
- C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
- D. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
- E. Mow, dethatch, core aerate, and rake existing turf.
- 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 initial fertilizer required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.
 1. Initial Fertilizer: Slow-release fertilizer applied according to manufacturer's recommendations.
- J. Apply seed and protect with straw mulch as required for new turf.
- K. Water newly planted areas and keep moist until new turf is established.

3.7 TURF MAINTENANCE

- A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and 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. Lay out temporary watering system to avoid walking over muddy or newly planted areas.

2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent 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 turf-type tall fescue to a height of 2 to 3 inches.

3.8 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Architect:
 1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
 2. 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. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

3.9 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. 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 Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.10 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.
- C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

- D. Remove nondegradable erosion-control measures after grass establishment period.

3.11 MAINTENANCE SERVICE

- A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:
 - 1. Seeded Turf: 30 days from date of Substantial Completion.
 - a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.
 - 2. Sodded Turf: 30 days from date of Substantial Completion.

END OF SECTION 329200

SECTION 32 93 00

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. Plants.
- B. Related Requirements:
 - 1. Section 329200 "Turf and Grasses" for turf.

1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than sizes indicated; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.
- C. Balled and Potted Stock: 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 sizes indicated.
- D. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a 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 plant required.
- E. Finish Grade: Elevation of finished surface of planting soil.
- F. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.

- G. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- H. Planting Area: Areas to be planted.
- I. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- J. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- K. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- L. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- M. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 COORDINATION

- A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
 - 1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
- B. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

- C. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.
 - 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 - 2. Experience: Three years' experience in landscape installation.
 - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 4. Pesticide Applicator: State licensed, commercial.
- B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
- C. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
 - 1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
 - 2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
- D. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, 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 plants during shipping and delivery. Do not drop plants during delivery and handling.

D. Handle planting stock by root ball.

E. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks, 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.

F. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

G. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or 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 plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.10 FIELD CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. 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 to June 15.
 2. Fall Planting: August 15 to October 15.
- C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

- A. Special Warranty: 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 abuse, lack of adequate maintenance, or neglect by Owner.
 - b. Structural failures including plantings falling or blowing over.
 2. Warranty Periods: From date of planting completion.
 - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
 - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
 3. Include the following remedial actions as a minimum:
 - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace 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 plant is required except for losses or replacements due to failure to comply with requirements.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots are unacceptable.

2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants 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 begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- D. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.
- E. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

2.2 FERTILIZERS

- A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.
 1. Size: 10-gram tablets.
 2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

2.3 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: Shredded hardwood.
 2. Size Range: 3 inches maximum, 1/2 inch minimum.
 3. Color: Natural.

2.4 PESTICIDES

- A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

- B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.5 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.
- B. Burlap: Non-synthetic, biodegradable.
- C. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
 - 3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

3.3 PLANTING AREA ESTABLISHMENT

- A. General: Prepare planting area for soil placement and mix planting soil according to ...
- B. Placing Planting Soil: Place manufactured planting soil over exposed subgrade.
- C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
- D. Application of Mycorrhizal Fungi: At time directed by Architect, broadcast dry product uniformly over prepared soil at application rate according to manufacturer's written recommendations.

3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits.
 - 1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
 - 2. Excavate approximately three times as wide as ball diameter for balled and burlapped stock.
 - 3. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
 - 4. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
 - 5. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 - 6. Maintain supervision of excavations during working hours.
 - 7. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
- B. Backfill Soil: Subsoil and topsoil removed from excavations may be used as backfill soil unless otherwise indicated.

- 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 planting pits.

3.5 TREE, SHRUB, AND VINE PLANTING

- A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
 - 1. Backfill: Planting soil. For trees, use excavated soil for backfill.
 - 2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and 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.
 - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
 - a. Quantity: Two per plant.
 - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 2 inch above adjacent finish grades.
 - 1. Backfill: Planting soil. For trees, use excavated soil for backfill.
 - 2. Carefully remove root ball from container without damaging root ball or plant.
 - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly

before placing remainder of backfill. Repeat watering until no more water is absorbed.

4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.

- a. Quantity: Two per plant.

5. Continue backfilling process. Water again after placing and tamping final layer of soil.

- E. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 TREE, SHRUB, AND VINE PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Prune, thin, and shape trees, shrubs, and vines as directed by Architect.
- C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.
- D. Do not apply pruning paint to wounds.

3.7 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing.
- B. Use planting soil for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to a depth not less than two nodes.
- E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.8 PLANTING AREA MULCHING

- A. Mulch backfilled surfaces of planting areas and other areas indicated.
 - 1. Trees in Turf Areas: Apply organic mulch ring of 3-inch average thickness, with 24-inch radius around trunks or stems. Do not place mulch within 3 inches of trunks or stems.
 - 2. Organic Mulch in Planting Areas: Apply 3-inch average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.

3.9 EDGING INSTALLATION

- A. Shovel-Cut Edging: Separate mulched areas from turf areas with a 45-degree, 4- to 6-inch- deep, shovel-cut edge.

3.10 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.
- B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.11 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to 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. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas according to manufacturer's written recommendations. Do not apply to seeded areas.
- C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.12 REPAIR AND REPLACEMENT

- A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Architect.
 - 1. Submit details of proposed pruning and repairs.
 - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
 - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.
- B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.
 - 1. Species of Replacement Trees: Same species being replaced.

3.13 CLEANING AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.
- C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

END OF SECTION 329300