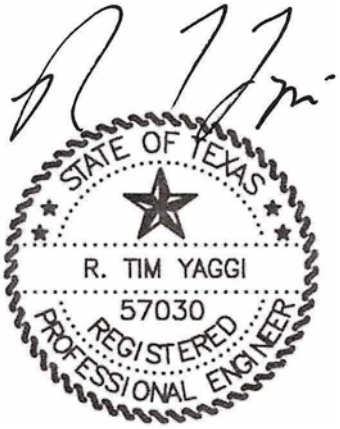
UNT
UNIVERSITY
OF NORTH TEXAS

SPECIFICATIONS

for

CAMPUS LIGHTING UPGRADES
HIGH MAST ZONES 6, 11, 25, 29 & AVE C
UNIVERSITY OF NORTH TEXAS
DENTON, TEXAS

AUGUST 31, 2023



08-31-2023

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SECTION 011000

SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:
1. Project information
2. Work covered by Contract Documents
3. Phased construction
4. Work by Owner
5. Owner-furnished products
6. Access to site
7. Coordination with occupants
8. Work restrictions
9. Specification and drawing conventions
10. Special provisions
11. Purpose of Division 1 – General Requirements

1.3 PROJECT INFORMATION

A. Owner: University of North Texas System
B. Project Identification: Campus Lighting Upgrades
C. Project Location: Various Locations within Campus
1. Owner’s Construction Manager
2. Owner’s Designated Representative
D. Architect: Yaggi Engineering, Inc.
E. Construction Manager-at-Risk Name:
1. Construction Manager-at-Risk for this Project is Project's constructor. In Divisions 01 through 49 Sections, the terms "Construction Manager" and "Contractor" are synonymous.
F. Project Web Site: A Project Web site administered by the Contractor will be used for purposes of managing communication and documents during the construction stage.
1. See Division 01 Section 013100 “Project Management and Coordination" for Contractor's requirements for utilizing the Project Web site.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of the Project is defined by the Contract Documents and consists of the following:
1. New parking, street, and pedestrian lighting systems to replace select existing high mast lighting zones.
B. Type of Contract
1. Project will be constructed under a Type of Agreement contract.

1.5 PHASED CONSTRUCTION

A. The Work shall be conducted in phases, with each phase substantially complete as indicated:
1. Phase Designation : Brief Phase Description. Work of this phase shall commence within ( ) days after the Notice to Proceed and be substantially complete and ready for occupancy within ( ) days after the Notice to Proceed.
2. Phase Designation : The remaining Work shall be substantially complete and ready for occupancy at time of Substantial Completion for the Work.
B. Before commencing Work of each phase, submit an updated copy of the Contractor's construction schedule showing the sequence, commencement and completion dates [and move-out and -in dates of Owner's personnel] for all phases of the Work.

1.6 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

B. Fees Paid by Owner: Impact Fees.
C. Fees Reimbursed by Owner: Tap Fees and Meter Fees.

1.7 ACCESS TO SITE

A. Use of Site: Limit use of Project site to [work in areas] [areas within the Contract limits] indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated. Use of any area outside of work area must be approved by Owner.
B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weather-tight condition throughout construction period. Repair damage caused by construction operations to equal or better condition.

1.8 COORDINATION WITH OCCUPANTS

A. Full Owner Occupancy: Owner will occupy site and existing adjacent building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
   1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
   2. Notify the Owner not less than three (3) days in advance of activities that will affect Owner's operations.

1.9 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.
   1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.
B. On-Site Work Hours: Limit work in the existing building to normal business working hours of a.m. to p.m., Monday through Friday, except as otherwise indicated.
   1. Hours for Utility Shutdowns: Coordinated with Owner, with not less than two (2) weeks written notice of intended shutdown.
   2. Hours for core drilling and other noisy activities:
C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
   1. Notify Owner not less than three (3) days in advance of proposed utility interruptions.
   2. Obtain Owner's written permission before proceeding with utility interruptions.
D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
   1. Notify Owner not less than three (3) days in advance of proposed disruptive operations.
   2. Obtain Owner's written permission before proceeding with disruptive operations.
E. Nonsmoking Campus: Smoking is not permitted anywhere on any UNT campus.
F. Employee Identification: Provide identification tags for Contractor personnel working on the Project site. Require personnel to utilize identification tags at all times.

1.10 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
   2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
C. Drawing Coordination: Requirements for materials and products identified on the Drawings are described in detail in the Specifications. One or more of the following are used on the Drawings to identify materials and products:
   1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
   2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
   3. Keynoting: Materials and products are identified by reference keynotes referencing Specification

Section numbers found in this Project Manual.

1.11 SPECIAL PROVISIONS

A. Review Owner's tree protection and mitigation policy (Denton Campus ONLY) available at http://policy.unt.edu/policy/8-6.
Review Owner's Campus Design Guidelines (Denton ONLY) available at https://facilities.unt.edu/sites/default/files/DESIGN%20GUIDELINES%202017_rev%203_09.01.17.pdf

1.12 DIVISION 1 – GENERAL REQUIREMENTS

A. The specification sections contained with Division 01 – General Requirements, serve to expand and define in more detail, the administrative and procedural requirements outlined in Section 007000 – General Conditions. Should any provisions with Division 01 sections be in conflict with the General Conditions, the General Conditions shall govern.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 012100

ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.
   1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to the Contractor. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:
   1. Lump sum allowances
   2. Unit cost allowances
   3. Quantity allowances

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Design Professional and Owner of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Design Professional’s request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Design Professional from the designated supplier.

1.4 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

D. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 LUMP SUM, UNIT COST AND QUANTITY ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Design Professional under allowance and shall include freight, and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials [ordered by Owner] [selected by Architect] under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
   1. If requested by Design Professional, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.7 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: Should Owner determine that an adjustment is needed in an allowance amount; a Change Order will be prepared based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
   1. Include installation costs in purchase amount only where indicated as part of the allowance.
   2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.

3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit cost allowances.
4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. : Lump Sum Unit Cost Quantity Contingency Testing and Inspecting Allowance: Include the sum of [Insert dollar or quantity amount of allowance] : Include [Insert allowance description] as specified in Division [Insert Division number] Section " [Insert Section title] " and as shown on Drawings.
1. This allowance includes material cost, receiving, handling, and installation, and Contractor overhead and profit .
2. Coordinate quantity allowance adjustment with corresponding unit price requirements of Division 01 Section "Unit Prices."

END OF SECTION

SECTION 012200

UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

1.3 DEFINITIONS

A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, cost for delivery, installation, insurance, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. Unit Price No. - Insert unit price item :

1. Description: Insert unit-price item description according to Division Section , " Title ".
2. Unit of Measurement:
3. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Division 01 Section 012100, “Allowances".

END OF SECTION

SECTION 012300

ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by Contractor and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
   1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
   2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
   1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: RAB in lieu of Hubbell for “H” Series poles and fixtures. “A” Series fixtures shall be 80 CRI under this alternate.

B. Alternate No. 1A: Restripe entire Parking Lot #1.

C. Alternate No. 1B: Restripe entire Parking Lot #5.

D. Alternate No. 1C: Restripe entire Parking Lot #13.

E. Alternate No. 2A: High mast zone 29 utilizing Hubbell for “A” Series and “H” Series poles and fixtures.

F. Alternate No. 2B: High mast zone 29 utilizing Hubbell for “A” Series poles and fixtures and RAB for “H” Series poles and fixtures. “A” Series fixtures shall be 80 CRI under this alternate for high mast zone 29.

G. Alternate No. 2C: Restripe entire Parking Lot #27.

H. Alternate No. 3A: Avenue C utilizing Hubbell for “A” Series and “H” Series poles and fixtures.

I. Alternate No. 3B: Avenue C utilizing Hubbell for “A” Series poles and fixtures and RAB for “H” Series poles and fixtures. “A” Series fixtures shall be 80 CRI under this alternate for Avenue C.

END OF SECTION

SECTION 012500

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

A. Substitution Requests: Submit one (1) PDF file of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitution Request Form: Use CSI Form 012500.13
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified product, fabrication, or installation cannot be provided, if applicable.
      b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, which will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
      d. Product Data: including drawings and descriptions of products and fabrication and installation procedures
      e. Samples, where applicable or requested
      f. Certificates and qualification data, where applicable or requested
      g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
      h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
      i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
      j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
      k. Cost information, including a proposal of change, if any, in the Contract Sum.
      l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
      m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
   3. Design Professional's Action: If necessary, Design Professional will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Design

Professional will notify Contractor of acceptance or rejection of proposed substitution within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

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

1.6 PROCEDURES

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

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than fifteen (15) days prior to time required for preparation and review of related submittals.
   1. Conditions: Design Professional will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
      a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
      b. Substitution request is fully documented and properly submitted.
      c. Requested substitution will not adversely affect Contractor's construction schedule.
      d. Requested substitution has received necessary approvals of authorities having jurisdiction.
      e. Requested substitution is compatible with other portions of the Work.
      f. Requested substitution has been coordinated with other portions of the Work.
      g. Requested substitution provides specified warranty.
      h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed, unless otherwise indicated. If allowed Design Professional will consider requests for substitution if received within sixty (60) days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Design Professional.
   1. Conditions: Design Professional will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Design Professional will return requests without action, except to record noncompliance with these requirements:
      a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect Design Professional redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
      b. Requested substitution does not require extensive revisions to the Contract Documents.
      c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
      d. Substitution request is fully documented and properly submitted.
      e. Requested substitution will not adversely affect Contractor's construction schedule.
      f. Requested substitution has received necessary approvals of authorities having jurisdiction.
      g. Requested substitution is compatible with other portions of the Work.
      h. Requested substitution has been coordinated with other portions of the Work.
      i. Requested substitution provides specified warranty.
      j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 012500.13

SUBSTITUTION REQUEST FORM

PROJECT: _____ **(After Contract Award)**

TO: _____

_____

NO. _____ DATE: _____

Contractor hereby requests acceptance of the following product or system as a substitution in accordance with provisions of Division 01 Section 012500 “Substitution Procedures”:

1. SPECIFIED PRODUCT OR SYSTEM

Substitution request for: _____

Specification Section No.: _____ Article/ Paragraph: _____

2. REASON FOR SUBSTITUTION REQUEST

SPECIFIED PRODUCT	PROPOSED PRODUCT
☐ Is no longer available	☐ Will reduce construction time
☐ Is unable to meet project schedule	☐ Will result in cost savings of
☐ Is unsuitable for the designated application	$ _____ to Project
☐ Cannot interface with adjacent materials	☐ Is for supplier’s convenience
☐ Is not compatible with adjacent materials	☐ Is for subcontractor’s convenience
☐ Cannot provide the specified warranty	☐ Other: _____
☐ Cannot be constructed as indicated	_____

☐ Cannot be obtained due to one or more of the following:

- ☐ Strike
- ☐ Lockout
- ☐ Bankruptcy of manufacturer or supplier
- ☐ Similar occurrence (explain below)

3. SUPPORTING DATA

☐ Drawings, specifications, product data, performance data, test data, and any other necessary information to facilitate review of the Substitution Request are attached.

☐ Sample is attached ☐ Sample will be sent if requested

4. QUALITY COMPARISON

Provide all necessary side-by-side comparative data as required to facilitate review of Substitution Request:

SPECIFIED PRODUCT PROPOSED PRODUCT

Manufacturer: _____

Name / Brand: _____

Catalog No.: _____

Vendor: _____

Variations: _____

(Add Additional Sheets If Necessary)

Local Distributor or Supplier: _____

Maintenance Service Available: ☐ Yes ☐ No

Spare Parts Source: _____

Warranty: ☐ Yes ☐ No _____ Years

5. PREVIOUS INSTALLATIONS

Identification of at least three (3) similar projects on which proposed substitution was used:

PROJECT #1

Project: _____

Address: _____

_____

Architect: _____

Owner: _____

Contractor: _____

Date Installed: _____

PROJECT #2

Project: _____

Address: _____

_____

Architect: _____

Owner: _____

Contractor: _____

Date Installed: _____

PROJECT #3

Project: _____

Address: _____

_____

Architect: _____

Owner: _____

Contractor: _____

Date Installed: _____

6. EFFECT OF SUBSTITUTION

Proposed substitution affects other work or trades: ☐ No ☐ Yes (if yes, explain)

_____

_____

Proposed substitution requires dimensional revisions or redesign of architectural, structural, M-E-P, life safety, or other work:

☐ No ☐ Yes (if yes, attach data explaining revisions)

7. STATEMENT OF CONFORMANCE OF REQUEST TO CONTRACT REQUIREMENTS

Contractor and Subcontractor have investigated the proposed substitution and hereby represent that:

A. They have personally investigated the proposed substitution and believe that it is equal to or superior in all respects to specified product, except as stated above;

B. The proposed substitution is in compliance with applicable codes and ordinances;

C. The proposed substitution will provide same warranty as specified for specified product;

D. They will coordinate the incorporation of the proposed substitution into the Work, and will include modifications to the Work as required to fully integrate the substitution;

E. They have included complete cost data and implications of the substitution (attached);

F. They will pay any redesign fees incurred by the Architect or any of the Design Professional's consultants, and any special inspection costs incurred by the Owner, caused by the use of this product;

G. They waive all future claims for added cost or time to the Contract related to the substitution, or that become known after substitution is accepted.

H. The Design Professional's approval, if granted, will be based upon reliance upon data submitted and the opinion, knowledge, information, and belief of the Design Professional at the time decision is rendered and Addendum is issued; and that Design Professional's approval therefore is interim in nature and subject to reevaluation and reconsideration as additional data, materials, workmanship, and coordination with other work are observed and reviewed.

Contractor: _____
(Name of Contractor)

Date: _____ By: _____

Subcontractor: _____
(Name of Subcontractor)

Date:_____ By: _____ _____

Note: Unresponsive or incomplete requests will be rejected and returned without review.

8. DESIGN PROFESSIONAL'S REVIEW AND ACTION

☐ Substitution is accepted.

☐ Substitution is accepted, with the following comments: _____

_____

_____

☐ Resubmit Substitution Request:

☐ Provide more information in the following areas: _____

_____

_____

☐ Provide proposal indicating amount of savings / credit to Owner

☐ Bidding Contractor shall sign Bidder's Statement of Conformance

☐ Bidding Subcontractor shall sign Bidder's Statement of Conformance

☐ Substitution is not accepted:

☐ Substitution Request received too late.

☐ Substitution Request received directly from subcontractor or supplier.

☐ Substitution Request not submitted in accordance with requirements.

☐ Substitution Request Form is not properly executed.

☐ Substitution Request does not indicate what item is being proposed.

☐ Insufficient information submitted to facilitate proper evaluation.

☐ Proposed product does not appear to comply with specified requirements.

☐ Proposed product will require substantial revisions to Contract Documents.

By: _____

Date: _____

Design Professional has relied upon the information provided by the Contractor, and makes no claim as to the accuracy, completeness, or validity of such information. If an accepted substitution is later found to be not in compliance with the Contract Documents, Contractor shall provide the specified product.

9. OWNER'S REVIEW AND ACTION

☐ Substitution is accepted for items not involving additional costs.

☐ Substitution is not accepted.

By: _____
(Owner's Construction Manager)

Date: _____

END OF FORM

SECTION 012600

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections:

1. Division 01 Section 016000, "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Design Professional will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions." or Architect's Bulletin form.

1.4 CHANGE ORDER REQUESTS

A. Owner/Design Professional-Initiated Change Order Requests: will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Change Order Requests issued by Owner/Design Professional are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Change Order Request after receipt of Change Order Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship.
    e. Quotation Form: Use Chang Order Request (COR) form. Contractor shall complete the COR Cost Analysis form and the Sub-Contractor shall submit the Sub-Contractor Cost Analysis form with supporting documentation and cost breakdown by line item, or other form approved by Owner.

B. Contractor-Initiated Change Orders: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Owner/Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section 012500, "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Change Order Request Form: Use Owner's standard Change Order Request form as approved by Owner and Design Professional.

1.5 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: Refer to Division 01, Section 012100, "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

B. Unit Price Adjustment: Refer to Division 01 Section 012200, "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit price work.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Change Order Request, Owner will prepare and issue a Change Order on attached form for signatures of Owner, Design Professional and Contractor.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Work Change Directive: Owner may issue a Construction Change Directive on attached form. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

CONSTRUCTION CHANGE ORDER

UNT SYSTEM

☐ **Construction Agreement**
☐ **JOC Job Order** **JO Date:**

FROM OWNER:
University of North Texas System
1155 Union Circle #311040
Denton, TX 76203

CHANGE ORDER NO.:
DATE:
CIP PROJECT NO.:
PO NO.:

TO CONTRACTOR: *(Name and Address)*

A/E NAME:
PROJECT/CONTRACT NO.:
CONTRACT DATE:
PROJECT NAME:

The Agreement is changed as follows:

Total	**$ -**

All Services provided per _____ attached are hereby incorporated by reference for all purposes.

The original Agreement, Early Release Packages, and/or GMP Amendment Sum:	
The net change by previously authorized Change Orders:	
The Agreement Sum prior to this Change Order:	$ -
The Agreement Sum will be increased by this Change Order in the amount of	$ -
New Agreement Sum including this Change Order:	**$ -**

The TIME of the project has increased by _____ **days**

The date of SUBSTANTIAL COMPLETION as of the date of this Change Order is _____

Or if services are being provided after SUBSTANTIAL COMPLETION
The completion date of the services provided in this Change Order will be _____

NOT VALID UNTIL SIGNED BY THE A/E, CONTRACTOR AND OWNER

A/E (*Firm Name*)	CONTRACTOR (*Firm Name*)	University of North Texas System OWNER
By (Signature)	By (Signature)	By (Signature)
Name (Typed or Printed Name)	Name (Typed or Printed Name)	Name (Typed or Printed Name)
Title	Title	Title
Date	Date	Date

Approved by UNTS OGC through 12/31/2021

Construction Change Directive

FROM OWNER:
University of North Texas (System or Institution)
1155 Union Circle #311040
Denton, Texas 76203

CONSTRUCTION CHANGE DIRECTIVE NUMBER:

DATE ISSUED: _____

TO CONTRACTOR: *(Name and Address)*

_____
_____
_____
_____

PROJECT NAME: _____
AGREEMENT DATE: _____
CIP PROJECT NUMBER _____
PURCHASE ORDER NUMBER: _____

The following change in the Contract Documents is approved by the Owner and the Work is authorized to proceed accordingly:

Additional Days Required [ ] Calendar Days

Not to Exceed Cost $ -

When the Owner and Contractor agree upon the exact adjustment in the Contract Price and/or the Contract Time for a change in the Work directed by this Construction Change Directive, such agreement shall be the subject of a Change Order.

The Change Order shall include all outstanding Construction Change Directives that the contractor would like to include on an application for payment.

A Change Order must be executed before the Contractor is allowed to add the Work described above on an application for payment.

Owner
University of North Texas (System or Institution Name)

_____
BY *(Signature)*

[Authorized Signatory Name]
[Authorized Signatory Title]

Date

_____
BY (*Signature)*

[Authorized Signatory Name]
[Authorized Signatory Title]

SECTION 012900

PAYMENT PROCEDURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections include the following:

1. Division 01 Section 012600 for administrative procedures for handling changes to the Contract.
2. Division 01 Section 013200 for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittal Schedule.
3. Division 00 Section 007000 – University of North Texas System Uniform General Conditions and Supplementary General Conditions 2019, Amended.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Application for Payment. The Schedule of Values is a form provided by Owner to Contractor

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules including the following:
   a. Application for Payment form with Continuation Sheets
   b. Submittal Schedule
   c. Contractor's Construction Schedule
2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven calendar days before the date scheduled for submittal of initial Application for Payment.
3. Sub schedules: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules indicating values correlated with each phase of payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:
   a. Project name and location
   b. Name of Architect
   c. Architect's project number
   d. Contractor's name and address
   e. Date of submittal
2. The Schedule of Values is formatted using CSI Divisions. (see form instructions)
3. Draft Submittals: Submit in same format as final payment application
4. Arrange the Schedule of Values in tabular form with separate sections to indicate the following for each item listed:
   a. Related Specification Section or Division
   b. Change Orders (numbers) that affect value

c. Dollar value
   1) Percentage of the Contract Sum to nearest one-tenth percent adjusted to total 100 percent.

5. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Owner/Architect will review Contractor's Schedule of Values and approve upon receipt of sufficient detail as deemed satisfactory to Owner/Architect.

6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored but not yet installed.
   a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance and storage in bonded warehousing for materials stored off-site.
   b. For major items provide separate line items for materials and labor based on CSI Master Format Division. Major items include but not limited to:

- Division 01 - General Requirements
- Division 02 - Existing Conditions
- Division 03 - Concrete
- Division 04 - Masonry
- Division 05 - Metals
- Division 06 - Wood, Plastics, Composites
- Division 07 - Thermal and Moisture Protection
- Division 08 - Openings
- Division 09 - Finishes
- Division 10 - Specialties
- Division 11 - Equipment
- Division 12 - Furnishings
- Division 13 - Special Construction
- Division 14 - Conveying Equipment
- Division 21 - Fire Suppression
- Division 22 - Plumbing
- Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)
- Division 25 - Integrated Automation
- Division 26 - Electrical
- Division 27 - Communications
- Division 28 - Electronic Safety and Security
- Division 31 - Earthwork
- Division 32 - Exterior Improvements
- Division 33 - Utilities
- Division 34 - Transportation
- Division 35 - Waterway and Marine Construction
- Division 40 - Process Integration
- Division 41 - Material Processing and Handling Equipment
- Division 42 - Process Heating, Cooling, and Drying Equipment
- Division 43 - Process Gas and Liquid Handling, Purification and Storage Equipment
- Division 44 - Pollution and Waste Control Equipment
- Division 45 - Industry-Specific Manufacturing Equipment
- Division 46 - Water and Wastewater Equipment
- Division 48 - Electrical Power Generation

7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost.
8. In addition to line item costs of Sections in Division 02 thru 39, furnish line item costs for each item of the following general administrative and procedural cost items.
    a. Bonds
    b. Insurance
    c. Mobilization
    d. Field Superintendence
    e. Temporary Facilities
    f. Trench Safety
    g. Clean-up and Disposal
    h. Project Close Out
    i. Final Cleaning
    j. Demobilization
    k. Overhead and General Conditions
    l. Contractor's Fee
9. Plumbing, HVAC, Electrical and Life Safety work shall be broken down in accordance with the following subcategories as a minimum:
    a. Fire Protection:
    b. Plumbing:
    c. Heating, Ventilating and Air Conditioning (HVAC):
    d. Electrical:
    e. Fire Detection and Alarm:
10. Schedule Updating: Update and resubmit the Schedule of Values before the next Application for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Electronically deliver in a format approved by Owner after the Design Professional has certified the Payment Application Payment processing will start as soon as we receive and date stamp the payment. In return the Contractor will be given a receipt that will be initialed and a photocopy will be provided to the Contractor.

B. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
    1. Initial Application for Payment, Application for Payment at time of Substantial Completion and Final Application for Payment involve additional requirements.

C. Payment Application Times: Progress payment is due once a month.

D. Payment Application Forms: Use Application for Payment form to be furnished by Owner.

E. Application Preparation: Complete every entry on form. Application to be Notarized by a Notary and executed by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
    1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
    2. Include amounts of Change Order issued before the last day of construction period covered by application.
    3. Include supporting documentation including subcontractor and supplier invoices.

F. Transmittal: Prepare one copy with original signatures and original notary of each Application for Payment by a method ensuring receipt within 24-hours. The copy shall include waivers of lien, schedule updates, contractor's executive summary and similar attachments.
    1. Transmit each package with a transmittal form listing attachments and recording appropriate information about application including subcontractor supplemental documentation and required general conditions documents.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from subcontractors, sub-subcontractors and suppliers for construction period covered by the previous application.
   1. Submit partial lien waivers on each item for amount requested in previous applications after deduction for retainage of each item.
   2. When an application shows completion of an item submit final or full lien waivers.
   3. Owner reserves the right to designate which entities involved in the Work must submit lien waivers.
   4. Submit final Application for Payment with, or proceeded by, final lien waivers from every entity involved with performance of the Work covered by the application that is lawfully entitled to a lien.
   5. Waiver Forms: Submit waivers of lien on forms executed in a manner acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment.
   1. Include the following:
      a. List of subcontractors
      b. Schedule of Values
      c. Contractor's Construction Schedule (preliminary if not final)
      d. Products list
      e. Submittal Schedule (preliminary if not final)
      f. List of Contractor's staff assignments
      g. List of Contractor's principal consultants
      h. Initial progress report
      i. Report of preconstruction conference
      j. Certificates of insurance and insurance policies
      k. Performance and payment bonds
      l. Data needed to acquire Owner's insurance

I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
   1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum
   2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: Submit Final Application for Payment within thirty (30) days of Substantial Completion along with releases and supporting documentation not previously submitted and accepted including, but not limited to, the following:
   1. Evidence of completion of Project closeout requirements
   2. Insurance certificate for products and completed operations where required and proof taxes, fees and similar obligations were paid
   3. Updated final statement accounting for final changes to the Contract Sum
   4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims"
   5. AIA Document G706A, "Contractor's Affidavit of Release of Liens"
   6. AIA Document G707, "Consent of Surety to Final Payment"
   7. Evidence that claims have been settled

K. Electronic Fund Transfer (EFT): Vendors are encouraged to utilize EFT for the distribution of all future payments. To sign up for EFT, complete the EFT Agreement (Supplier) at, https://www.untsystem.edu/sites/default/files/forms/procurement/supplier_eft_form_revised.pdf. Once established, all future payments will be made by EFT. When an EFT payment is made, an email will be sent to the email address you specify on the EFT agreement form. If you have any questions, please contact the Business Service Center at bsc@untsystem.edu or 940-369-5500.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 013100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General project coordination procedures
   2. Administrative and supervisory personnel
   3. Coordination drawings
   4. Requests for Information (RFIs)
   5. Project Web site
   6. Project meetings

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

1.3 DEFINITIONS

A. RFI: Request from Contractor seeking information from each other during construction.

1.4 COORDINATION

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

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 to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of Contractor's construction schedule, continually updated, and in a format acceptable to Owner
   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. Pre-Installation conferences
   7. Project closeout activities
   8. Startup and adjustment of systems
   9. Project closeout activities

1.5 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
   1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.
g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Design Professional indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate sub-framing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines, including fire protection requirements.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:
   a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems
   b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment
   c. Fire-rated enclosures around ductwork
7. Electrical Work: Show the following:
   a. Runs of vertical and horizontal conduit 1¼ -inch diameter and larger
   b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire alarm locations
   c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor control center locations
   d. Location of pull boxes and junction boxes, dimensioned from column center lines
8. Fire Protection System: Show the following:
   a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
9. Review: Design Professional will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility. If the Design Professional determines that the coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Design Professional will so inform the Contractor (copy the Owner), who shall make changes as directed and resubmit.
10. Coordination Drawing Prints: Prepare coordination drawing prints in accordance with requirements of Division 01 Section 013300, "Submittal Procedures".

C. Coordination Digital Data Files: Prepare coordination digital data files in accordance with the following requirements:
1. File Preparation Format: Same digital data software program, version, and operating system as the original Drawings.
2. File Preparation Format: DWG, Version, operating in Microsoft Windows operating system.
3. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.

4. Design Professional will furnish Contractor one set of digital data files of the Drawings for use in preparing coordination digital data files. Refer to Division 01 Section 013300, “Submittal Procedures”, for digital data file requirements.
    a. Design Professional makes no representations as to the accuracy or completeness of digital data files as they relate to the Drawings.
    b. Digital Data Software Program: The Drawings are available in AutoCAD.
    c. Contractor shall execute a data licensing agreement in a form agreeable to the Design Professional.

1.6 CHANGE KEY PERSONNEL

A. Change Key Personnel Names: Changes to key personnel originally stated in the bid response must include a revised 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.
    2. Key personnel must be same as those proposed in the bid response unless changes are authorized in writing from the Associate Vice Chancellor for System Facilities prior to their first day on the project.

1.7 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI. All RFIs should be sent directly to the Design Professional via email or posted to project collaboration site (if one is being utilized). The Design Professional will redistribute to the appropriate reviewer.
    1. Design Professional will return RFIs submitted to Design Professional by other entities controlled by Contractor 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 information or interpretation and the following:
    1. Project name
    2. Project number
    3. Date
    4. Name of Contractor
    5. Name of Design Professional
    6. RFI number, numbered sequentially
    7. RFI subject
    8. RFI Question
    9. Specification Section number and title and related paragraphs, as appropriate
    10. Drawing number and detail references, as appropriate
    11. Field dimensions and conditions, as appropriate
    12. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
    13. Contractor's signature
    14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
        a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Design Professional. RFIs should be emailed to Design Professional with the following format standards. 1) RFI should include RFI number in subject line of email along with brief description. 2) Body of email should include question or description of RFI and suggestion. Sketches or other necessary documents should be attached to email in PDF format.

D. Design Professional's Action: Design Professional will review each RFI, determine action required, and respond. Allow seven (7) business days for Design Professional's response for each RFI. RFIs received by Design Professional 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 coordination information already indicated in the Contract Documents
        d. Requests for adjustments in the Contract Time or the Contract Sum

e. Requests for interpretation of Design Professional's actions on submittals
f. Incomplete RFIs or inaccurately prepared RFIs

2. Design Professional's action may include a request for additional information, in which case Design Professional's time for response will date from time of receipt of additional information.
3. Design Professional's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section 012600, "Contract Modification Procedures".
   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Design Professional in writing within ten (10) days of receipt of the RFI response.

E. On receipt of Design Professional's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Design Professional within seven days if Contractor disagrees with response.

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. log with not less than the following:
1. RFI Log Date
2. Project name
3. Name and address of Contractor
4. Name and address of Design Professional and Construction Manager
5. RFI number including RFIs that were dropped and not submitted
6. RFI description
7. Date the RFI was submitted
8. Request Date
9. Date Design Professional's and Construction Manager's response was received
10. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate
11. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate

1.8 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Design Professional of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees in advance of meeting.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Design Professional, within three (3) days of the meeting.

B. Pre-construction Conference: Schedule and conduct a pre-construction conference before starting construction, at a time convenient to Owner and Design Professional, but no later than fifteen (15) days after notice to proceed.
1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Construction Manager, Design Professional, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Distribute the agenda to all invited attendees in advance of meeting. Discuss items of significance that could affect progress, including the following:
   a. Tentative construction schedule
   b. Phasing
   c. Critical work sequencing and long-lead items
   d. Designation of key personnel and their duties
   e. Lines of communications
   f. Procedures for processing field decisions and Change Orders
   g. Procedures for RFIs
   h. Procedures for testing and inspecting
   i. Procedures for processing Applications for Payment
   j. Distribution of the Contract Documents
   k. Submittal procedures
   l. Sustainable design requirements
   m. Preparation of record documents
   n. Use of the premises[and existing building]
   o. Work restrictions
   p. Working hours

q. Owner's occupancy requirements
r. Responsibility for temporary facilities and controls
s. Procedures for moisture and mold control
t. Procedures for disruptions and shutdowns
u. Construction waste management and recycling
v. Parking availability
w. Office, work, and storage areas
x. Equipment deliveries and priorities
y. First aid
z. Security
aa. Progress cleaning
bb. Commissioning requirements/coordination

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes within three (3) days of meeting date.

C. Pre-Installation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Design Professional of scheduled meeting dates.
2. Agenda: Distribute the agenda to all invited attendees in advance of meeting. Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
a. Contract Documents
b. Options
c. Related RFIs
d. Related Change Orders
e. Purchases
f. Deliveries
g. Submittals
h. Review of mockups
i. Possible conflicts
j. Compatibility problems
k. Time schedules
l. Weather limitations
m. Manufacturer's written recommendations
n. Warranty requirements
o. Compatibility of materials
p. Acceptability of substrates
q. Temporary facilities and controls
r. Space and access limitations
s. Regulations of authorities having jurisdiction
t. Testing and inspecting requirements
u. Installation procedures
v. Coordination with other work
w. Required performance results
x. Protection of adjacent work
y. Protection of construction and personnel
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes within three (3) days of meeting date.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct Project closeout conference, at a time convenient to Owner and Design Professional, but no later than [number] days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Design Professional, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Distribute the agenda to all invited attendees in advance of meeting. Discuss items of significance that could affect or delay Project closeout, including the following:
   a. Preparation of record documents
   b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance
   c. Submittal of written warranties
   d. Requirements for preparing sustainable design documentation
   e. Requirements for preparing operations and maintenance data
   f. Requirements for demonstration and training
   g. Preparation of Contractor's punch list
   h. Procedures for processing Applications for Payment at Substantial Completion and for final payment
   i. Submittal procedures
   j. Coordination of separate contracts
   k. Owner's partial occupancy requirements
   l. Installation of Owner's furniture, fixtures, and equipment
   m. Responsibility for removing temporary facilities and controls
4. Minutes: Entity conducting meeting will record and distribute meeting minutes within three (3) days of meeting date.

E. Progress Meetings: Conduct progress meetings at agreed upon intervals.
1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, Owner's Commissioning authority, Construction Manager, and Design Professional, each contractor, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Distribute the agenda to all invited attendees in advance of meeting. Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      Review schedule for next period.
   b. Review present and future needs of each entity present, including the following:
      Interface requirements
      Sequence of operations
      Status of submittals
      Deliveries
      Off-site fabrication
      Access
      Site utilization
      Temporary facilities and controls
      Progress cleaning
      Quality and work standards
      Status of correction of deficient items
      Field observations
      Status of RFIs
      Status of proposal requests
      Pending changes
      Status of Change Orders
      Pending claims and disputes
      Documentation of information for payment requests
      Recommendations of construction feasibility
      Safety precautions and programs
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information within three (3) days of meeting date.
   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

F. Coordination Meetings: Conduct project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and pre-installation conferences.
   1. Attendees: In addition to representatives of Owner and Design Professional, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
   2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
      a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
      c. Review present and future needs of each contractor present, including the following:
         Interface requirements
         Sequence of operations
         Status of submittals
         Deliveries
         Off-site fabrication
         Access
         Site utilization
         Temporary facilities and controls
         Work hours
         Hazards and risks
         Progress cleaning
         Quality and work standards
         Change Orders
   3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting, within three (3) days of meeting date.
   4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes within three (3) days of meeting date.

G. Meetings Requested by Owner: While not necessarily coinciding with dates of other meetings, Owner reserves the right to call and conduct meetings with project participants as the need arises.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 013200

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Contractor's Work Progress Schedule
   2. Daily construction reports
   3. Material location reports
   4. Field condition reports
   5. Special reports

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and/or controlling the construction project. Activities included in a construction schedule that consume time and resources.
   1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
   2. Predecessor Activity: An activity that precedes another activity in the network.
   3. Successor Activity: An activity that follows another activity in the network.

1.1 Baseline Schedule: The initial time schedule prepared by Contractor for Owner's information and acceptance that conveys Contractor's and Subcontractors' activities (including coordination and review activities required in the Contract Documents to be performed by Design Professional and Owner), durations, and sequence of work related to the entire Project to the extent required by the Contract Documents. The schedule clearly demonstrates the Longest Path of activities, durations, and necessary predecessor conditions that drive the end date of the schedule. The Baseline Schedule shall not exceed the time limit current under the Contract Documents.

1.2 Longest Path: The sequence of directly related activities that comprise the longest continuous chain of activities from the start of the first activity to the finish of the last activity. The activities represent critical path plus float plus historical weather days. Each activity in the Longest Path is critical and directly related in that it prevents its successor from being scheduled earlier than it is.

B. Event: The starting or ending point of an activity.

C. Work Progress Schedule: The continually updated time schedule prepared and monitored by the Contractor that coordinates and integrates activities of the Project, including Contractor's services, Design Professional's services, the work of other consultants, suppliers, and Owner's activities with the anticipated construction schedules for other contractors. The WPS accurately indicates all necessary and appropriate revisions including a longest path impact analysis, as required by the conditions of the Work and the Project while maintaining a concise comparison to the Baseline Schedule.

D. Float: The period of time a task can be delayed without delaying Substantial Completion date.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
   1. PDF electronic file.

B. Contractor's Baseline Schedule: Initial Baseline Schedule due with Guaranteed Maximum Price in a Construction Manager-At-Risk and with the Proposal Response in a CSP, of size required to display entire schedule for entire construction period. The Baseline Schedule shall become the comparison to the actual conditions throughout the Contract duration and become part of the Contractor's Work Progress Schedule.
   1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (baseline or updated) and date on label.

C. WPS Reports: Concurrent with WPS schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, original duration, and remaining duration in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity.
3. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.

D. Material Location Reports: Submit at prior to application for payment
E. Field Condition Reports: Submit at time of discovery of differing conditions
F. Special Reports: Submit at time of unusual event

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in WPS scheduling and reporting, with capability of producing WPS reports and diagrams within twenty-four (24) hours of Design Professional's request.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
B. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from entities involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S WORK PROGRESS SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for commencement of the Work to date of Final Completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
   1. Procurement Activities: Include procurement process activities for long lead items (as identified by Contractor) and major items, requiring a cycle of more than sixty (60) days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   2. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section 013300, "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
   3. Startup and Testing Time: Include not less than fifteen (15) days for startup and testing.
   4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Design Professional's administrative procedures necessary for certification of Substantial Completion.
   5. Punch List and Final Completion: Include not more than thirty (30) days for punch list and final completion.
C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
   1. Phasing: Arrange list of activities on schedule by phase.
   2. Work under More Than One Contract: Include a separate activity for each contract.
   3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
   4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section 011000, "Summary". Delivery dates indicated stipulate the earliest possible delivery date.
   5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section 011000, "Summary". Delivery dates indicated stipulate the earliest possible delivery date.
   6. Work Restrictions: Show the effect of the following items on the schedule:
      a. Coordination with existing conditions
      b. Limitations of continued occupancies
      c. Uninterruptible services
      d. Partial occupancy before Substantial Completion
      e. Use of premises restrictions

f. Lead time for future construction
g. Seasonal variations
h. Environmental control

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
   a. Subcontract awards
   b. Submittals
   c. Purchases
   d. Mockups
   e. Fabrication
   f. Sample testing
   g. Deliveries
   h. Installation
   i. Tests and inspections
   j. Adjusting
   k. Curing
   l. Startup and placement into final use and operation
8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
   a. Structural completion
   b. Permanent space enclosure
   c. Completion of mechanical installation
   d. Completion of electrical installation
   e. Substantial Completion

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

E. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.
   1. Refer to Division 01 Section 012900, "Payment Procedures" for cost reporting and payment procedures.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
   1. Unresolved issues
   2. Unanswered RFIs
   3. Rejected or unreturned submittals
   4. Notations on returned submittals

G. Recovery Schedule: When periodic update indicates the Work is fourteen (14) or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required for compliance, and date by which recovery will be accomplished.

H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules. Confirm acceptability of software with Owner. Contractor is responsible for all costs associated with licensing and training of the software.

I. Schedule shall be updated with the weekly OAC meeting and must include current details for all activities.

2.2 CONTRACTOR'S WORK PROGRESS SCHEDULE (WPS SCHEDULE)

A. General: Contractor shall submit for review and approval a Baseline Schedule that will indicate starting and completing dates of various aspects required to complete the work using the Longest Path. The Baseline Schedule shall become the comparison to the actual conditions throughout the contract and become a part of the Work Progress Schedule.

B. Contractor’s Work Progress Schedule (WPS) shall coordinate and integrate the services and activities of Contractor, Design Professional and Owner, other consultants/suppliers, subcontractors and requirements of governmental entities. The WPS is due within twenty-one (21) days after the effective date of Notice to Proceed.

C. Contractor shall be responsible to:
   1. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel and Owner’s Representative, in proper methods of providing data and using WPS information.
   2. Establish procedures for monitoring and updating WPS and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

3. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to correlate with Contract Time.

D. WPS Preparation: Prepare a list of all activities required to complete the Work.
   1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
      a. Preparation and processing of submittals
      b. Mobilization and demobilization
      c. Purchase of materials
      d. Delivery
      e. Fabrication
      f. Utility interruptions
      g. Installation
      h. Work by Owner that may affect or be affected by Contractor's activities
      i. Testing
      j. Punch list and final completion
      k. Activities occurring following final completion
   2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
   3. Processing: Process data to produce output data on a computer drawn, time scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the WPS within the limitations of the Contract Time.
   4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
      a. Sub-networks on separate sheets are permissible for activities clearly off the critical path.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time impact analysis to demonstrate the effect of the proposed change on the overall project schedule.

F. Initial Issue of Schedule: Prepare initial schedule from a sorted activity list indicating straight "early start ". Identify critical activities. Prepare tabulated reports showing the following:
   1. Contractor or subcontractor and the Work or activity
   2. Description of activity
   3. Principal events of activity
   4. Immediate preceding and succeeding activities
   5. Activity duration in workdays

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
   1. Identification of activities that have changed
   2. Changes in activity durations in workdays
   3. Changes in the critical path
   4. Changes in total float time
   5. Changes in the Contract Time
   6. Show relationship between activities on initial and updated schedule.

2.3 REPORTS

A. Daily Construction Reports: Prepare a daily construction report record the following information concerning events at Project site:
   1. List of subcontractors at Project site
   2. List of separate contractors at Project site
   3. Approximate count of personnel at Project site
   4. Equipment at Project site
   5. Material deliveries
   6. High and low temperatures and general weather conditions, including presence of rain or snow
   7. Accidents
   8. Meetings and significant decisions
   9. Unusual events (refer to special reports)
   10. Stoppages, delays, shortages, and losses
   11. Meter readings and similar recordings
   12. Emergency procedures
   13. Orders and requests of authorities having jurisdiction
   14. Change Orders received and implemented
   15. Construction Change Directives received and implemented
   16. Services connected and disconnected
   17. Equipment or system tests and startups

18. Partial completions and occupancies
19. Substantial Completions authorized

B. Material Location Reports: Monthly prepare and submit a comprehensive list of materials delivered to and stored at Project site. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents prepare and submit, to the Design Professional, a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

D. Executive Summary Reports: Provided monthly with Payment Applications. Provides highlight details, schedule summary, and other information pertinent to Owner, including, but not limited to the following:
1. Table of contents, simple project schedule clearly indicating benchmark dates, a narrative stating the current status of construction, a list of construction concerns, a look at what is coming up, potential change order log, and progress photo's.

2.4 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one (1) day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S WORK PROGRESS SCHEDULE

A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using WPS scheduling.
1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in WPS scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

B. Contractor's WPS Updating: Update and submit the WPS with the OAC meeting minutes to reflect actual construction progress and activities.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

C. Distribution: Distribute copies of approved schedule to Design Professional, Owner, commissioning agent, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION

SECTION 013233

PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Pre-construction photographs
   2. Periodic construction photographs
   3. Final completion construction photographs
   4. Owner may elect to retain an independent firm to photographically document the progress of the work. Work of this firm shall not diminish or replace responsibilities of the Contractor for documentation required by this section. Contractor to cooperate fully with independent photographer.

1.3 UNIT PRICES

A. Basis for Bids: Base number of construction photographs on average of twenty (20) photographs per week over the duration of Project.

1.4 INFORMATIONAL SUBMITTALS

A. Digital Photographs: Submit image files within three days of taking photographs.
   1. Digital Camera: Minimum sensor resolution of 8 megapixels.
   2. Format: Minimum 1600 by 1200 pixels, 400 dpi minimum, in unaltered original files, with same aspect ratio as the sensor, un-cropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
   3. Identification: Provide the following information with each image description in file metadata tag:
      a. Name of Project
      b. Name of Design Professional
      c. Name of Contractor
      d. Date photograph was taken
      e. Description of location, direction (by compass point), and elevation or story of construction

1.5 COORDINATION

A. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities.

1.6 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 1600 by 1200 pixels and 400 dpi.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
   1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image editing software.
   1. Date and Time: Include date and time in file name for each image.

2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.

C. Pre-construction Photographs: Before commencement of excavation, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
   1. Flag construction limits before taking construction photographs
   2. Take twenty (20) photographs to show existing conditions adjacent to property before starting the Work
   3. Take twenty (20) photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction
   4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

D. Periodic Construction Photographs: Take twenty (20) photographs monthly (unless otherwise directed), coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

E. Time-lapse Sequence Construction Photographs: Take photographs as indicated, to show status of construction and progress since last photographs were taken.
   1. Frequency: Take photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment.
   2. Vantage Points: Following suggestions by Architect and Contractor, photographer to select vantage points. During each of the following construction phases, take not less than two of the required shots from same vantage point each time to create a time-lapse sequence as follows:
      a. Commencement of the Work, through completion of subgrade construction
      b. Above-grade structural framing
      c. Exterior building enclosure
      d. Interior Work, through date of Substantial Completion

END OF SECTION

SECTION 013300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Design Professional's responsive action. Action submittals are those submittals indicated in individual Specification Sections as action submittals.

B. Informational Submittals: Written and graphic information and physical samples that do not require Design Professional's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as informational submittals.

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Design Professional and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with start-up construction schedule. Include submittals required during the first sixty (60) days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead-time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

   Submit revised submittal schedule to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
   a. Scheduled date for first submittal
   b. Specification Section number and title
   c. Submittal category: Action, informational
   d. Name of subcontractor
   e. Description of the Work covered
   f. Scheduled date for Design Professional's final release or approval
   g. Scheduled dates for purchasing
   h. Scheduled dates for installation
   i. Activity or event number

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Design Professional's Digital Data Files: Design Professional will provide electronic copies of CAD Drawings for Contractor's use in preparing coordination submittals.

1. Design Professional will furnish Contractor one (1) set of drawing files for use in preparing Shop Drawings and Project record drawings.

2. Design Professional makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
3. Digital Drawing Software Program: The Contract Drawings are available in AutoCAD software.
4. Contractor shall execute a data licensing agreement in the form of Agreement included in Project Manual.
5. CAD files will by furnished for each appropriate discipline.

B. 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. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are approved by Design Professional.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. 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.
5. Design Professional reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Design Professional's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals. Submittals received after 1:00 pm will be considered to have been received the following day.
1. Allow ten (10) business days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Design Professional will advise Contractor when a submittal being processed must be delayed for coordination. Allow fifteen (15) business days for review time for large or complex submittals will require additional review time. The following are examples but not limited to such submittals, Millwork, Curtain Wall, Structural Steel, Doors, Frames, Hardware (total opening).
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow ten (10) business days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Design Professional's consultants, Owner, or other parties is indicated, allow fifteen (15) business days for initial review of each submittal.

D. Identification and Information: Place a permanent label or title block on each copy submittal item for identification.
1. On large format Shop Drawings, Contractor shall stamp each individual page as well as the reviewer’s stamp.
2. Indicate name of firm or entity that prepared each submittal on label or title block.
3. Provide a space approximately 6-inches by 8-inches on label or beside title block to record Contractor's review and approval markings and action taken by Design Professional.
4. Include the following information for processing and recording action taken:
    a. Project name
    b. Date
    c. Name of Design Professional
    d. Name of Contractor
    e. Name of subcontractor
    f. Name of supplier
    g. Name of manufacturer
    h. Submittal number or other unique identifier, including revision identifier
        1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
    i. Number and title of appropriate Specification Section
    j. Drawing number and detail references, as appropriate
    k. Location(s) where product is to be installed, as appropriate
    l. Other necessary identification

E. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

a. For typical projects that do not require separate submittals for different buildings or sub the submittal file name shall use Specification Section number followed by a dash and then a sequential number. Resubmittals shall include an numerical suffix after another dash. Include brief description of submittal after sequential number or resubmittal suffix. (e.g., 061000-001-0 Rough Carpentry).
b. For complex projects that require project identifier for separate buildings within a project or require individual submittals to be submitted by multiple subcontractors, the submittal file name shall follow the following: Specification Section number followed by a decimal point and then a sequential number. Resubmittals shall include an alphabetic suffix after another decimal point. Project Identifier should follow in parentheses (e.g., 061000-001-0 (LNHS) Rough Carpentry).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Design Professional.
4. Include the following information on an inserted cover sheet:
   a. Project name
   b. Date
   c. Name and address of Design Professional
   d. Name of Contractor
   e. Name of firm or entity that prepared submittal
   f. Name of subcontractor
   g. Name of supplier
   h. Name of manufacturer
   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. Related physical samples submitted directly
   m. Other necessary identification
5. Include the following information as keywords in the electronic file metadata:
   a. Project name
   b. Number and title of appropriate Specification Section
   c. Manufacturer name
   d. Product name

F. Options: Identify options requiring selection by the Design Professional.
G. Deviations: Identify deviations from the Contract Documents on submittals.
H. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Design Professional observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
   1. Submit one (1) copy of submittal to concurrent reviewer in addition to specified number of copies to Design Professional.
I. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Design Professional will return submittals, without review, received from sources other than Contractor.
   1. Transmittal Form: Use standard contractor form as approved by Design Professional Owner.
   2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Design Professional on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
J. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
   1. Note date and content of previous submittal.
   2. Note date and content of revision in label or title block and clearly indicate extent of revision.
   3. Include all submitted information from previous submittal in resubmittal, to form a comprehensive document for Design Professional’s review.
   4. Resubmit submittals until they are marked with ‘Reviewed’, ‘Furnish as Corrected’ notation from Design Professional's action stamp, or with approval notation from alternate reviewer
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. Use for Construction: Use only final submittals that are marked with ‘Reviewed’, ‘Furnish as Corrected’ notation from Design Professional's action stamp, or with approval notation from alternate reviewer.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
   1. Email or upload electronic submittals as PDF electronic files directly to Design Professional's Info Exchange Folder specifically established for Project.
      a. Design Professional will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
   2. Action Submittals: For large format drawings and submittals (larger than 11x17), submit PDF file plus two (2) hard copies. For smaller format drawings and submittals (11x17 or less), provide only PDF file. Design Professional will return only the marked-up PDF.
   3. Informational Submittals: Submit two paper copies of each submittal, unless otherwise indicated. Design Professional will not return copies.
   4. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section 017700, "Closeout Procedures".
   5. Certificates and Certifications Submittals: Provide a 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.
      a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
      b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
   6. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section 014000, "Quality Requirements".

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
   1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
   2. Mark each copy of each submittal to show which products and options are applicable.
   3. Include the following information, as applicable:
      a. Manufacturer's catalog cuts
      b. Manufacturer's product specifications
      c. Standard color charts
      d. Statement of compliance with specified referenced standards
      e. Testing by recognized testing agency
      f. Application of testing agency labels and seals
      g. Notation of coordination requirements
      h. Availability and delivery time information
   4. For equipment, include the following in addition to the above, as applicable:
      a. Wiring diagrams showing factory-installed wiring
      b. Printed performance curves
      c. Operational range diagrams
      d. Clearances required to other construction, if not indicated on accompanying Shop Drawings
   5. Submit Product Data before or concurrent with Samples.
   6. Submit Product Data in the following format:
      a. PDF electronic file

C. Shop Drawings: Prepare Project specific information, drawn accurately to scale.
   1. Submittals containing reproduction of Contract Drawings are not considered Shop Drawings and will be returned without action. Any delay due to such rejection will not be grounds for an extension of Contract Time.
   2. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
      a. Identification of products
      b. Schedules
      c. Compliance with specified standards
      d. Notation of coordination requirements
      e. Notation of dimensions established by field measurement
      f. Relationship and attachment to adjoining construction clearly indicated
      g. Seal and signature of professional engineer if specified
   3. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
   4. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8 ½ -inches by 11-inches but no larger than 30-inches by 42-inches.

5. Submit Shop Drawings in the following format:
    a. For large format drawings and submittals (larger than 11 x 17), submit PDF file plus two (2) hard copies. For smaller format drawings and submittals (11x17 or less), provide only PDF file. Design Professional will return only the marked-up PDF.

D. 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 applicable 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. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    a. Number of Samples: Submit three (3) full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Design Professional will return submittal with options selected.
5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    a. Number of Samples: Submit sets of Samples. Design Professional will retain one sample set; remainder will be returned. Mark up and retain one returned Sample set as a Project record sample.
        1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
        2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space
4. Location within room or space
5. Submit product schedule in the following format:
    a. PDF electronic file

F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section 013200, "Construction Progress Documentation".

G. Application for Payment: Comply with requirements specified in Division 01 Section 012900, "Payment Procedures".

H. Schedule of Values: Comply with requirements specified in Division 01 Section 012900, "Payment Procedures".

I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A. Include the following information in tabular form:
1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

4. Submit subcontract list in the following format:
    a. PDF electronic file

J. Coordination Drawings: Comply with requirements specified in Division 01 Section 013100, "Project Management and Coordination".

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

L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.

M. Installer Certificates: Submit 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.

N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

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

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

Q. Material Test Reports: Submit 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.

R. Product Test Reports: Submit 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.

S. Research Reports: Submit 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

T. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section 014000, "Quality Requirements".

U. Pre-construction Test Reports: Submit 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.

V. Compatibility Test Reports: Submit 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.

W. Field Test Reports: Submit reports indicating and interpreting results of field tests either performed during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

X. Maintenance Data: Comply with requirements specified in Division 01 Section 017823, "Operation and Maintenance Data".

Y. Design Data: Prepare and submit 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, other performance and design criteria, and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED DESIGN SERVICES

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 Design Professional.

B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three (3) paper copies of certificate, 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.
   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 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: 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 Design Professional.

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section 017700, "Closeout Procedures".

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 DESIGN PROFESSIONAL'S ACTION

A. General: Design Professional will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Design Professional will review each submittal, make marks to indicate corrections or modifications required, and return it. Design Professional will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
   1. Reviewed
   2. Revise and Resubmit
   3. Rejected
   4. Furnish As Corrected
   5. No Action Taken

C. Informational Submittals: Design Professional will review each submittal and will not return it, or will return it if it does not comply with requirements. Design Professional will forward each submittal to appropriate party.

D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Design Professional.

E. Incomplete submittals are not acceptable, will be considered non-responsive, and will be returned without review.

F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION

Advancement of Constructio Technology

SUBCONTRACTORS AND MAJOR MATERIAL SUPPLIERS LIST

Project: _____

_____

To (A/E): _____

_____

From (Contractor): _____

Date: _____

A/E Project Number: _____

Contract For: _____

List Subcontractors and Major Material Suppliers proposed for use on this Project as required by the Construction Documents. Attach supplemental sheets if necessary.

Section Number	Section Title	Firm	Address	Phone Number (Fax Number)	Contact

☐ Attachments

Signed by: Date:

Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ File

July 1994
CSI Form 1.5A

SECTION 013516

ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:
   1. Products and installation for patching and extending Work within construction areas of existing facilities.
   2. Providing transition and adjustments
   3. Repair of damaged surfaces and finishes

B. Related Sections include the following:
   1. Division 01 Section 015000 “Temporary Facilities and Controls” for construction of temporary fire-rated partitions to separate existing occupied areas from construction areas.

1.3 OCCUPANCY, ACCESS, AND PROTECTION

A. Entire existing facility or any portion thereof will be occupied during progress of construction for conduct of normal operations. Phase Work in accordance with Section 011000, “Summary”.

B. Cooperate with Owner in scheduling operations to minimize conflict and to permit continuous usage. Perform work not to interfere with operations of occupied areas.

C. Existing facilities will remain in full operation during execution of this Work. Exercise every precaution to ensure safety and protection for existing facilities, occupants, merchandise, pedestrians, and vehicles. The following must meet required codes and accessibility requirements.
   1. Maintain safe access and egress at all times for occupants, pedestrians, and vehicles.
   2. Provide protection to prevent damage to facilities, merchandise, and vehicles from dust, water, weather, and other similar harmful elements. Refer to Section 015000, “Temporary Facilities and Controls” for additional requirements.
   3. Maintain exiting from facilities to provide safe passage complying with applicable codes.

1.4 SCHEDULING OF WORK

A. Make arrangements with Owner and schedule Work to avoid interference with normal operations of occupied areas. Submit schedule and summary of applicable Work within occupied areas and obtain Owner approval not less than two (2) days prior to commencement of such Work.
   1. Requests for use of certain existing loading docks, passage ways, and other similar spaces within areas outside limits of construction operations will be limited to day-by-day basis and must be approved in advance by Owner.

B. Coordinate access and scheduling of Work within tenant areas with Owner.

1.5 TORCH-CUTTING AND WELDING PROCEDURES

A. Notify Owner in advance of torch-cutting and welding operations performed within occupied areas; obtain approval prior to proceeding with such operations.
   1. Neither open-flame torch-cutting, welding nor arc-welding are allowed without having secured appropriate permit from Fire Marshal or authority having jurisdiction.
   2. Keep portable fire extinguisher of appropriate class within reach during welding or torch-cutting operations.
   3. Screen arc-welding from vision of passersby.

B. Maintain a “Fire Watch” for minimum of sixty (60) minutes after completion of each torch-cutting and welding operation.

1.6 UTILITY SERVICE OUTAGES

A. Keep utility and service outages to minimum and perform only after written approval of Owner is received.
   1. Requests for outages will not be considered unless they include an identification of areas which will be affected by proposed outage.
   2. Schedule outages for times other than normal business hours.
   3. Make requests for outages minimum of five (5) calendar days in advance of proposed outage.

B. Contractor: Responsible for investigating utility and service lines to determine effect of outage upon building operations outside of limit of operations. Obtain approval in advance from Owner to execute investigations.

1.7 KEYS

A. When necessary to perform Work, Owner will issue keys to existing mechanical/electrical equipment spaces.

B. Return keys at end of warranty period.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Type and Quality of Existing Products: Use products or types of construction that exist in structure, as needed to patch, extend, or match existing Work.
   1. Generally, Contract Documents do not define products or standards of workmanship present in existing construction.
   2. Determine by inspecting and testing products where necessary, referring to existing work as quality standard.

B. New Materials: Comply with Specifications for each product involved.
   1. Match existing products and work for patching existing work.

C. Materials for Temporary Fire-Rated Partitions: Comply with provisions of Division 01 Section 015000 “Temporary Facilities and Controls”.

D. Salvaged Materials: Salvage sufficient quantities of cut or removed material to replace damaged Work of existing construction, when material is not readily obtainable on current market.
   1. Store salvaged items in dry, secure place on site.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Comply with provisions of Division 01 Section 017300, “Execution”.
   1. Responsible for verifying existing conditions to determine that all areas meet constructability and are ready for alteration and remodeling.

B. Discrepancies: Verify dimensions and elevations indicated in layout of existing work.
   1. Prior to commencing work, carefully compare and check Contract Documents for discrepancies in locations or elevations of work to be executed.
   2. Refer discrepancies among Drawings and existing conditions to Design Professional for adjustment before work affected is performed.

3.2 PREPARATION

A. Construct temporary fire-rated partitions to separate existing occupied areas from construction and alteration areas. Comply with provisions of Division 01 Section 015000, “Temporary Facilities and Controls”.

B. Cut, move, or remove items as necessary for access to alteration and renovation Work.
   1. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, deteriorated masonry and concrete, and other deteriorated materials. Replace materials as specified for finished Work.
   2. Remove debris and abandoned items from area and from concealed spaces.

C. Cutting and Removal: Perform cutting and removal work to remove minimum necessary, and in manner to avoid damage to adjacent work. Cut finish surfaces such as masonry, tile, plaster, or metals by methods to terminate surfaces in straight line at natural point of division.

D. Prepare surfaces and remove surface finishes as necessary to provide for proper installation of new materials and finishes.

E. Close openings in exterior surfaces to protect existing Work from weather and extremes of temperature and humidity. Insulate ductwork and piping to prevent condensation in exposed areas.

F. Provide temporary barriers and closures to control operations to prevent spread of dust to occupied portions of building; refer to Division 01 Section 015000, “Temporary Facilities and Controls”.

3.3 INSTALLATION

A. Coordinate Work of alterations and renovations to expedite completion and to accommodate Owner occupancy.

B. Remove, cut, and patch Work in manner to minimize damage and to provide means of restoring products and finishes to specified condition.

1. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with neat transition to adjacent finishes.

C. Install products as specified in individual Specification sections.

D. Where new Work abuts or aligns with existing, perform smooth and even transition to match existing adjacent surface in texture and appearance.

1. When finished surfaces are cut so that smooth transition with new Work is not possible, terminate existing surface along straight line at natural line of division and request instructions from Design Professional as to method of making transition.

3.4 ADJUSTMENTS

A. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to provide smooth plane without breaks, steps, or soffits.

B. Trim existing doors as necessary to clear new floor finish. Refinish trim as required.

C. Fit Work at penetrations of surfaces as specified in Division 01 Section 017300, “Execution”.

D. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections. Repair substrate prior to application of finishes.

3.5 FINISHES

A. Finish new surfaces as specified in individual Specification sections.

B. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

3.6 CLEANING

A. Comply with Division 01 Section 017700, “Closeout Procedures”. Thoroughly clean areas and spaces affected by Work. Completely remove paint, mortar, oils, putty and items of similar nature.

B. Clean Owner occupied areas daily. Clean spillage, overspray, and heavy collection of dust in Owner occupied areas immediately.

END OF SECTION

SECTION 014000

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality assurance and control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality assurance and control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality assurance and control services required by Design Professional, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections:

1. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

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

B. Quality Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Design Professional.

C. Mockups: Full size physical assemblies that are constructed onsite. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size, physical assemblies constructed at testing facility to verify performance characteristics.
2. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on the project site, consisting of multiple products, assemblies and subassemblies.
3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

D. Pre-construction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

G. Field Quality Control Testing: Tests and inspections that are performed onsite for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Design Professional and Owner for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Design Professional for a decision before proceeding.

1.5 ACTION SUBMITTALS

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

1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Quality Control Plan: For quality assurance and quality control activities and responsibilities.

B. Contractor's Quality Control Manager Qualifications: For supervisory personnel.

C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Entity responsible for performing tests and inspections
   3. Description of test and inspection
   4. Identification of applicable standards
   5. Identification of test and inspection methods
   6. Number of tests and inspections required
   7. Time schedule or timespan for tests and inspections
   8. Requirements for obtaining samples
   9. Unique characteristics of each quality control service

1.7 CONTRACTOR'S QUALITY CONTROL PLAN

A. Quality Control Plan, General: Submit quality control plan within ten (10) days of Notice to Proceed, and not less than five (5) days prior to pre-construction conference. Submit in format acceptable to Design Professional. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality assurance and quality control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality assurance and quality control procedures similar in nature and extent to those required for Project.
   1. Project quality control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: Include in quality control plan a comprehensive schedule of Work requiring testing or inspection, including the following:
   1. Contractor performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor’s elected tests and inspections.
   2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections".
   3. Owner performed tests and inspections indicated in the Contract Documents including tests and inspections indicated to be performed by the Commissioning Authority, if applicable.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Design Professional has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.8 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
   1. Date of issue
   2. Project title and number
   3. Name, address, and telephone number of testing agency
   4. Dates and locations of samples and tests or inspections
   5. Names of individuals making tests and inspections
   6. Description of the Work and test and inspection method
   7. Identification of product and Specification Section
   8. Complete test or inspection data
   9. Test and inspection results and an interpretation of test results
   10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
   11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
   12. Name and signature of laboratory inspector
   13. Recommendations on retesting and re-inspecting

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of technical 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.

C. Factory Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory authorized service representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of factory authorized service representative making report.
   2. Statement that equipment complies with requirements.
   3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   4. Statement whether conditions, products, and installation will affect warranty.
   5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.9 QUALITY ASSURANCE

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

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly,

or products that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Pre-construction Testing: Where testing agency is indicated to perform pre-construction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
f. When testing is complete, remove test specimens, assemblies, mockups; do not reuse products on Project.
2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality assurance service to Design Professional, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Design Professional.
2. Notify Design Professional five (5) business days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Design Professional's approval of mockups before starting work, fabrication, or construction.
a. Allow seven (7) days for initial review and each re-review of each mockup.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed, unless otherwise indicated.

L. Integrated Exterior Mockups: Construct integrated exterior mockup in accordance with approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual specification sections, along with supporting materials.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed

to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

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

C. Manufacturer's Field Services: Where indicated, engage a factory authorized service representative to inspect field assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section 013000, "Submittal Procedures".

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

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

F. Testing Agency Responsibilities: Cooperate with Design Professional and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify Design Professional and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
   3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
   5. Does not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
   6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work
   2. Incidental labor and facilities necessary to facilitate tests and inspections
   3. Adequate quantities of representative samples of materials that require testing and inspecting Assist agency in obtaining samples
   4. Facilities for storage and field curing of test samples
   5. Delivery of samples to testing agencies
   6. Preliminary design mix proposed for use for material mixes that require control by testing agency
   7. Security and protection for samples and for testing and inspecting equipment at Project site

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

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
   1. Verifying that manufacturer maintains detailed fabrication and quality control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.

2. Notifying Owner, Design Professional and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Design Professional with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, this includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and re-inspecting corrected work

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted
   2. Description of the Work tested or inspected
   3. Date test or inspection results were transmitted to Design Professional
   4. Identification of testing agency or special inspector conducting test or inspection

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Design Professional's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section 017300, "Execution".

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality control services.

END OF SECTION

SECTION 014200

REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Design Professional's action on Contractor's submittals, applications, and requests, "approved" is limited to Design Professional's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Design Professional. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Following are acronyms used by Owner in the Contract Documents:

1. A/E: Architect/Engineer
2. AHJ: Authority Having Jurisdiction
3. BOR: Board of Regents
4. CCD: Construction Change Directive
5. CCL: Construction Cost Limitation
6. CMAR: Construction Manager at Risk
7. CSP: Competitive Sealed Proposal
8. DD: Design Development
9. FPE: Fire Protection Engineer
10. GCs: General Conditions
11. GMP: Guaranteed Maximum Price
12. GSF: Gross Square Feet
13. HSP: HUB Subcontractor Plan

14.	HUB:	Historically Underutilized Business
15.	LA:	Landscape Architect
16.	LEED:	Leadership in Energy and Environmental Design
17.	LDs:	Liquidated Damages
18.	NASF:	Net Assignable Square Feet
19.	NTP:	Notice to Proceed
20.	OAC:	Owner/Architect/Contractor
21.	OCM:	Owner's Construction Manager
22.	ODR:	Owner's Designated Representative
23.	PAR:	Progress Assessment Report
24.	PE:	Professional Engineer
25.	PM:	Project Manager
26.	RID:	Registered Interior Designer
27.	R&R:	Repair and Rehabilitation
28.	SD:	Schematic Design
29.	SDs:	Schematic Design Drawings
30.	UGC/SGC:	Uniform General Conditions/Supplemental General Conditions

END OF SECTION

SECTION 015000

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's own forces, Design Professional, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Owner will pay sewer service use charges for sewer usage by all entities for construction operations.

C. Water Service: Owner will pay water service use charges for water used by all entities for construction operations.

D. Electric Power Service: Owner will pay electric power service use charges for electricity used by all entities for construction operations.

E. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

F. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage, including delivery, handling, and storage provisions for materials subject to water absorption or water damage, discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water damaged Work.

1. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

D. Dust-Control and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust-control and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:

1. Locations of dust-control partitions at each phase of the work
2. HVAC system isolation schematic drawing
3. Location of proposed air filtration system discharge
4. Other dust-control measures
5. Waste management plan
6. Comply with other requirements on a per Campus basis

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch, 0.148-inchthick, galvanized steel, chain-link fabric fencing; minimum 6-feet high with galvanized steel pipe posts; minimum 2⅜ -inch OD line posts and 2⅞-inch OD corner and pull posts, with 1⅝-inch OD top rails.

B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized steel, chain-link fabric fencing; minimum 6-feet high with galvanized steel pipe posts; minimum 2⅜-inch OD line posts and 2⅞-inch OD corner and pull posts, with 1⅝-inch OD top and bottom rails. Provide galvanized steel bases for supporting posts.

C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mils minimum thickness, with flame-spread rating of 15 or less per ASTM E 84.

D. Dust Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.

E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Design Professional, Construction Manager, and construction personnel office activities and to accommodate project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4-foot square tack and marker boards.
3. Drinking water and private toilet.
4. Coffee machine and supplies.
5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
6. Lighting fixtures capable of maintaining average illumination of 20 FC at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section 017700 "Closeout Procedures".

C. Air Filtration Units: HEPA primary and secondary filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
   1. Locate facilities to limit site disturbance as specified in Division 01 Section 011000, "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
   1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. [

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
   1. Prior to commencing work, isolate the HVAC system in area where work is to be performed in accordance with approved coordination drawings.
      a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
      b. Maintain negative air pressure within work area using HEPA-equipped air filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
   2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust containment devices.
   3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
   1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

H. [Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.]

I. [

J. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

K. Telephone:
   1. Post a list of important telephone numbers.
      a. Police and fire departments
      b. Ambulance service
      c. Contractor's home office
      d. Architect's office
      e. Engineers' offices

f. Owner's office
g. Principal subcontractors' field and home offices

2. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30-feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Design Professional schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install sub-base and base for temporary roads and paved areas according to Division 31 Section [Insert Section number], "Earth Moving".
3. Recondition base after temporary use, including removing contaminated material, re-grading, proof rolling, compacting, and testing.

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

D. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
a. Provide temporary, directional signs for construction personnel and visitors.
3. Maintain and touchup signs so they are legible at all times.

G. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section 017419, "Construction Waste Management and Disposal."

H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

I. Temporary Elevator Use: Refer to Division 14 Sections for temporary use of new elevators.

J. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

K. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
1. Comply with work restrictions specified in Division 01 Section 011000, "Summary."

B. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Division 31 Section [], "Site Clearing."

C. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Tree and Plant Protection: Comply with requirements specified in Division 01 Section 015639, "Temporary Tree and Plant Protection."

E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular

intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
   1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
   2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

G. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

I. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

J. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weather-tight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

K. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
   1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.
   2. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant treated plywood.
      a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48-inches between doors. Maintain water-dampened foot mats in vestibule.
   3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
   4. Insulate partitions to control noise transmission to occupied areas.
   5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
   6. Protect air-handling equipment.
   7. Provide walk-off mats at each entrance through temporary partition.

L. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
   1. Prohibit smoking in construction areas.
   2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
   3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
   4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
   1. Protect porous materials from water damage.
   2. Protect stored and installed material from flowing or standing water.
   3. Keep porous and organic materials from coming into prolonged contact with concrete.
   4. Remove standing water from decks.
   5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
   1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.

2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use permanent HVAC system to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for forty-eight (48) hours are considered defective.
b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record daily readings over a forty-eight (48) hour period. Identify materials containing moisture levels higher than allowed. Report findings in writing to Design Professional.
c. Remove materials that can not be completely restored to their manufactured moisture level within forty-eight (48) hours.

E. Refer to Section 015300, Mold Prevention Measures, for additional requirements.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a twenty-four (24) hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.

D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section 017700, "Closeout Procedures."

END OF SECTION

SECTION 015300

MOLD PREVENTION MEASURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes: Administrative and procedural requirements to help prevent mold contamination in construction. This section is in addition to requirements contained in Division 01 Section 015000, “Temporary Facilities and Controls”.

1.3 SUBMITTALS

A. Reports: Submit reports required in this Section, including but not limited to the following:
   1. Sightings of existing mold
   2. Window and storefront testing
   3. Moisture contents of materials
   4. Exterior sealant cracks, damage, and deterioration

1.4 QUALITY ASSURANCE

A. Pre-construction Meeting: Review requirements of this Section at Pre-construction Meeting.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Do not bring finish materials into building until building is in a conditioned state. Protect finish materials stored within building. Stage materials off the floor and cover with waterproof covering. Examples of these materials include, but are not limited to, insulation, gypsum products, wall coverings, carpet, ceiling tile, wood products, etc.

C. Remove from Project site damaged materials or materials that have become wet. Do not install such materials.

1.6 PROJECT CONDITIONS

A. Perform daily visual inspections of existing building for existing mold. Report sightings of mold to Architect.

B. Remove water found within building during construction immediately.
   1. Energize lift stations and sump pumps as early in Project as possible. Use temporary pumps if necessary to get water out of building and drain lines.

C. Ventilation:
   1. Verify that existing HVAC system is providing positive pressure in building.
   2. Provide adequate air circulation and ventilation during demolition phase(s).
   3. Seal off return air ducts and diffusers to prevent construction dust and moisture from entering occupied areas and HVAC system.
   4. Provide temporary outside air ventilation as building becomes enclosed.

D. Maintain clean project site, free from hazards, garbage, and debris.

E. Eating, drinking, and smoking are not permitted within building.

F. Slope perimeter grades, both temporary and final grades, away from building structure.

G. Verify that condensate pans drain properly beginning with initial installation.

H. Flash roof penetrations immediately. Do not allow water to penetrate to floor below.

I. Seal window openings prior to window installation with plastic to prevent moisture entry.

J. Sprayed-on Fireproofing: Keep air moving throughout building when using sprayed-on fireproofing.

K. Cover stored and installed ductwork and installed duct openings with plastic to prevent dust, debris, and moisture from entering ductwork. Repair damaged plastic barrier.

L. Do not operate air handling equipment below 60° F supply air temperature until building is 100 percent enclosed.

M. Monitor humidity and temperature for conformance to installation requirements defined by material and equipment manufacturers.

N. Check moisture content of gypsum board prior to applying finishes. Record findings.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 INSTALLATION

A. Roof Drains: Connect roof drains to risers and storm drainage lines as soon as possible.

B. Floor Drains: Connect floor drains as soon as possible. Cover floor drains with tape during construction to keep construction debris from blocking drain. Clean out floor drain lines to mains prior to Substantial Completion.

C. Wall Assemblies:

1. Install exterior wall insulation, vapor retarder, and gypsum board only after building is enclosed.
2. Keep bottom of installed gypsum board off floor ½ -inch.

D. Cavity Conditions: Clean and inspect cavity conditions prior to covering, sealing, or restricting access. Vacuum-clean cavity spaces prior to covering or enclosing.

E. Sprayed-On Fireproofing: Remove sprayed-on fireproofing overspray immediately.

F. Plumbing: Pressure test plumbing piping identified as insulated on Project prior to installation of insulation.

G. Roof Mounted Equipment: Inspect rooftop units and other roof-mounted equipment for signs of rain leaks immediately after first rain. Water test with hose immediately after installation. Seal leaks immediately.

H. Windows and Storefront: Water test windows to manufacturer's and Project Manual's specifications. Record findings and forward to Architect.

I. Sealants: Inspect exterior sealants for cracks, damage, or deterioration. Record findings and forward to Architect.

J. HVAC Equipment (Permanent HVAC Equipment Used for Temporary Conditioning of Building During Construction Phases): Change filters and clean ductwork interior to remove dirt, dust, debris, and moisture buildup prior to turning Project over to Owner.

3.2 ADJUSTING

A. Remove damaged materials or materials that have become wet. Replace with new materials.

3.3 DEMONSTRATION

A. Train and educate Owner's maintenance personnel on use of building systems. Explain how improper operation and shutting down systems during off periods can create mold problems.

B. Schedule with Owner a review of building for mold problems at 1-year warranty walk-through. Inspect exterior sealants and masonry joints for cracks and other damage or deterioration where water can penetrate building envelope.

C. Explain to Owner the need for Owner to establish annual building review for mold.

END OF SECTION

SECTION 015639

TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

1.3 DEFINITIONS

A. Caliper: Diameter of a trunk measured by a diameter tape at 6-inchesabove the ground for trees up to, and including, 4-inch size; and 12-inches above the ground for trees larger than 4-inch size.
B. Plant Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.
C. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated.
D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Samples for Verification: For each type of the following:
    1. Organic Mulch: 1-pint volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
    2. Protection Zone Fencing: Assembled Samples of manufacturer's standard size made from full-size components.
C. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
    1. Species and size of tree
    2. Location on site plan. Include unique identifier for each.
    3. Reason for pruning
    4. Description of pruning to be performed
    5. Description of maintenance following pruning
D. Qualification Data: For qualified arborist and tree service firm.
E. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.
F. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes pre-construction conditions that might be misconstrued as damage caused by construction activities.
    1. Use sufficiently detailed photographs or videotape.
    2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

1.5 QUALITY ASSURANCE

A. Arborist Qualifications: Certified Arborist as certified by ISA.
B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.
C. Pre-installation Conference: Will conduct conference at Pre-Construction Meeting.
    1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:
        a. Construction schedule. Verify availability of materials, personnel, and equipment needed to make progress and avoid delays.

b. Enforcing requirements for protection zones
c. Arborist's responsibilities
d. Field quality control

1.6 PROJECT CONDITIONS

A. The following practices are prohibited within protection zones:
1. Storage of construction materials, debris, or excavated material
2. Parking vehicles or equipment
3. Foot traffic
4. Erection of sheds or structures
5. Impoundment of water
6. Excavation or other digging unless otherwise indicated
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: Natural or cultivated top layer of the soil profile or manufactured topsoil; containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, or gray than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 1 inch in diameter; and free of weeds, roots, and toxic and other non-soil materials.
1. Obtain topsoil only from well-drained sites where topsoil is 4-inches deep or more; do not obtain from bogs or marshes.

B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of the following:
1. Type: Shredded hardwood, fully composted.
2. Size Range: 3-inches maximum, ½ -inch minimum
3. Color: Natural

C. Protection Zone Fencing: Fencing fixed in position and meeting the following requirements (previously used materials may be used when approved by Architect):
1. Protection Zone Fencing: 4’ tall, heavy duty HDPE, high visibility orange, safety fencing. with rigid metal t-posts, minimum 6’ tall installed 2’ into the ground

PART 3 - EXECUTION

3.1 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

B. For the record, prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

A. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Flag each tree trunk at 54-inches above the ground.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

C. Tree Protection Zones: Mulch areas inside tree-protection zones and other areas indicated.
1. Apply 3-inch average thickness of organic mulch. Do not place mulch within 6-inches of tree trunks.

3.3 TREE AND PLANT PROTECTION ZONES

A. Protection Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected area except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
   1. Locate buried utilities and irrigation around trees and adjust tree protection fencing to miss utilities and maintain irrigation system as required before setting tree protection fencing.
   2. Safety Fencing: Install and maintain throughout the duration of construction.
   3. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.
   4. Access Gates: Install as necessary; adjust to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Maintain protection zones free of weeds and trash.

C. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner and time period approved by Architect.

D. Maintain protection zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.
   1. Do not remove protection zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
   2. Temporary access is permitted subject to pre-approval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.4 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Division 31 "Earth Moving".

B. Trenching near Trees: Where utility trenches are required within protection zones, hand excavate under or around tree roots or tunnel under the roots by drilling, auger boring, air spade, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning.

C. Where construction is required within the tree protection zone, provide 2”X4” wood barrier around the trunk of the tree. Replace barrier fencing as soon as possible after work in the tree protection zone is complete.

D. Redirect roots in backfill areas where possible. If encountering large roots, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3-inches back from new construction and as required for root pruning.

E. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.5 ROOT PRUNING

A. Prune roots that are affected by temporary and permanent construction.
   1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
   2. Cut Ends: Coat cut ends of roots more than 1-inch in diameter with an approved root sealant.
   3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
   4. Cover exposed roots with burlap and water regularly.
   5. Backfill as soon as possible.
   6. Root Pruning at Edge of Protection Zone: Prune roots 12-inches outside of the protection zone, by cleanly cutting all roots to the depth of the required excavation

B. Root Pruning within Protection Zone: Clear and excavate by hand to the depth of the required excavation to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

3.6 CROWN PRUNING

A. Prune branches that are affected by temporary and permanent construction.
   1. Prune trees to remain to compensate for root loss caused by damaging or cutting root system at the direction of the Owner and Architect. Provide subsequent maintenance during Contract period as recommended by arborist.
   2. Pruning Standards: Prune trees according to ANSI A300 (Part 1) and the following:
      a. Type of Pruning: Cleaning.
      b. Specialty Pruning: Restoration.
   3. Cut branches with sharp pruning instruments; do not break or chop.
   4. Apply pruning paint to wounds.

3.7 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.
   1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.

C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

D. Minor Fill within Protection Zone: Where existing grade is 2-inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single un-compacted layer and hand grade to required finish elevations.

3.8 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.9 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.
   1. Submit details of proposed root cutting and tree and shrub repairs.
   2. Have arborist perform the root cutting, branch pruning, and damage repair of trees and shrubs.
   3. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
   4. Perform repairs within 24 hours.
   5. Replace vegetation that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Trees: Remove and replace trees indicated to remain 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. Provide new trees of same size and species as those being replaced for each tree that measures 6 inches or smaller in caliper size.
   2. Provide one (1) new tree(s) of 6-inch caliper size for each tree being replaced that measure more than 6-inches in caliper size.
      a. Species: Species selected by Architect.
   3. Plant and maintain new trees as specified in Division 32 “Landscape Planting”.

C. Soil Aeration: Where directed by Architect, aerate surface soil compacted during construction. Aerate 10 feet beyond drip line and no closer than 36-inches to tree trunk. Use Air Spade Technology, 12-inches deep for aeration.

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 015713

EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes providing temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion and sedimentation control Drawings and requirements of authorities having jurisdiction. Temporary measures include the following:
   1. Silt fences and straw bales
   2. Sediment barriers and check dams
   3. Stabilized construction entrance
   4. Construction of temporary swales and sedimentation basins as required
   5. Seeding, sodding, and hydro mulching

B. Comply with all local, state, and federal regulations regarding erosion control including the applicable provisions of the National Pollution Discharge Elimination System (NPDES) regulations from the Federal Clean Water Act.

C. Should any provisions of this section be at variance with erosion control plan prepared by the civil engineer, the civil engineer's directive shall take precedence.

1.2 NOTICE OF INTENT

A. Contractor shall submit an EPA Notice of Intent (NOI) prior to construction.

B. Contractor shall prepare the report, coordinate with Owner, and file in accordance with regulations.

PART 2 - PRODUCTS

2.1 SILT FENCE

A. Filter Fabric: Non-woven polypropylene, polyethylene or polyamide thermoplastic fibers with non-raveling edges. The fabric shall be non-biodegradable, inert to most soil chemicals, ultraviolet resistant, unaffected by moisture or other weather conditions, and permeable to water while retaining sediment. The filter fabric shall be supplied in rolls a minimum of 36-inches wide.
   1. Acceptable Products: Lundin "Silt Buster", Mirafi "Envirofence" or acceptable substitution.

B. Wire Fence Support: Welded wire fabric 2 x 4 - W1.0 x W1.0.

C. Fence Posts: Painted or galvanized steel Tee or Y-posts with anchor plates, not less than 5-feet in length with a minimum weight of 1.3 pounds per foot. Hangers shall be adequate to secure fence and fabric to posts. Posts and anchor plates shall conform to ASTM A-702.

2.2 STRAW BALES

A. Standard rectangular straw bales bound by baling wire (NO TWINE).

2.3 SEDIMENT TRAPS

A. Standard manufacture designed to fit the intended inlet.

2.4 STABILIZED CONSTRUCTION ENTRANCE

A. Aggregate: Graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448 and TEX 401-A coarse-aggregate; with 0 percent being retained by a 5-inch sieve and 100 percent being retained by a 3-inch sieve.

2.5 GRASS

A. Materials and seeding and sodding shall conform to applicable Division 32 section.

2.6 FERTILIZER

A. Use commercial grade fertilizers to insure germination and growth. Analysis by weight shall be 16-4-8 or 15-5-10 for Nitrogen, Phosphoric Acid and Potash.

2.7 WATER

A. Use clean potable water for maintaining the grass.

PART 3 - EXECUTION

3.1 GENERAL

A. Keep disturbed areas to a minimum required to adequately perform the work. At all times, maintain the site in such a manner that minimizes erosion of the site. The execution of work under this section shall be in conformance with the NPDES rulings and the site Storm Water Pollution Prevention Plan.

3.2 SILT FENCES

A. Silt fence shall be a minimum of 24-inches high. Posts shall be embedded a minimum of 12-inches in the ground, placed a maximum of 8-feet apart and set on a slight angle toward the anticipated runoff source.
   1. When directed by the Engineer or designated representative, posts shall be set at specified intervals to support concentrated loads.

B. Securely attach filter fabric to posts and wire support fence, with the bottom 12-inches of filter fabric buried in a trench a minimum of 6-inches deep and 6-inches wide to prevent sediment from passing under the fence.
   1. When silt fence is constructed on impervious material, a 12-inch flap of fabric shall be extended upstream from the bottom of the silt fence and weighted to limit particulate loss.
   2. No horizontal joints will be allowed in the filter fabric.
   3. Vertical joints shall be overlapped a minimum of 12-inches with the ends sewn or otherwise securely tied.

C. Silt fence shall be maintained for the duration of the project, and repaired, replaced, and/or relocated when necessary or as directed by the Engineer or designated representative. Accumulated silt shall be removed when it reaches a depth of 6-inches

3.3 EROSION CONTROL BARRIERS

A. Provide erosion control barriers at intervals along swales and ditches as shown on the Drawings or as necessary to meet the requirements of the Storm Water Pollution Prevention Plan.

B. Barriers: Silt fence or straw bales placed as indicated on the Drawings.

C. Maintain barriers in good working condition and replace when damaged.

3.4 STABILIZED CONSTRUCTION ENTRANCE

A. Remove brush, stumps, obstructions, and other objectionable material and dispose of in a manner that will not interfere with the excavation, grading, and construction of the entrance as indicated on the Drawings.
   1. Stabilized construction entrance shall not drain onto the public right-of-way and shall not allow surface water runoff to exit the construction site.
   2. When necessary, vehicle wheels shall be cleaned to remove sediment prior to entrance onto public right-of-way.
      a. When vehicle washing is required, it shall be done on an area stabilized with crushed stone, which drains into an approved sediment trap or sediment basin.
   3. Sediment shall be prevented from entering any storm drain, ditch or watercourse through use of sand bags, gravel, boards, silt fence or other methods approved by the Engineer or designated representative.

B. The entrance shall be maintained in a condition that will prevent tracking or disposition of sediment onto public right-of-way. Provide periodic top dressing with additional stone as conditions demand, as well as the repair and/or cleanout of any measures used to trap sediment. Sediment that is spilled, dropped, washed, or tracked onto public right-of-way shall be removed immediately.

3.5 TEMPORARY AND PERMANENT SWALES

A. Description:
   1. Provide temporary and permanent drainage swales as required to carry drainage away from the work area to an approved outfall point.
   2. Unless otherwise shown on the drawings, swales shall be earthen "V" shaped channels graded to a sufficient depth and slope to carry the anticipated runoff, but at least 2-feet deep with a slope of 0.1 percent.
   3. Swales not designated to remain in place at the completion of the contract shall be cleaned of any muck, debris and other unsuitable material and filled with approved fill before final grading operations begin.
   4. Swales shall have erosion control barriers as required.
   5. All permanent swales shall be sodded to a minimum width of 10-feet on either side of the centerline of the swale.

B. Maintenance:
   1. During the course of construction maintain temporary swales constructed for this contract so as to allow proper drainage from the construction area. Before Contractor leaves the site at the end of construction, place temporary swales to remain in good working condition.
   2. Work with other contractors at the site in maintaining existing swales and ditches.
   3. Where necessary for access to the work areas install adequately sized culverts and maintain to provide the access without disturbing the site drainage.
   4. Take care not to rut and damage sodded swales. Immediately repair damaged swales.
   5. Keep sodded swales mowed.

3.6 DRAINAGE DITCHES
A. Immediately hydro mulch drainage ditches upon final grading.
B. Repair erosion of the banks of the drainage ditches immediately and re-stabilize.
C. Place sediment barriers at intervals along the ditch as shown on the plans or as necessary to help trap sediment on the site. Remove sediment and other debris trapped by the barriers daily.
D. Maximum Ditch Side Slopes: 3-feet horizontal to 1-foot vertical.
E. Maintenance of the ditches during construction shall include but not be limited to mowing, re-grading, sediment removal, re-hydro mulching, bank repair, and debris removal.
F. Sediment removed from the ditches may be re-spread on the site as directed by the Owner.

3.7 FILL AND CUT SLOPES
A. Fill slopes in all cases shall be no steeper than 3:1 unless specifically stated on the plans or approved by the Owner's soils engineer.
B. When cut slopes exceed 2:1 for depths over 3-feet, proper bracing and shoring per OSHA requirements shall be used and maintained.
C. For permanent slopes, cut or fill, between 2:1 and 10:1, erosion protection shall be provided with hydro mulching, sodding, seeding, or other method as approved.

3.8 SEDIMENTATION BASINS
A. Description:
   1. Provide sedimentation ponds where indicated.
   2. Route drainage from cleared areas through the sedimentation basin.
   3. Operate and maintain the pond during construction.
B. Maintenance:
   1. Maintain the pond and the outfall and sediment-retarding structure in good working condition throughout the time the pond is to be in operation.
   2. When sediment and debris fill the pond to over one third (⅓) its' designed capacity, clean out the pond.
   3. Stockpile, in its' own separate area, the sediment from the clearing operation, or remove from the site, as required. Make adequate drainage provisions such that drainage from the sediment stockpile drains back into the sediment pond. When approved by the Owner, sediment removed from the pond may be spread over the site.

3.9 SEEDING
A. Seed disturbed portions of the site and stockpile areas within fourteen (14) days if the phasing of the construction operations is anticipated to leave those portions of the areas unworked for twenty-one (21) days or more.
B. Maintain seeded areas until the Owner accepts the project. Maintain by watering, fertilizing, reseeding, mowing and erosion repair as may be required. Cut grass when the average height of the grass reaches 4-inches. Clippings may be mulched back into the seeded areas.

END OF SECTION

SECTION 015720

INDOOR AIR QUALITY PLAN DURING CONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY
- A. Section Includes:
  1. Requirements to develop and utilize an indoor air quality plan for the construction operation.
  2. A sample plan applicable to all interior construction and trades.
  3. Reference:
     a. "IAQ Guidelines for Occupied Buildings under Construction", 2008 Edition, by the Sheet Metal and Air Conditioning Contractors National Association, Inc.

1.2 TRAINING
- A. Contractor shall provide copies of the plan and training to all subcontractors and appropriate personnel.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXECUTION
- A. Contractor shall utilize a plan to protect the indoor environments from contamination during construction and finish out similar to the following plan.
- B. Contractor shall enforce and verify compliance by all personnel and subcontractors.
- C. Contractor shall take pictures of the related construction operations to verify conformance to each section of the plan. These pictures will be provided to the Architect. A minimum of eighteen (18) pictures (six (6) pictures taken on three (3) separate occasions) will be submitted.

3.2 INDOOR AIR QUALITY PLAN DURING CONSTRUCTION OPERATIONS
- A. Introduction
  1. This plan outlines the processes required to assure acceptable air quality. Elements of the program include:
     a. HVAC Protection and Containing the work area
     b. Source Control and Modifying HVAC Operation and Reducing Emissions
     c. Pathway Interruptions
     d. Intensifying Housekeeping
     e. Scheduling or Relocation of Occupants

3.3 THESE REQUIREMENTS APPLY TO ALL PARTIES INVOLVED IN DESIGN, CONSTRUCTION, AND BUILDING MOVE IN:
- A. CONTAMINANTS
  1. Air contaminants include many different materials. These may include: gases, vapors, chemicals, mold/fungus, pathogens, allergens, particulates and radiation. Eliminating all of these is not possible but reducing the introduction and distribution of these contaminants is possible and desirable. The programs outlined in the following pages are intended to reduce contaminants and provide as clean a building as possible for the residents.
  2. The following sections outline procedures and precautions to reduce building contamination and meet the requirements for a healthy environment.
- B. CONSTRUCTION OPERATIONS
  1. HVAC PROTECTION: The air conditioning system is the distribution method for air and potential contaminants throughout the building. Keeping the system clean is a necessity.
     a. All air handling equipment, spiral and fabricated ducts and accessories shall be kept clean during transportation, storage and assembly.
     b. All lined, spiral and assembled ducts shall be wrapped and protected from dirt and water during transportation and storage.
     c. All insulation and lined duct shall be kept dry at all times. Any insulation that has become wet shall be removed and replaced.
     d. Fiberglass duct board in the air handlers and bases shall be kept dry and clean. Exposed fiberglass subject to erosion shall be coated with a sealer to prevent the entry of raw fiberglass into the air stream.

1) Water will not be allowed to stand on any mechanical equipment.

e. All open ends of installed duct and equipment shall be covered and sealed to prevent the entry of dirt.

f. All zone boxes shall be wrapped and sealed from dirt and water before installation. Installed zone boxes shall have the openings sealed until permanently connected to the ductwork.

g. All dampers and attenuators into open chases and ducts shall be covered to reduce dirt entry.

h. The air handlers shall not be started without MERV 8 filtration in place. Upon system activation, install sheet media on all return openings and filters in zone box plenum openings. These filters must be monitored and changed as necessary to prevent the entry of dirt into the system. The temporary media shall be removed after building flush out and before occupancy.

i. The return air system should not be used during sheet rock installation, sanding or painting operations.

j. The building should be kept under a positive pressure as much as possible.

k. Chase dampers shall be kept closed until the system is activated.

l. Complete the initial mechanical checklists at system startup.

m. Replace final filters with new filters before flush out or occupancy per design requirements.

2. SOURCE CONTROL

a. No smoking or tobacco materials shall be allowed on all campuses.

b. No gasoline or fuel-fired equipment shall be used inside any enclosed building.

c. Wet processes within the building shall be kept to a minimum.

d. All chase and wallboard materials shall be protected from water. All damaged materials shall be removed and replaced.

e. Use low-emission materials and chemicals.

f. All cleaning involving chemicals shall be performed outside the building wherever possible.

g. All carpet materials shall be unrolled or unboxed and aired out in a well-ventilated warehouse for a minimum of three days before installation.

h. All modular furniture shall be aired out in a well-ventilated warehouse for seven days before entry into the building.

i. Trash shall be cleaned up and removed daily to the appropriate recycle container.

j. Any mold growth shall be treated according to the procedures shown in the New York City Department of Health “Guidelines on Assessment and Remediation of Fungi in Indoor Environments”.

k. Clean the inside of all walls at the base track to remove excess materials and dirt with a vacuum cleaner before enclosing the wall. This is particularly critical on walls with plumbing or water piping included.

l. HEPA vacuum all concrete floors before installation of floor covering materials.

m. No obvious mold or chemical contamination shall be enclosed, hidden or painted.

3. PATHWAY INTERRUPTION

a. Dust-producing operations shall be exhausted to the outside to the extent possible.

b. Exhaust fans may be installed on each floor to remove dust and contaminants.

c. The air handler shall supply conditioned air to the floors. Floors with heavy dust or chemical operations shall be exhausted to the outside.

d. During rain or high-humidity conditions, the air supply coming from the coils shall be cooled to 55° F or the air handler stopped to prevent moist air entry into the building. Exhaust fans shall not draw moist air into the building. It is preferable to have little airflow to moist air entering the building.

e. Return air dampers and openings shall be covered with filter media during operations that may contaminate the system.

f. During activities producing airborne particulates in occupied buildings undergoing renovation, or projects whose airspace is connected to occupied buildings, dust producing activities such as, but not limited to, demolition, sanding, buffing, and welding, the Contractor will provide commercial high volume air scrubbers at the rate of 1 per 7000 square feet, operate them continuously, and service them per the manufacturer, including high-efficiency particulate arrestance (HEPA) filter replacement.

4. HOUSEKEEPING

a. Food or food residues shall be properly disposed after meals or breaks.

b. Once the building is enclosed with finishes applied, keep dirt entry to a minimum with walk off mats at all entrances. Clean the mats at least daily.

c. All sweeping shall be done with dust reducing wax-based sweeping compounds.

d. All materials shall be kept clean and stored neatly on dunnage or pallets as required by the manufacturer.

e. Coils, fans, and air handler chambers, including return air chambers, shall be inspected and cleaned if required before start up, final testing and commissioning, and air testing.
f. All workers shall utilize the proper personal protective equipment per OSHA standards during any operation involving chemicals and dust production.
g. No food, drink, or smoking shall be allowed within the building after the building is enclosed.

5. SCHEDULING
   a. Complete all dust producing and chemical operations before the installation of “sink” materials such as carpet and ceiling tile.
   b. Complete the HVAC control system sufficient to allow the operation of the supply and exhaust systems to control pressurization and contaminants.
   c. Group contaminating operations where possible to maximize exhaust use.

END OF SECTION

SECTION 016000

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material", "equipment", "system", and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, which is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product", including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
   2. Design Professional's Action: If necessary, Design Professional will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Design Professional will notify Contractor of approval or rejection of proposed comparable product request within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
      a. Form of Approval: As specified in Division 01 Section 013300, "Submittal Procedures".
      b. Use product specified if Design Professional does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section 013300, "Submittal Procedures". Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

C. Storage:
1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements under cover in a weather-tight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. Refer to Divisions 02 through 49. Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section 017700, "Closeout Procedures".

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected", Design Professional will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal", or "or approved equal", or "or approved", comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:
1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: 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.

3. Products:
    a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered, unless otherwise indicated.
    b. Non-restricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
4. Manufacturers:
    a. Restricted List: 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 be considered, unless otherwise indicated.
    b. Non-restricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Design Professional's sample", provide a product that complies with requirements and matches Design Professional's sample. Design Professional's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section 012500, "Substitution Procedures" for proposal of product.

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

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Design Professional will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Design Professional may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents, it is consistent with the Contract Documents, will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of Design Professionals and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 017300

EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout
   2. Field engineering and surveying
   3. Installation of the Work
   4. Cutting and patching
   5. Coordination of Owner installed products
   6. Progress cleaning
   7. Starting and adjusting
   8. Protection of installed construction
   9. Correction of the Work

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Certified Surveys: Submit two (2) paper copies that are certified, sealed and signed by a Texas registered professional land surveyor. Also submit one copy of the survey in CAD format using surface coordinates and one copy of the survey in CAD format using grid coordinates. Coordinate with Owner for the reference coordinate system and CAD guidelines.

D. Final Property Survey: Submit one (1) digital copy that is certified, sealed and signed by a Texas registered professional land surveyor showing the Work performed. Also submit one copy of the survey in CAD format using surface coordinates and one copy of the survey in CAD format using grid coordinates. Coordinate with Owner for the reference coordinate system and CAD guidelines.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
   1. Structural Elements: When cutting and patching structural elements, notify Design Professional of locations and details of cutting and await directions from the Design Professional before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
   2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that result in increased maintenance or decreased operational life or safety. Operational elements include the following:
      a. Primary operational systems and equipment
      b. Fire separation assemblies
      c. Air or smoke barriers
      d. Fire-suppression systems
      e. Mechanical systems piping and ducts
      f. Control systems
      g. Communication systems
      h. Conveying systems
      i. Electrical wiring systems

j. Operating systems of special construction

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, which results in reducing their capacity to perform as intended, or that result in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
   a. Water, moisture, or vapor barriers
   b. Membranes and flashings
   c. Exterior curtain-wall construction
   d. Equipment supports
   e. Piping, ductwork, vessels, and equipment
   f. Noise- and vibration-control elements and systems
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Design Professional's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

D. Manufacturer's Installation Instructions: Obtain and maintain onsite manufacturer's written recommendations and instructions for installation of products and equipment.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.
   1. For projects requiring compliance with sustainable design and construction practices and procedures, utilize products for patching that comply with requirements of Division 01 Section 018114, "Sustainable Design Requirements".

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Design Professional for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work. Surveyor will perform a Locative Survey (Category 3) according to the standards set by the Texas Society of Professional Surveyors Manual of Practice.
   1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water service piping; underground electrical services, and other utilities.
   2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
   3. Collect and depict all utility infrastructure according to the Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data published by the American Society of Civil Engineers, publication number CI/ASCE 38-02. All utility data must have a quality level clearly associated, either via a geospatial database, CAD layering, plan symbols, and/or plan labels per the guidelines. Design Professional or Engineer will work with Owner to explain and detail costs and benefits so as to achieve the highest quality levels of subsurface utility engineering applicable to the Project and Work.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
   a. Description of the Work
   b. List of detrimental conditions, including substrates
   c. List of unacceptable installation tolerances
   d. Recommended corrections
2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Design Professional according to requirements in Division 01 Section 013100, "Project Management and Coordination".

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Design Professional promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
   1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
   2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
   3. Inform installers of lines and levels to which they must comply.
   4. Check the location, level, and plumb of every major element as the Work progresses.
   5. Notify Design Professional when deviations from required lines and levels exceed allowable tolerances.
   6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Design Professional.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Owner and Design Professional. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Design Professional before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish, construct and maintain a minimum of two permanent benchmarks on Project site, referenced to Owner's established geographic coordinate system. Benchmarks will function as both horizontal and vertical benchmarks. A registered professional land surveyor must establish the new benchmarks to meet specifications of National Geodetic Survey (NGS) Class RT1 surveys per the latest version of the User Guidelines for Single Base Real Time GNSS Positioning publication. New and re-set benchmarks will comply with the guidelines specified by Appendix B of the Bench Mark Reset Procedures document published by the NGS agency.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Mapping As-built Conditions: Once inspected and approved by Owner, all underground utility locations will be mapped using GPS mapping equipment to decimeter precision or better, prior to backfill, to collect geospatial data on as-built conditions. Any work covered prior to mapping will be required to be uncovered at no cost or schedule impact to the project. Consult with Owner for guidelines on how to collect the geospatial data and what information needs to be recorded about each utility feature. This information will be incorporated into the project record drawings to indicate the horizontal and vertical location of facilities, easements and improvements, as built.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produces harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory-prepared and field-installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Design Professional.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements of Division 01 Section 011000, "Summary".

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned; bypass such services/systems before cutting to prevent interruption to occupied areas.

F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
   b. Restore damaged pipe covering to its original condition.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
   a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or re-hang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather-tight condition.

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

3.7 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Pre-installation Conferences: Include Owner's construction personnel at pre-installation conferences covering portions of the Work that are to receive Owner's work. Attend pre-installation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold waste materials more than seven (7) days during normal weather or three (3) days if the temperature is expected to rise above 80° F.
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
      a. Utilize containers intended for holding waste materials of type to be stored.
   4. Coordinate progress cleaning for joint-use areas where more than one installer has worked.

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

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section 015000, "Temporary Facilities and Controls" and Division 01 Section 017419, “Construction Waste Management and Disposal".

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section 019113, "General Commissioning Requirements".

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section 014000, "Quality Requirements".

3.10 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.11 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
   1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 017419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

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

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

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

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

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

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

1.4 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling a minimum of seventy-five percent (75%) by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:
   1. Demolition Waste:
      a. Concrete
      b. Concrete reinforcing steel
      c. Brick
      d. Concrete masonry units
      e. Doors and frames
      f. Door hardware
      g. Metal studs
      h. Gypsum board
      i. Acoustical tile and panels
      j. Carpet
      k. Carpet pad
      l. Plumbing fixtures
      m. Piping
      n. Mechanical equipment
      o. Refrigerants
      p. Electrical conduit
      q. Copper wiring
      r. Lighting fixtures
      s. Switchgear and panelboards
      t. Transformers
   2. Construction Waste:
      a. Site-clearing waste
      b. Masonry and CMU
      c. Lumber
      d. Wood sheet materials

e. Wood trim
f. Metals
g. Carpet and pad
h. Gypsum board
i. Piping
j. Electrical conduit
k. Packaging: Regardless of salvage/recycle goal indicated in paragraph above, salvage or recycle one-hundred percent (100%) of the following uncontaminated packaging materials:
   1) Paper
   2) Cardboard
   3) Boxes
   4) Plastic sheet and film
   5) Polystyrene packaging
   6) Wood crates
   7) Plastic pails

1.5 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within thirty (30) days of date established for commencement of the Work.

1.6 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with LEED Submittal. Include the following information:
   1. Material category
   2. Generation point of waste
   3. Total quantity of waste in tons
   4. Quantity of waste salvaged, both estimated and actual in tons
   5. Quantity of waste recycled, both estimated and actual in tons
   6. Total quantity of waste recovered (salvaged plus recycled) in tons
   7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste
B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
C. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
D. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
E. LEED Submittal: LEED letter template for Credit MRc5, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.
F. Qualification Data: For waste management coordinator refrigerant recovery technician.
G. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of Projects with similar requirements.
B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
D. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 Section 013100, "Project Management and Coordination". Review methods and procedures related to waste management including, but not limited to, the following:
   1. Review and discuss waste management plan including responsibilities of waste management coordinator.
   2. Review requirements for documenting quantities of each type of waste and its disposition.
   3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
   4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
   5. Review waste management requirements for each trade.

1.8 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609 and requirements of this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition, site clearing, and construction waste generated by the Work. Use attached form or comparable generated by Contractor. Include estimated quantities and assumptions for estimates.

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

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
   1. Comply with Division 01 Section 015000, “Temporary Facilities and Controls" for operation, termination, and removal requirements.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
   1. Distribute waste management plan to everyone concerned within three days of submittal return.
   2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
   2. Comply with Division 01 Section 015000, “Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

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

B. Salvaged Items for Sale and Donation: NOT Permitted on Project site.

C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until delivery to Owner.
   4. Transport items to Owner's storage area designated by Owner.
   5. Protect items from damage during transport and storage.

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

E. Plumbing Fixtures: Separate by type and size.

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

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

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

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

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

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

3.4 DISPOSAL OF WASTE

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

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION

SECTION 017700

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Substantial Completion procedures
   2. Final completion procedures
   3. Warranties
   4. Final cleaning

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.
   1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
   2. Advise Owner of pending insurance changeover requirements.
   3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   5. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
   6. Deliver attic stock and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
   7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
   8. Complete startup testing of systems.
   9. Submit test/adjust/balance records.
   10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
   11. Advise Owner of changeover in heat and other utilities.
   12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
   13. Complete final cleaning requirements, including touchup painting.
   14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
   1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
   2. Results of completed inspection will form the basis of requirements for final completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:
   1. Submit a final Application for Payment according to Division 01 Section 012900, "Payment Procedures".
   2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
   3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
   4. Submit pest-control final inspection report and warranty.

5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected. Include cost for re-inspection based on incomplete work of the Contractor.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A attached or form provide by Contractor and approved by Owner and Architect.
1. Organize list of spaces in sequential order, starting with exterior areas first.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
   a. Project name
   b. Date
   c. Name of Architect
   d. Name of Contractor
   e. Page number
4. Submit list of incomplete items in the following format:
   a. PDF electronic file
   b. ~~Three (3) paper copies of product schedule or list, unless otherwise indicated. Architect will return two (2) copies~~.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within fifteen (15) days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
~~1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8½ by 11-inch paper.~~
~~2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.~~
~~3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES", Project name, and name of Contractor.~~
~~4. Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide table of contents at beginning of document.~~

D. Provide additional copies of each warranty to include in operation and maintenance manuals. Included digital copies of each warranty within appropriate division of operations and maintenance manuals.

E. After final assembly, scan entire warranty binder into PDF format and deliver to Owner. Deliver entire closeout package to owner in PDF format on a thumb drive.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
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.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Remove snow and ice to provide safe access to building.
    f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    g. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    h. Sweep concrete floors clean in unoccupied spaces.
    i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
    k. Remove labels that are not permanent.
    l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
        1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.
    m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    n. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
    o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    q. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.
        1) Clean HVAC system in compliance with NADCA Standard ACR-2013.
    r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
    s. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section 017419, "Construction Waste Management and Disposal".

END OF SECTION

SECTION 017823

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Operation and maintenance documentation directory
   2. Emergency manuals
   3. Operation manuals for systems, subsystems, and equipment
   4. Product maintenance manuals
   5. Systems and equipment maintenance manuals

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual specification sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
   1. Where applicable, clarify and update reviewed manual content to correspond to modifications and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:
   a. PDF electronic file. Assemble each manual into a composite electronically-indexed file. Submit on digital media acceptable to Design Professional.
      a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically-linked operation and maintenance directory.
      b. Enable inserted reviewer comments on draft submittals.
   b. One (1) paper copy. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Design Professional will return.

C. Initial Manual Submittal: Submit draft copy of each manual to Owner and Design Professional at least thirty (30) days before commencing demonstration and training. Design Professional, Owner, and Commissioning Agent will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least fifteen (15) days before commencing demonstration and training. Design Professional and Commissioning Agent will return copy with comments.
   1. Correct or modify each manual to comply with Design Professional's and Commissioning Agent’s comments. Submit copies of each corrected manual within fifteen (15) days of receipt of Design Professional's and Commissioning Agent’s comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:
   1. List of documents
   2. List of systems
   3. List of equipment
   4. Table of contents

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of a system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4-2008, "Preparation of Operating and Maintenance Documentation for Building Systems".

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page
2. Table of contents
3. Manual contents

B. Title Page: Include the following information:
1. Subject matter included in manual
2. Name and address of Project
3. Name and address of Owner
4. Date of submittal
5. Name and contact information for Contractor
6. Name and contact information for Construction Manager
7. Name and contact information for Design Professional
8. Name and contact information for Commissioning Agent
9. Names and contact information for major consultants to the Design Professional that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based upon file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily-navigated file tree. Configure electronic manual to display bookmark panel upon opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound, and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf or post-type binders, in thickness necessary to accommodate contents, sized to hold 8½ by 11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
   a. If two (2) or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
   b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL", Project title or name and subject matter of contents. Indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8½ by 11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.

b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:
1. Type of emergency
2. Emergency instructions
3. Emergency procedures

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire
2. Flood
3. Gas leak
4. Water leak
5. Power failure
6. Water outage
7. System, subsystem, or equipment failure
8. Chemical release or spill

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping
2. Shutdown instructions for each type of emergency
3. Operating instructions for conditions outside normal operating limits
4. Required sequences for electric or electronic systems
5. Special operating instructions and procedures

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards
4. Operating procedures
5. Operating logs
6. Wiring diagrams
7. Control diagrams
8. Piped system diagrams
9. Precautions against improper use
10. License requirements including inspection and renewal dates

B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name
3. Equipment identification with serial number of each component
4. Equipment function
5. Operating characteristics
6. Limiting conditions
7. Performance curves
8. Engineering data and tests
9. Complete nomenclature and number of replacement parts

C. Operating Procedures: Include the following, as applicable:
1. Startup procedures
2. Equipment or system break-in procedures
3. Routine and normal operating instructions
4. Regulation and control procedures
5. Instructions on stopping
6. Normal shutdown instructions
7. Seasonal and weekend operating instructions
8. Required sequences for electric or electronic systems
9. Special operating instructions and procedures

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
B. Source Information: List each product included in manual identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
C. Product Information: Include the following, as applicable:
    1. Product name and model number
    2. Manufacturer's name
    3. Color, pattern, and texture
    4. Material and chemical composition
    5. Reordering information for specially manufactured products
D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
    1. Inspection procedures
    2. Types of cleaning agents to be used and methods of cleaning
    3. List of cleaning agents and methods of cleaning detrimental to product
    4. Schedule for routine cleaning and maintenance
    5. Repair instructions
E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
    1. Include procedures to follow and required notifications for warranty claims

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
B. Source Information: List each system, subsystem, and piece of equipment included in manual identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
    1. Standard maintenance instructions and bulletins
    2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly
    3. Identification and nomenclature of parts and components
    4. List of items recommended to be stocked as spare parts
D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
    1. Test and inspection instructions
    2. Troubleshooting guide
    3. Precautions against improper maintenance
    4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
    5. Aligning, adjusting, and checking instructions
    6. Demonstration and training video recording, if available
E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
    1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
    2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION AND DELIVERY
A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
   1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
   2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
   1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
   1. Do not use original project record documents as part of operation and maintenance manuals.
   2. Comply with requirements of newly prepared record Drawings in Division 01 Section 017839, "Project Record Documents".
G. Comply with Division 01 Section 017700, "Closeout Procedures" for schedule for submitting operation and maintenance documentation.
H. Include transmittal with all deliveries to Owner. Request receipt confirmation.

END OF SECTION

SECTION 017839

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:
   1. Record Drawings
   2. Record Specifications
   3. Record Product Data
   4. Miscellaneous record submittals

1.3 DEFINITIONS

A. Geospatial Data: Data or information that identifies the geographic location of features and boundaries in relation to the Owner's coordinate system.

1.4 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit copies of record Drawings as follows:
      a. Initial Submittal: Submit one (1) paper copy and PDF electronic files of marked-up record prints and one (1) set of plots from corrected record digital data files. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
      b. Final Submittal: Submit one (1) paper copy, PDF electronic files, CADD and BIM of marked-up record prints, one (1) set of record digital data files, and three (3) sets of record digital data file plots. Plot each drawing file, whether or not changes and additional information were recorded.
      c. Architect will amend record CADD files for submission to Owner at completion of project.

B. Record Specifications: Submit one (1) paper copy and one (1) PDF copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one (1) paper copy, one (1) PDF copy of each submittal, and one (1) CoBIE format.
   1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one (1) paper copy of each submittal.

E. Reports: Submit written report indicating items incorporated in Project record documents concurrent with progress of the Work, including modifications, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one (1) set of marked-up paper copies of the Contract Drawings and Shop Drawings.
   1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later
      b. Accurately record information in an acceptable drawing technique
      c. Record data as soon as possible after obtaining it
      d. Record and check the markup before enclosing concealed installations
      e. Cross-reference record prints to corresponding archive photographic documentation

2. Content: Types of items requiring marking include, but are not limited to, the following:
    a. Dimensional changes to Drawings
    b. Revisions to details shown on Drawings
    c. Depths of foundations below first floor
    d. Locations and depths of underground utilities
    e. Revisions to routing of piping and conduits
    f. Revisions to electrical circuitry
    g. Actual equipment locations
    h. Duct size and routing
    i. Locations of concealed internal utilities
    j. Changes made by Change Order or Construction Change Directive
    k. Changes made following Architect's written orders
    l. Details not on the original Contract Drawings
    m. Field records for variable and concealed conditions
    n. Record information on the Work that is shown only schematically
3. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
2. Format: As approved by Owner.
3. Format: Annotated PDF electronic file with comment function enabled.
4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
5. Refer instances of uncertainty to Architect through Construction Manager for resolution.
6. Incorporate geospatial data collected during construction and installation to more accurately reflect as-built conditions.

C. Newly-Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Architect and Construction Manager for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

D. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
    a. Project name
    b. Date
    c. Designation "PROJECT RECORD DRAWINGS"
    d. Name of Architect and Construction Manager
    e. Name of Contractor

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as a scanned PDF electronic file of the marked up paper copy of Specifications.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Specifications as a scanned PDF electronic file and CoBIE format of the marked up paper copy of Specifications.
1. Include record Product Data directory organized by specification section number and title, electronically linked to each item of record Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit record Specifications as a scanned PDF electronic file of the marked up paper copy of Specifications.
1. Include miscellaneous record submittals directory organized by specification section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one (1) copy of each submittal during the construction period for project record document purposes. Post changes and modifications to project record documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's and Construction Manager's reference during normal working hours.

END OF SECTION

SECTION 017900

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Demonstration of operation of systems, subsystems, and equipment
   2. Training in operation and maintenance of systems, subsystems, and equipment

B. Related Sections:
   1. Divisions 02 through 49 Sections for specific requirements for demonstration and training for products in those Sections

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
   1. Indicate proposed training modules utilizing manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For facilitator

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section 014000, "Quality Requirements", experienced in operation and maintenance procedures and training.

C. Pre-Instruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section 013100, "Project Management and Coordination". Review methods and procedures related to demonstration and training including, but not limited to, the following:
   1. Inspect and discuss locations and other facilities required for instruction.
   2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
   3. Review required content of instruction.
   4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Design Professional.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
   a. System, subsystem, and equipment descriptions
   b. Performance and design criteria if Contractor is delegated design responsibility
   c. Operating standards
   d. Regulatory requirements
   e. Equipment function
   f. Operating characteristics
   g. Limiting conditions
   h. Performance curves
2. Documentation: Review the following items in detail:
   a. Emergency manuals
   b. Operations manuals
   c. Maintenance manuals
   d. Project record documents
   e. Identification systems
   f. Warranties and bonds
   g. Maintenance service agreements and similar continuing commitments
3. Emergencies: Include the following, as applicable:
   a. Instructions on meaning of warnings, trouble indications, and error messages
   b. Instructions on stopping
   c. Shutdown instructions for each type of emergency
   d. Operating instructions for conditions outside of normal operating limits
   e. Sequences for electric or electronic systems
   f. Special operating instructions and procedures
4. Operations: Include the following, as applicable:
   a. Startup procedures
   b. Equipment or system break-in procedures
   c. Routine and normal operating instructions
   d. Regulation and control procedures
   e. Control sequences
   f. Safety procedures
   g. Instructions on stopping
   h. Normal shutdown instructions
   i. Operating procedures for emergencies
   j. Operating procedures for system, subsystem, or equipment failure
   k. Seasonal and weekend operating instructions
   l. Required sequences for electric or electronic systems
   m. Special operating instructions and procedures
5. Adjustments: Include the following:
   a. Alignments
   b. Checking adjustments
   c. Noise and vibration adjustments
   d. Economy and efficiency adjustments
6. Troubleshooting: Include the following:
   a. Diagnostic instructions
   b. Test and inspection procedures
7. Maintenance: Include the following:
   a. Inspection procedures
   b. Types of cleaning agents to be used and methods of cleaning
   c. List of cleaning agents and methods of cleaning detrimental to product
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance
   f. Procedures for routine maintenance
   g. Instruction on use of special tools

8. Repairs: Include the following:
   a. Diagnosis instructions
   b. Repair instructions
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions
   d. Instructions for identifying parts and components
   e. Review of spare parts needed for operation and maintenance

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training modules. Assemble training modules into a training manual organized in coordination with requirements in Division 01 Section 017823, "Operations and Maintenance Data".

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
   1. Schedule training with Owner, through Construction Manager, with at least seven days' advance notice.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified individual to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
   1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.
   1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
   2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
   3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
   4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:
      a. Name of Contractor/Installer
      b. Business address
      c. Business phone number
      d. Point of contact
      e. E-mail address

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
   1. Film training session(s) in segments not to exceed fifteen (15) minutes.
      a. Produce segments to present a single significant piece of equipment per segment.
      b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
      c. Where a training session on a particular piece of equipment exceeds fifteen (15) minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
   1. Furnish additional portable lighting as required.
E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.
F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.
G. Pre-produced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION

SECTION 018114

SUSTAINABLE DESIGN REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes general requirements and procedures for compliance with USGBC LEED prerequisites and credits needed for Project to obtain LEED certification based on LEED ***[Level]*** certification based on ***[LEED Version]***. Other LEED prerequisites and credits needed to obtain LEED certification depend on material selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
   1. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Design Professional's design and other aspects of Project that are not part of the Work of the Contract.
   2. A copy of the LEED Project checklist is attached at the end of this Section for information only.

B. Related Sections:
   1. Divisions 01 through 33 Sections for requirements specific to the work of each of these Sections.

1.3 DEFINITIONS

A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship". Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

B. LEED: Leadership in Energy & Environmental Design.

C. Rapidly Renewable Materials: Materials made from plants that are typically harvested within a 10-year or shorter cycle. Rapidly renewable materials include products made from bamboo, cotton, flax, jute, straw, sunflower seed hulls, vegetable oils, or wool.

D. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

E. Regionally-Manufactured Materials: Materials that are manufactured within a radius of 500 miles from Project site. Manufacturing refers to the final assembly of components into the building product that is installed at Project site.

F. Regionally-Extracted and Manufactured Materials: Regionally-manufactured materials made from raw materials that are extracted, harvested, or recovered within a radius of 500 miles from Project site.

G. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
   1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
   2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

H. Recycled Content: The percentage by weight of constituents that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer), or after consumer use (post-consumer).
   1. Spills and scraps from the original manufacturing process that are combined with other constituents after a minimal amount of reprocessing for use in further production of the same product are not recycled materials.
   2. Discarded materials from one manufacturing process that are used as constituents in another manufacturing process are pre-consumer recycled materials.

1.4 SUBMITTALS

A. General: Submit sustainable submittals required by other Specification Sections.

B. Sustainable submittals are to be submitted with other submittals required by each section. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated sustainable requirements.

C. Project Materials Cost Data: Provide statement indicating total cost for building materials used for Project, excluding mechanical, electrical, and plumbing components, and specialty items such as elevators and equipment. Include statement indicating total cost for wood-based materials used for Project.

D. Sustainable Action Plans: Provide preliminary submittals within fourteen (14) days of date established for commencement of the Work indicating how the following requirements will be met:
   1. Waste management plan complying with Division 01 Section 017419, "Construction Waste Management and Disposal".
   2. Recycled Content: List of proposed materials with recycled content. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
   3. Regional Materials: List of proposed regional materials. Identify each regional material, including its source, cost, and the fraction by weight that is considered regional.
   4. Certified Wood: List of proposed certified wood products. Indicate each product containing certified wood, including its source and cost of certified wood products.
   5. Indoor Air Quality: Construction indoor-air-quality management plan.

E. Sustainable Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with action plans for the following:
   1. Waste reduction progress reports complying with Division 01 Section 017419, "Construction Waste Management and Disposal".
   2. Recycled content
   3. Regional materials
   4. Certified wood products

F. Sustainable Documentation Submittals:
   1. Product data and wiring diagrams for sensors and data collection system used to provide continuous metering of building energy consumption performance over time.
   2. Recycled Content: Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
   3. Regional Material: Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
   4. Certified Wood: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
   5. Indoor Air Quality During Construction:
      a. Construction indoor air quality management plan
      b. Product data for temporary filtration media
      c. Product data for filtration media used during occupancy
      d. Construction Documentation: Six (6) photographs at three (3) different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor air quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.
   6. Indoor Air Quality Prior to Occupancy:
      a. Signed statement describing the building air flush-out procedures, including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
      b. Product data for filtration media used during flush-out and during occupancy.
      c. Report from testing and inspecting agency, indicating results of indoor air quality testing and documentation shows compliance with indoor air quality testing procedures and requirements.
   7. Adhesives and Sealants: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   8. Paints and Coatings: Product data for paints and coatings used inside the weatherproofing system indicating chemical composition and VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   9. Urea Formaldehyde Prohibition: Product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.

1.5 QUALITY ASSURANCE

A. Sustainability Coordinator: Engage an experienced LEED-Accredited Professional to coordinate sustainable requirements. Sustainability Coordinator may also serve as waste management coordinator.

PART 2 - PRODUCTS

2.1 RECYCLED CONTENT OF MATERIALS

A. Cost of post-consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.

B. Do not include mechanical and electrical components in the calculation.

2.2 REGIONAL MATERIALS

A. Provide 20 percent of building materials (by cost) that are regional materials.

B. Provide 20 percent of building materials (by cost) that are regionally manufactured materials.

C. Provide 10 percent of building materials (by cost) that are regionally extracted and manufactured materials.

2.3 CERTIFIED WOOD

A. Provide a minimum of 50 percent (by cost) of wood-based materials that are produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship".

1. Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:
    a. Rough carpentry
    b. Miscellaneous carpentry
    c. Heavy-timber construction
    d. Wood decking
    e. Metal plate-connected wood trusses
    f. Structural glued-laminated timber
    g. Finish carpentry
    h. Architectural woodwork
    i. Wood paneling
    j. Wood veneer wall covering
    k. Wood flooring
    l. Wood lockers
    m. Wood cabinets
    n. Furniture

2.4 LOW-EMITTING MATERIALS

A. For field applications that are inside the weatherproofing system, use adhesives and sealants that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L
2. Metal-to-Metal Adhesives: 30 g/L
3. Adhesives for Porous Materials (Except Wood): 50 g/L
4. Subfloor Adhesives: 50 g/L
5. Plastic Foam Adhesives: 50 g/L
6. Carpet Adhesives: 50 g/L
7. Carpet Pad Adhesives: 50 g/L
8. VCT and Asphalt Tile Adhesives: 50 g/L
9. Cove Base Adhesives: 50 g/L
10. Gypsum Board and Panel Adhesives: 50 g/L
11. Rubber Floor Adhesives: 60 g/L
12. Ceramic Tile Adhesives: 65 g/L
13. Multipurpose Construction Adhesives: 70 g/L
14. Fiberglass Adhesives: 80 g/L
15. Contact Adhesive: 80 g/L
16. Structural Glazing Adhesives: 100 g/L
17. Wood Flooring Adhesive: 100 g/L
18. Structural Wood Member Adhesive: 140 g/L

19. Special Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, Teflon, ultra-high molecular weight polyethylene, rubber or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
20. Top and Trim Adhesive: 250 g/L
21. Plastic Cement Welding Compounds: 350 g/L
22. ABS Welding Compounds: 400 g/L
23. CPVC Welding Compounds: 490 g/L
24. PVC Welding Compounds: 510 g/L
25. Adhesive Primer for Plastic: 650 g/L
26. Sheet Applied Rubber Lining Adhesive: 850 g/L
27. Aerosol Adhesive, General-Purpose Mist Spray: 65 percent by weight
28. Aerosol Adhesive, General-Purpose Web Spray: 55 percent by weight
29. Special-Purpose Aerosol Adhesive (All Types): 70 percent by weight
30. Other Adhesives: 250 g/L
31. Architectural Sealants: 250 g/L
32. Non-Membrane Roof Sealants: 300 g/L
33. Single-Ply Roof Membrane Sealants: 450 g/L
34. Other Sealants: 420 g/L
35. Sealant Primers for Nonporous Substrates: 250 g/L
36. Sealant Primers for Porous Substrates: 775 g/L
37. Modified Bituminous Sealant Primers: 500 g/L
38. Other Sealant Primers: 750 g/L

B. For field applications that are inside the weatherproofing system, use paints and coatings that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions:
1. Flat Paints, Coatings, and Primers: VOC not more than 50 g/L
2. Non-Flat Paints, Coatings, and Primers: VOC not more than 150 g/L
3. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L
4. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L
5. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L
6. Floor Coatings: VOC not more than 100 g/L
7. Shellacs, Clear: VOC not more than 730 g/L.
8. Shellacs, Pigmented: VOC not more than 550 g/L
9. Stains: VOC not more than 250 g/L
10. Flat Interior Topcoat Paints: VOC not more than 50 g/L
11. Non-Flat Interior Topcoat Paints: VOC not more than 150 g/L
12. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L
13. Clear Wood Finishes, Varnishes and Sanding Sealers: VOC not more than 350 g/L
14. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L
15. Floor Coatings: VOC not more than 100 g/L
16. Shellacs, Clear: VOC not more than 730 g/L
17. Shellacs, Pigmented: VOC not more than 550 g/L
18. Stains: VOC not more than 250 g/L
19. Primers, Sealers, and Undercoats: VOC not more than 200 g/L
20. Dry-Fog Coatings: VOC not more than 400 g/L
21. Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L
22. Pretreatment Wash Primers: VOC not more than 420 g/L
23. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).

C. Urea Formaldehyde Prohibition: Do not use composite wood or agrifiber products or adhesives that contain urea-formaldehyde resin.

PART 3 - EXECUTION

3.1 REFRIGERANT AND CLEAN-AGENT FIRE-EXTINGUISHING-AGENT REMOVAL

A. Remove CFC-based refrigerants from existing HVAC&R equipment indicated to remain and replace with refrigerants that are not CFC-based. Replace or adjust existing equipment to accommodate new refrigerant as described in Division 23 Section ***[Number] [Title]***.

B. Remove clean-agent fire-extinguishing agents that contain HCFCs or halons and replace with agent that does not contain HCFCs or halons. See Division 21 Section ***[Number]***, “Clean-Agent Fire Extinguishing Systems" for additional requirements.

3.2 MEASUREMENT AND VERIFICATION

A. Implement measurement and verification plan consistent with [Option B: Energy Conservation Measure Isolation] [Option D: Calibrated Simulation, Savings Estimation Method 2] in the EVO's "International Performance Measurement and Verification Protocol (IPMVP) Volume III: Concepts and Options for Determining Energy Savings in New Construction".

B. If not already in place, install metering equipment to measure energy usage. Monitor, record, and trend log measurements.

C. Evaluate energy performance and efficiency by comparing actual to predicted performance.

D. Measurement and verification period shall cover at least one year of post-construction occupancy.

3.3 CONSTRUCTION WASTE MANAGEMENT

A. Comply with Division 01 Section 015639, “Construction Waste Management and Disposal".

3.4 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

A. Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction".

1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Division 01 Section "Temporary Facilities and Controls", install filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
2. Replace all air filters immediately prior to occupancy.

B. Comply with the following requirements:

1. Air-Quality Testing:
   a. Conduct baseline indoor-air-quality testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air” and as additionally detailed in the USGBC's ***[LEED Version]***: Reference Guide".
   b. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:
      1) Formaldehyde: 50 ppb
      2) Particulates (PM10): 50 micrograms/cu. m
      3) Total Volatile Organic Compounds (TVOC): 500 micrograms/cu. m
      4) 4-Phenylcyclohexene (4-PH): 6.5 micrograms/cu. m
      5) Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels
   c. For each sampling point where the maximum concentration limits are exceeded, conduct additional flush-out with outside air and retest the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting non-complying building areas, take samples from same locations as in the first test.
   d. Air-sample testing shall be conducted as follows:
      1) All measurements shall be conducted prior to occupancy but during normal occupied hours and with building ventilation system starting at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.
      2) Building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Non-fixed furnishings such as workstations and partitions are encouraged, but not required, to be in place for the testing.
      3) Number of sampling locations will vary depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft. or for each contiguous floor area, whichever is larger, and shall include areas with the least ventilation and greatest presumed source strength.
      4) Air samples shall be collected between 3-feet and 6-feet from the floor to represent the breathing zone of occupants, and over a minimum four (4) hour period.

END OF SECTION

SECTION 019113

GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. OPR and BoD documentation are included by reference for information only.

1.2 SUMMARY

A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.

1.3 DEFINITIONS

A. BoD: Basis of Design. A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

B. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

C. CxA: Commissioning Authority.

D. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

E. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.4 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of each Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner:

1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
2. Representatives of the facility user and operation and maintenance personnel.
3. Architect and engineering design professionals.

1.5 OWNER'S RESPONSIBILITIES

A. Provide the OPR documentation to the Design Professional, CxA and Contractor for information and use.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

C. Provide the BoD documentation, prepared by Design Professional and approved by Owner, to the CxA and Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.6 CONTRACTOR'S RESPONSIBILITIES

A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
2. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
3. Attend commissioning team meetings held on a monthly basis.
4. Integrate and coordinate commissioning process activities with construction schedule.
5. Review and accept construction checklists provided by the CxA.
6. Complete electronic construction checklists as Work is completed and provide to the CxA.

7. Review and accept commissioning process test procedures provided by the CxA.
8. Complete commissioning process test procedures.

1.7 CxA'S RESPONSIBILITIES

A. Organize and lead the commissioning team
B. Provide commissioning plan
C. Convene commissioning team meetings
D. Provide Project-specific construction checklists and commissioning process test procedures.
E. Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CxA will report the failure in the Issues Log.
F. Prepare and maintain the Issues Log
G. Prepare and maintain completed construction checklist log
H. Witness systems, assemblies, equipment, and component startup
I. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures and finishes, for the following:
      a. Piers
      b. Footings
      c. Slabs-on-grade
      d. Concrete encasement of utility lines

1.2 REFERENCES

A. Definitions
   1. Cementitious Materials
      a. Portland cement alone or in combination with 1 or more of the following:
         1) Blended hydraulic cement
         2) Fly ash
         3) Other pozzolans
         4) Ground granulated blast-furnace slag
         5) Silica fume
      b. Subject to compliance with the requirements of this specification

B. Reference Standards
   1. Reference standards cited in this Specification refer to the current reference standard published at the time of the latest revision date logged at the end of this Specification, unless a date is specifically cited.
   2. American Association of State Highway and Transportation (AASHTO):
      a. M182, Burlap Cloth Made from Jute or Kenaf.
   3. American Concrete Institute (ACI):
      a. ACI 117 Specification for Tolerances for Concrete Construction and Materials
      b. ACI 301 Specifications for Structural Concrete
      c. ACI 305.1 Specification for Hot Weather Concreting
      d. ACI 306.1 Standard Specification for Cold Weather Concreting
      e. ACI 308.1 Standard Specification for Curing Concrete
      f. ACI 318 Building Code Requirements for Structural Concrete
      g. ACI 347 Guide to Formwork for Concrete
   4. ASTM International (ASTM):
      a. A36, Standard Specification for Carbon Structural Steel.
      b. A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
      c. A193, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications.
      d. A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
      e. A706, Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
      f. C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.

g. C33, Standard Specification for Concrete Aggregates.
h. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
i. C42, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
j. C94, Standard Specification for Ready-Mixed Concrete.
k. C109, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch or Cube Specimens)
l. C143, Standard Test Method for Slump of Hydraulic-Cement Concrete.
m. C171, Standard Specification for Sheet Materials for Curing Concrete.
n. C150, Standard Specification for Portland Cement.
o. C172, Standard Practice for Sampling Freshly Mixed Concrete.
p. C219, Standard Terminology Relating to Hydraulic Cement.
q. C231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
r. C260, Standard Specification for Air-Entraining Admixtures for Concrete.
s. C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
t. C494, Standard Specification for Chemical Admixtures for Concrete.
u. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
v. C881, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
w. C989, Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
x. C1017, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
y. C1059, Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
z. C1064, Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
aa. C1240, Standard Specification for Silica Fume Used in Cementitious Mixtures.
bb. E1155, Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.
cc. F436, Standard Specification for Hardened Steel Washers.

5. American Welding Society (AWS).
   a. D1.1, Structural Welding Code - Steel.
   b. D1.4, Structural Welding Code - Reinforcing Steel.
6. Concrete Reinforcing Steel Institute (CRSI)
   a. Manual of Standard Practice

1.3 ADMINISTRATIVE REQUIREMENTS

A. Work Included
1. Design, fabrication, erection and stripping of formwork for cast-in-place concrete including shoring, reshoring, falsework, bracing, proprietary forming systems, prefabricated forms, void forms, permanent metal forms, bulkheads, keys, blockouts, sleeves, pockets and accessories.
   a. Erection shall include installation in formwork of items furnished by other trades.
2. Furnish all labor and materials required to fabricate, deliver and install reinforcement and embedded metal assemblies for cast-in-place concrete, including steel bars, welded steel wire fabric, ties, supports and sleeves.
3. Furnish all labor and materials required to perform the following:
   a. Cast-in-place concrete
   b. Concrete mix designs

c. Grouting

1.4 SUBMITTALS

A. Product Data
1. Required for each type of product indicated

B. Design Mixtures
1. For each concrete mixture submit proposed mix designs in accordance with ACI 318, chapter 5.
2. Submit each proposed mix design with a record of past performance.
3. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results or other circumstances warrant adjustments.
4. Indicate amounts of mixing water to be withheld for later addition at Project site.
   a. Include this quantity on delivery ticket.

C. Steel Reinforcement Submittals for Information
1. Mill test certificates of supplied concrete reinforcing, indicating physical and chemical analysis.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications
1. A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94 requirements for production facilities and equipment.
2. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities".

B. Source Limitations
1. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from 1 source and obtain admixtures through 1 source from a single manufacturer.

C. ACI Publications
1. Comply with the following unless modified by requirements in the Contract Documents:
   a. ACI 301 Sections 1 through 5
   b. ACI 117

D. Concrete Testing Service
1. Engage a qualified independent testing agency to perform material evaluation tests.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement
1. Deliver, store, and handle steel reinforcement to prevent bending and damage.
2. Avoid damaging coatings on steel reinforcement.

B. Waterstops
1. Store waterstops under cover to protect from moisture, sunlight, dirt, oil and other contaminants.

1.7 WARRANTY

A. Refer to Standard General Conditions of the Construction Contract for warranty requirements.

PART 2 - PRODUCTS

2.1 PRODUCT TYPES AND MATERIALS

A. Form-Facing Materials
   1. Rough-Formed Finished Concrete
      a. Plywood, lumber, metal or another approved material
      b. Provide lumber dressed on at least 2 edges and 1 side for tight fit.
   2. Chamfer Strips
      a. Wood, metal, PVC or rubber strips
      b. 3/4-inch x 3/4-inch, minimum
   3. Rustication Strips
      a. Wood, metal, PVC or rubber strips
      b. Kerfed for ease of form removal
   4. Form-Release Agent
      a. Commercially formulated form-release agent that will not bond with, stain or adversely affect concrete surfaces
      b. Shall not impair subsequent treatments of concrete surfaces
      c. For steel form-facing materials, formulate with rust inhibitor.
   5. Form Ties
      a. Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
      b. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
      c. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
      d. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

B. Steel Reinforcement
   1. Reinforcing Bars
      a. ASTM A615, Grade 60, deformed

C. Reinforcement Accessories
   1. Smooth Dowel Bars
      a. ASTM A615, Grade 60, steel bars (smooth)
      b. Cut bars true to length with ends square and free of burrs.
   2. Bar SupportsBolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire reinforcement in place
      b. Manufacture bar supports from steel wire, plastic or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
         1) For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
         2) For slabs-on-grade, provide sand plates, horizontal runners or precast concrete blocks on bottom where base material will not support chair legs or where vapor barrier has been specified.

D. Embedded Metal Assemblies
   1. Steel Shapes and Plates: ASTM A36.
   2. Headed Studs: Heads welded by full-fusion process, as furnished by TRW Nelson Stud Welding Division or approved equal.

E. Expansion Anchors
1. Available Products
a. Wej-it Bolt, Wej-it Corporation, Tulsa, Oklahoma
b. Kwik Bolt II, Hilti Fastening Systems, Tulsa, Oklahoma
c. Trubolt, Ramset Fastening Systems, Paris, Kentucky

F. Adhesive Anchors and Dowels
1. Adhesive anchors shall consist of threaded rods anchored with an adhesive system into hardened concrete or grout-filled masonry.
a. The adhesive system shall use a 2-component adhesive mix and shall be injected with a static mixing nozzle following manufacturer's instructions.
b. The embedment depth of the rod shall provide a minimum allowable bond strength that is equal to the allowable yield capacity of the rod, unless otherwise specified.
2. Available Products
a. Hilti HIT HY 150 Max
b. Simpson Acrylic-Tie
c. Powers Fasteners AC 100+ Gold
3. Threaded Rods: ASTM A193
a. Nuts: ASTM A563 hex carbon steel
b. Washers: ASTM F436 hardened carbon steel
c. Finish: Hot-dip zinc coating, ASTM A153, Class C

G. Inserts
1. Provide metal inserts required for anchorage of materials or equipment to concrete construction where not supplied by other trades:
a. In vertical concrete surfaces for transfer of direct shear loads only, provide adjustable wedge inserts of malleable cast iron complete with bolts, nuts and washers.
1) Provide 3/4-inch bolt size, unless otherwise indicated.
b. In horizontal concrete surfaces and whenever inserts are subject to tension forces, provide threaded inserts of malleable cast iron furnished with full depth bolts.
1) Provide 3/4-inch bolt size, unless otherwise indicated.

H. Concrete Materials
1. Cementitious Material
a. Use the following cementitious materials, of the same type, brand, and source, throughout Project:
1) Portland Cement
a) ASTM C150, Type I/II, gray
b) Supplement with the following:
(1) Fly Ash
(a) ASTM C618, Class C or F
(2) Ground Granulated Blast-Furnace Slag
(a) ASTM C989, Grade 100 or 120.
(3) Silica Fume
(a) ASTM C1240, amorphous silica
(4) Normal-Weight Aggregates
(a) ASTM C33, Class 3S coarse aggregate or better, graded
(b) Provide aggregates from a single source.
(5) Maximum Coarse-Aggregate Size
(a) 3/4-inch nominal
(6) Fine Aggregate
(a) Free of materials with deleterious reactivity to alkali in cement

(7) Water
(a) ASTM C94 and potable

I. Admixtures
1. Air-Entraining Admixture
a. ASTM C260
2. Chemical Admixtures
a. Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete.
b. Do not use calcium chloride or admixtures containing calcium chloride.
c. Water-Reducing Admixture
1) ASTM C494, Type A
d. Retarding Admixture
1) ASTM C494, Type B
e. Water-Reducing and Retarding Admixture
1) ASTM C494, Type D
f. High-Range, Water-Reducing Admixture
1) ASTM C494, Type F
g. High-Range, Water-Reducing and Retarding Admixture
1) ASTM C494, Type G
h. Plastiizing and Retarding Admixture
1) ASTM C1017, Type II

J. Waterstops
1. Self-Expanding Butyl Strip Waterstops
a. Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, ¾-inch x 1-inch.
b. Available Products
1) Colloid Environmental Technologies Company; Volclay Waterstop-RX
2) Concrete Sealants Inc.; Conseal CS-231
3) Greenstreak; Swellstop
4) Henry Company, Sealants Division; Hydro-Flex
5) JP Specialties, Inc.; Earthshield Type 20
6) Progress Unlimited, Inc.; Superstop
7) TCMiraDRI; Mirastop

K. Curing Materials
1. Absorptive Cover
a. AASHTO M182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 ounces/square yard when dry
2. Moisture-Retaining Cover
a. ASTM C171, polyethylene film or white burlap-polyethylene sheet
3. Water
a. Potable
4. Clear, Waterborne, Membrane-Forming Curing Compound
a. ASTM C309, Type 1, Class B, dissipating
b. Available Products
1) Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB
2) Burke by Edoco; Aqua Resin Cure
3) ChemMasters; Safe-Cure Clear
4) Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure
5) Dayton Superior Corporation; Day Chem Rez Cure (J-11-W)
6) Euclid Chemical Company (The); Kurez DR VOX

7) Kaufman Products, Inc.; Thinfilm 420
8) Lambert Corporation; Aqua Kure-Clear
9) L&M Construction Chemicals, Inc.; L&M Cure R
10) Meadows, W. R., Inc.; 1100 Clear
11) Nox-Crete Products Group, Kinsman Corporation; Resin Cure E
12) Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure
13) Tamms Industries, Inc.; Horncure WB 30
14) Unitex; Hydro Cure 309
15) US Mix Products Company; US Spec Maxcure Resin Clear
16) Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100

L. Related Materials
1. Bonding Agent
a. ASTM C1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene
2. Epoxy Bonding Adhesive
a. ASTM C881, 2-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
1) Types I and II, non-load bearing
2) IV and V, load bearing, for bonding
3) Hardened or freshly mixed concrete to hardened concrete
3. Reglets
a. Fabricate reglets of not less than 0.0217-inch thick, galvanized steel sheet
b. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
4. Sleeves and Blockouts
a. Formed with galvanized metal, galvanized pipe, polyvinyl chloride pipe, fiber tubes or wood
5. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages
a. Sized as required
b. Shall be of strength and character to maintain formwork in place while placing concrete

M. Repair Materials
1. Repair Underlayment
a. Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses of 1/8-inch or greater
1) Do not feather.
b. Cement Binder
1) ASTM C150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219
c. Primer
1) Product of underlayment manufacturer recommended for substrate, conditions, and application
d. Aggregate
1) Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer
e. Compressive Strength
1) Not less than 4100 psi at 28 days when tested according to ASTM C109/C109M
2. Repair Overlayment
a. Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses of 1/8 inch or greater
1) Do not feather.

b. Cement Binder
    1) ASTM C150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219
c. Primer
    1) Product of topping manufacturer recommended for substrate, conditions, and application
d. Aggregate
    1) Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer
e. Compressive Strength
    1) Not less than 5000 psi at 28 days when tested according to ASTM C109

N. Concrete Mixtures, General
1. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
    a. Required average strength above specified strength
        1) Based on a record of past performance
            a) Determination of required average strength above specified strength shall be based on the standard deviation record of the results of at least 30 consecutive strength tests in accordance with ACI 318, Chapter 5.3 by the larger amount defined by formulas 5-1 and 5-2.
        2) Based on laboratory trial mixtures
            a) Proportions shall be selected on the basis of laboratory trial batches prepared in accordance with ACI 318, Chapter 5.3.3.2 to produce an average strength greater than the specified strength f'c by the amount defined in table 5.3.2.2.
        3) Proportions of ingredients for concrete mixes shall be determined by an independent testing laboratory or qualified concrete supplier.
        4) For each proposed mixture, at least 3 compressive test cylinders shall be made and tested for strength at the specified age.
            a) Additional cylinders may be made for testing for information at earlier ages.
2. Cementitious Materials
    a. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows, unless specified otherwise:
        1) Fly Ash: 25 percent
        2) Combined Fly Ash and Pozzolan: 25 percent
        3) Ground Granulated Blast-Furnace Slag: 50 percent
        4) Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent
        5) Portland cement minimum, with fly ash or pozzolan not exceeding 25 percent
        6) Silica Fume: 10 percent
        7) Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent
        8) Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent
3. Limit water-soluble, chloride-ion content in hardened concrete to:
    a. 0.30 percent by weight of cement if concrete will have no exposure to chlorides (typical)
    b. 0.15 percent by weight if concrete will be exposed to chlorides
    c. 1.0 percent by weight if concrete will have no exposure to chlorides and will be continually dry and protected.

4. Admixtures
    a. Use admixtures according to manufacturer's written instructions.
    b. Do not use admixtures which have not been incorporated and tested in accepted mixes.
    c. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
    d. Use water-reducing and retarding admixture when required by high temperatures, low humidity or other adverse placement conditions.
    e. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
    f. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

O. Concrete Mixtures
1. Proortion normal-weight concrete mixture as follows:
    a. Minimum Compressive Strength: 3,000 psi at 28 days
    b. Maximum Water-Cementitious Materials Ratio: 0.50
    c. Slump Limit: 5 inches or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch
    d. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size

P. Fabricating Reinforcement
1. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

Q. Fabrication of Embedded Metal Assemblies
1. Fabricate metal assemblies in the shop. Holes shall be made by drilling or punching. Holes shall not be made by or enlarged by burning. Welding shall be in accordance with AWS D1.1.
2. Metal assemblies exposed to earth, weather or moisture shall be hot dip galvanized. All other metal assemblies shall be either hot dip galvanized or painted with an epoxy paint. Repair galvanizing after welding with a Cold Galvanizing compound installed in accordance with the manufacturer's instructions. Repair painted assemblies after welding with same type of paint.

R. Concrete Mixing
1. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94, and furnish batch ticket information.
    a. When air temperature is between 85 and 90 degrees Fahrenheit, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 degrees Fahrenheit, reduce mixing and delivery time to 60 minutes.
2. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
    a. For mixer capacity of 1 cubic yardor smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
    b. For mixer capacity larger than 1 cubic yard,increase mixing time by 15 seconds for each additional 1 cubic yard.
    c. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Formwork
1. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
2. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
    a. Vertical alignment
        1) Lines, surfaces and arises less than 100 feet in height - 1 inch.
        2) Outside corner of exposed corner columns and control joints in concrete exposed to view less than 100 feet in height - 1/2 inch.
        3) Lines, surfaces and arises greater than 100 feet in height - 1/1000 times the height but not more than 6 inches.
        4) Outside corner of exposed corner columns and control joints in concrete exposed to view greater than 100 feet in height - 1/2000 times the height but not more than 3 inches.
    b. Lateral alignment
        1) Members - 1-inch.
        2) Centerline of openings 12 inches or smaller and edge location of larger openings in slabs - 1/2-inch.
        3) Sawcuts, joints, and weakened plane embedments in slabs - 3/4 inch.
    c. Level alignment
        1) Elevation of slabs-on-grade - 3/4-inch.
        2) Elevation of top surfaces of formed slabs before removal of shores - 3/4-inch.
        3) Elevation of formed surfaces before removal of shores - 3/4-inch.
    d. Cross-sectional dimensions: Overall dimensions of beams, joists, and columns and thickness of walls and slabs.
        1) 12 inch dimension or less - plus 1/2-inch to minus 1/4-inch.
        2) Greater than 12 inch to 3 foot dimension - plus 1/2-inch to minus 3/8-inch.
        3) Greater than 3 foot dimension - plus 1 inch to minus 3/4-inch.
    e. Relative alignment
        1) Stairs
            a) Difference in height between adjacent risers - 1/8-inch.
            b) Difference in width between adjacent treads - 1/4-inch.
            c) Maximum difference in height between risers in a flight of stairs - 3/8-inch.
            d) Maximum difference in width between treads in a flight of stairs - 3/8-inch.
        2) Grooves
            a) Specified width 2 inches or less - 1/8-inch.
            b) Specified width between 2 inches and 12 inches - 1/4-inch.
        3) Vertical alignment of outside corner of exposed corner columns and control joint grooves in concrete exposed to view - 1/4-inch in 10 feet.
        4) All other conditions - 3/8 inch in 10 feet.
3. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
    a. Class B, 1/4-inch for smooth-formed finished surfaces.
    b. Class C, 1/2-inch for rough-formed finished surfaces.
4. Construct forms tight enough to prevent loss of concrete mortar.

5. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
   a. Install keyways, reglets, recesses, and the like, for easy removal.
   b. Do not use rust-stained steel form-facing material.
6. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
7. Construct formwork to cambers shown or specified on the Drawings to allow for structural deflection of the hardened concrete. Provide additional elevation or camber in formwork as required for anticipated formwork deflections due to weight and pressures of concrete and construction loads.
8. Foundation Elements: Form the sides of all below grade portions of beams, pier caps, walls, and columns straight and to the lines and grades specified. Do no earth form foundation elements unless specifically indicated on the Drawings.
9. Provide temporary openings for cleanouts and inspection ports where interior area of formwork s inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
10. Chamfer exterior corners and edges of permanently exposed concrete.
11. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
12. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
13. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
14. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement, anchoring devices, and embedded items.
    a. Do not apply form release agent where concrete surfaces are scheduled to receive subsequent finishes which may be affected by agent. Soak contact surfaces of untreated forms with clean water. Keep surfaces wet prior to placing concrete.

B. Embedded Items
1. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   a. Install anchor rods, accurately located, to elevations required and complying with tolerances in AISC 303, Section 7.5.
      1) Spacing within a bolt group: 1/8-inch
      2) Location of bolt group (center): 1/2-inch
      3) Rotation of bolt group: 5 degrees
      4) Angle off vertical: 5 degrees
      5) Bolt projection: ± 3/8-inch
   b. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

C. Removing and Reusing Forms
1. Do not backfill prior to concrete attaining 70 percent of its 28-day design compressive strength.
2. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 degrees Fahrenheit for 24 hours after placing concrete, if concrete is hard

enough to not be damaged by form-removal operations and curing and protection operations are maintained.

a. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
b. Do not remove formwork supporting conventionally reinforced concrete until concrete has attained 70 percent of its specified 28 day compressive strength as established by tests of field cured cylinders. In the absence of cylinder tests, supporting formwork shall remain in place until the concrete has cured at a temperature of at least 50 degrees Fahrenheit for the minimum cumulative time periods given in ACI 347, Section 3.7.2.3. Add the period of time when the surrounding air temperature is below 50 degrees Fahrenheit, to the minimum listed time period. Formwork for 2-way conventionally reinforced slabs shall remain in place for at least the minimum cumulative time periods specified for 1-way slabs of the same maximum span.
c. Immediately reshore 2-way conventionally reinforced slabs after formwork removal. Reshores shall remain until the concrete has attained the specified 28 day compressive strength.
d. Minimum cumulative curing times may be reduced by the use of high-early strength cement or forming systems which allow form removal without disturbing shores, but only after the Contractor has demonstrated to the satisfaction of the Engineer that the early removal of forms will not cause excessive sag, distortion or damage to the concrete elements.
e. Completely remove wood forms. Provide temporary openings if required.
f. Provide adequate methods of curing and thermal protection of exposed concrete if forms are removed prior to completion of specified curing time.
g. Reshore areas required to support construction loads in excess of 20 pounds per square foot to properly distribute construction loading. Construction loads up to the rated live load capacity may be placed on unshored construction provided the concrete has attained the specified 28 day compressive strength.
h. Obtaining concrete compressive strength tests for the purposes of form removal is the responsibility of the Contractor.
i. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

3. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
4. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

D. Shores and Reshores
1. The Contractor is solely responsible for proper shoring and reshoring.
2. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
   a. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
3. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

E. Steel Reinforcement
1. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
   a. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

2. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
3. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
    a. Weld reinforcing bars according to AWS D1.4, where indicated. Only steel conforming to ASTM A706 may be welded.
4. Installation tolerances
    a. Top and bottom bars in slabs, girders, beams and joists:
        1) Members 8 inches deep or less: ±3/8-inch
        2) Members more than 8 inches deep: ±1/2-inch
    b. Concrete Cover to Formed or Finished Surfaces: ±3/8-inches for members 8 inches deep or less; ±1/2-inches for members over 8 inches deep, except that tolerance for cover shall not exceed 1/3 of the specified cover.
5. Concrete Cover
    a. Reinforcing in structural elements deposited against the ground: 3 inches
    b. Slabs: 3/4 inches
6. Splices: Provide standard reinforcement splices by lapping and tying ends. Comply with ACI 318 for minimum lap of spliced bars where not specified on the documents. Do not lap splice no. 14 and 18 bars.
7. Field Welding of Embedded Metal Assemblies
    a. Remove all paint and galvanizing in areas to receive field welds.
    b. Field Prepare all areas where paint or galvanizing has been removed with the specified paint or cold galvanizing compound, respectively.

F. Joints
1. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
2. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.
    a. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
    b. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
    c. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
    d. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
    e. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
    f. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
3. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat 1-1/2 of dowel length to prevent concrete bonding to 1 side of joint.

G. Waterstops
1. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

2. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

H. Adhesive Anchors
1. Comply with the manufacturer's installation instructions on the hole diameter and depth required to fully develop the tensile strength of the adhesive anchor or reinforcing bar.
2. Properly clean out the hole utilizing a wire brush and compressed air to remove all loose material from the hole, prior to installing adhesive material.

I. Concrete Placement
1. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.
3. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
    a. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
    b. Do not exceed the maximum specified water/cement ratio for the mix.
4. Deposit concrete continuously in 1 layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
    a. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures, 15 feet maximum and in a manner to avoid inclined construction joints.
    b. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
    c. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
    d. Do not permit concrete to drop freely any distance greater than 10 feet for concrete containing a high range water reducing admixture (superplasticizer) or 5 feet for other concrete. Provide chute or tremie to place concrete where longer drops are necessary. Do not place concrete into excavations with standing water. If place of deposit cannot be pumped dry, pour concrete through a tremie with its outlet near the bottom of the place of deposit.
    e. Discard pump priming grout and do not use in the structure.
5. Deposit and consolidate concrete for slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
    a. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
    b. Maintain reinforcement in position on chairs during concrete placement.
    c. Screed slab surfaces with a straightedge and strike off to correct elevations.
    d. Slope surfaces uniformly to drains where required.
    e. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

6. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
    a. When average high and low temperature is expected to fall below 40 degrees Fahrenheit for 3 successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
    b. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
    c. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
7. Hot-Weather Placement: Comply with ACI 305.1 and as follows:
    a. Maintain concrete temperature below 95 degrees Fahrenheit at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
    b. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

J. Finishing Formed Surfaces
1. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
    a. Apply to concrete surfaces not exposed to public view.
2. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

K. Miscellaneous Concrete Items
1. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
2. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
3. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.
    a. Housekeeping pads: Normal weight concrete (3000 psi), reinforced with #3@16 inches on center set at mid-depth of pad. Trowel concrete to a dense, smooth finish. Set anchor bolts for securing mechanical or electrical equipment during pouring of concrete fill.

L. Concrete Protecting and Curing
1. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 for hot-weather protection during curing.
2. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
3. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

4. Cure concrete according to ACI 308.1, by 1 or a combination of the following methods:
    a. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with the following materials:
        1) Water
        2) Continuous water-fog spray
        3) Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers
    b. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than 7 days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
        1) Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
        2) Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    c. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.2 REPAIR

A. Concrete Surface Repairs
1. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer’s approval.
2. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
3. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
    a. Immediately after form removal, cut-out honeycombs, rock pockets, and voids more than 1/2-inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
    b. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
    c. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.
4. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
    a. Repair finished surfaces containing defects. Surface defects include spalls, pop outs, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

b. After concrete has cured at least 14 days, correct high areas by grinding.
c. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
d. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
e. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

5. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.
6. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.3 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections
1. Steel reinforcement placement
2. Headed bolts and studs
3. Verification of use of required design mixture
4. Concrete placement, including conveying and depositing
5. Curing procedures and maintenance of curing temperature
6. Verification of concrete strength before removal of shores and forms from beams and slabs

C. Concrete Tests: Perform testing of composite samples of fresh concrete obtained according to ASTM C172 according to the following requirements:
1. Testing Frequency: Obtain 1 composite sample for each day's pour of each concrete mixture exceeding 5 cubic yard, but less than 25 cubic yard, plus 1 set for each additional 50 cubic yard or fraction thereof.
2. Slump: ASTM C143; 1 test at point of placement for each composite sample, but not less than 1 test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C231, pressure method, for normal-weight concrete; 1 test for each composite sample, but not less than 1 test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C1064; 1 test hourly when air temperature is 40 degrees Fahrenheit and below and when 80 degrees Fahrenheit and above, and 1 test for each composite sample.
5. Compression Test Specimens: ASTM C31.
a. Cast and laboratory cure 4 cylinders for each composite sample.
1) Do not transport field cast cylinders until they have cured for a minimum of 24 hours.

6. Compressive-Strength Tests: ASTM C39;
    a. Test 1 cylinder at 7 days.
    b. Test 2 cylinders at 28 days.
    c. Hold 1 cylinder for testing at 56 days as needed.
7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. Strength of each concrete mixture will be satisfactory if every average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
9. Report test results in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 or by other methods as directed by Engineer.
    a. When the strength level of the concrete for any portion of the structure, as indicated by cylinder tests, falls below the specified requirements, provide improved curing conditions and/or adjustments to the mix design as required to obtain the required strength. If the average strength of the laboratory control cylinders falls so low as to be deemed unacceptable, follow the core test procedure set forth in ACI 301, Chapter 17. Locations of core tests shall be approved by the Engineer. Core sampling and testing shall be at Contractors expense.
    b. If the results of the core tests indicate that the strength of the structure is inadequate, any replacement, load testing, or strengthening as may be ordered by the Engineer shall be provided by the Contractor without cost to the City.
11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E1155 within 48 hours of finishing.

3.4 CLEANING

A. Defective Work
1. Imperfect or damaged work or any material damaged or determined to be defective before final completion and acceptance of the entire job shall be satisfactorily replaced at the Contractor's expense, and in conformity with all of the requirements of the Drawings and Specifications.
2. Perform removal and replacement of concrete work in such manner as not to impair the appearance or strength of the structure in any way.

B. Cleaning
1. Upon completion of the work remove from the site all forms, equipment, protective coverings and any rubbish resulting therefrom.

2. Leave finished concrete surfaces in a clean condition, satisfactory to the City.

END OF SECTION 033000

SECTION 260000

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. General Requirements specifically applicable to Division 26.

B. The Contractor shall be responsible for:
   1. The work included consists of furnishing all materials, supplies, equipment and tools, and performing all labor and services necessary for installation of a completely functional power and lighting systems. Complete systems in accordance with the intent of Contract Documents.
   2. Coordinating the details of facility equipment and construction for all Specification Divisions, which affect the work covered under this Division.
   3. Furnishing and installing all incidental items not actually shown or specified, but which are required by good practice to provide complete functional systems.
   4. Temporary power service and lighting for construction. Coordinating all shutdown dates and schedules with Owner's Representative and obtain all work-permits required by Owner.

C. Intent of Drawings:
   1. The Drawings are necessarily diagrammatic by their nature, and are not intended to show every connection in detail or every device or raceway in its exact location, unless specifically dimensioned. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the work in order to avoid interference between the various phases of work. The Contractor shall be responsible for the proper routing of conduits and placement of poles, subject to prior review by the Owner and Engineer.
   2. The intent of the Drawings is to establish the type of systems and functions, but not to set forth each item essential to the functioning of the system. The drawings and specifications are cooperative, and work or materials called for in one and not mentioned in the other shall be provided. Review pertinent drawings and adjust the work to conditions shown. In case of doubt as to work intended, or where discrepancies occur between drawings, specifications, and actual conditions, immediately notify the Architect/Engineer and the Owner’s representative, and propose a resolution.

1.2 RELATED WORK

A. This Section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total general requirements for the project electrical systems and equipment.
   1. Division 01 Sections included in the project specifications.
   2. The contract.

1.3 DESIGN CRITERIA

A. Equipment and devices to be installed outdoors or in enclosures where the temperatures are not controlled shall be capable of continuous operation under such conditions per manufacturer’s requirements.

B. Compliance by the Contractor with the provisions of this Specification does not relieve him of the responsibilities of furnishing equipment and materials of proper design, mechanically and electrically suited to meet operating guarantees at the specified service conditions.

C. Electrical components shall be UL listed and labeled.

1.4 REFERENCE CODES AND STANDARDS, REGULATORY REQUIREMENTS

A. Standards of the following organizations as well as those listed in Division 01, may be referenced in the specification. Unless noted otherwise, references are to standards or codes current at the time of bidding. Work, materials and equipment must comply with the latest rules and regulations of the following.

1. International Building Code
2. Texas Accessibility Standards (State mandated)
3. Americans with Disability Act (ADA)
4. Association of Edison Illuminating Companies (AEIC)
5. American National Standards Institute (ANSI)
6. Institute of Electrical and Electronics Engineers (IEEE)
7. Insulated Cable Engineers Association (ICEA)
8. National Electrical Code (NEC)
9. National Electrical Manufacturers Association (NEMA)
10. National Electrical Safety Code
11. National Fire Protection Association (NFPA)
    a. NFPA 70
    b. NFPA 101 Life Safety Code
12. Underwriters' Laboratories (UL)
13. FM Standards
14. International Energy Conservation Code
15. International Existing Building Code
16. National Electrical Safety Code
17. Occupational Safety and Health Act (OSHA)
18. American Society for Testing and Materials (ASTM)
19. University of North Texas Design and Construction Guidelines
20. Applicable state and federal codes, ordinances and regulations

B. Discrepancies. The drawings and specifications are intended to comply with listed codes, ordinances, regulations and standards. Where discrepancies occur, immediately notify the Owner's representative in writing and ask for an interpretation. Should installed materials or workmanship fail to comply, the Contractor is responsible for correcting the improper installation. Additionally, where sizes, capacities, or other such features are required in excess of minimum code or standards requirements, provide those specified or shown.

C. Contractor shall obtain permits and arrange inspections required by codes applicable to this Section and shall submit written evidence to the Owner and Engineer that the required permits, inspections and code requirements have been secured.

1.5 SUBMITTALS

A. Submit the following in addition to and in accordance with the requirements of Division 01 for submittal requirement.

1. Include inspection and permit certificates and certificates of final inspection and acceptance from the authority having jurisdiction.
2. Manufacturer's standardized schematic diagrams and catalog cuts shall not be acceptable unless applicable portions of it are clearly indicated and non-applicable portions clearly deleted or crossed out.

3. All schematic, connection and/or interconnection diagrams shall be in accordance with the latest edition of NEMA.
4. Provide submittals as required by individual specification Section.

B. Provide the following with each submittal:
1. Catalog cuts with manufacturer's name clearly indicated. Applicable portions shall be circled and non-applicable portions shall be crossed out.
2. Line-by-line specification review by equipment manufacturer and contractor with any exceptions explicitly defined.

C. Equipment Layout Drawing: 1/4-inch scale minimum drawings indicating electrical equipment locations. Dimensions for housekeeping pads should be indicated on these drawings. Indicate routing of all site conduits and ductbanks on these drawings.

D. Within the specified time window after award of contract, submit list of equipment and materials to be furnished.
1. Itemize equipment and material by specification Section number; include manufacturer and identifying model or catalog numbers.
2. Replace rejected items with an acceptable item within 2 weeks after notification of rejection.
3. If a satisfactory replacement is not submitted within a two-week period, owner will notify contractor as to equipment manufacturer or type and make or material to be furnished. Provide designated items at no additional cost to owner.

E. As-Built Record Drawings: The Contractor shall maintain a master set of As-Built Record Drawings that show changes and any other deviations from the drawings. The markups must be made as the changes are done. At the conclusion of the job, these As-Built Record Drawings shall be transferred to AutoCad electronic files, in a format acceptable to the Owner, and shall be complete and delivered to the Owner's Representative prior to final acceptance.

1.6 SAFETY

A. The Contractor shall follow the safety procedures in addition to, and in accordance with, the requirements of Project Safety Manual (PSM).
1. The Contractors shall be responsible for training all personnel under their employ in areas concerning safe work habits and construction safety. The Contractor shall continually inform personnel on hazards particular to this project and update the information as the project progresses.
2. The Contractor shall secure all electrical equipment and the site, to limit access, prior to energizing any switchgear and shall control access during the project after energization. The Contractor shall post and maintain warning and caution signage in areas where work is ongoing near energized equipment. The Contractor shall cover all energized live parts when work is not being done in the equipment. This includes lunch and breaks.
3. The Contractor shall strictly enforce OSHA lock out/tag out procedures. Initial infractions shall result in a warning; a second infraction shall result in the removal of the workman and his foreman from the site. Continued infractions shall result in removal of the Contractor from the site.

1.7 SHORING AND EQUIPMENT SUPPORTS

A. The Contractor shall provide all permanent and temporary shoring, anchoring, and bracing required to make all parts absolutely stable and rigid; even when such shoring, anchoring, and bracing are not explicitly called for.

1.8 TEMPORARY POWER REQUIREMENTS

A. Provide power distribution system sufficient to accommodate construction operations requiring power, use of power tools, electrical heating, lighting, and start-up/testing of permanent electric-powered equipment prior to its permanent connection to electrical system. Provide proper overload protection. Ground fault circuit interrupters (GFCI) are to be used on all 120-volt, single-phase, 15 and 20 amp receptacle outlets where portable tools and equipment are used. Ground fault circuit interrupters shall be tested weekly by the Contractor.

B. Temporary power feeders shall originate from a distribution panel. The conductors shall be multi-conductor cord or cable per NEC for hard and extra-hard service multi-conductor cord.

C. Branch circuits shall originate in an approved receptacle or panelboard. The conductors shall be multi-conductor cord or cable per NEC for hard and extra-hard service multi-conductor cord. Each branch circuit shall have a separate equipment grounding conductor.

D. All receptacles shall be of the grounding type and electrically connected to the grounding conductor.

E. Provide temporary lighting as required to facilitate construction.

F. For temporary wiring, suitable fencing, barriers, or other effective means shall be provided to prevent access of anyone other than authorized and qualified personnel.

G. Temporary power cords shall be kept off the ground or floor. The Contractor shall provide temporary supports as required to keep temporary cords off the ground or floor.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and Equipment: Labeled and/or listed as acceptable to the authority having jurisdiction as suitable for the use intended. Materials shall be of a standard industrial quality if no specifications or specific model numbers are given.

B. Where two or more units of the same class of material are required, provide products of a single manufacturer. Component parts of materials or equipment need not be products of the same manufacturer.

C. All materials shall be new and unused.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. Install work in compliance with NEC latest edition.

B. Install material and equipment in accordance with manufacturers' instructions. Provide calibrated torque wrenches and screwdrivers and tighten all terminals, lugs, and bus joints using it.

C. Comply with startup procedures as defined by Construction Manager and Owner.

D. Arrange electrical work in a neat, well-organized manner. Do not block future connection points of electrical service. Install all electrical work parallel or perpendicular to site elements unless noted otherwise, in a neat manner.

E. Apply, install, connect, erect, use, clean, adjust, and condition materials and equipment as recommended by the manufacturers in their published literature.

3.2 REPLACEMENT AND REPAIR OF SITE ELEMENTS

A. Replace or repair paving, sidewalks, asphalt paving, concrete paving, landscape beds, landscape plant material, irrigation systems, utilities, etc. that is damaged as a result of construction.

B. Submit proposed means of replacement or repair for Owner review.

3.3 SERVICE CONTINUITY

A. Maintain continuity of electric service to entire facility. Phase construction work to accommodate Owner’s occupancy requirements.

B. Arrange temporary outages for cutover work with the Owner. Keep the outages to a minimum number and minimum length of time.

C. All service outages shall be requested in writing a minimum of four weeks prior to the date. Owner reserves the right to postpone shutdowns up to 24 hours prior to the shutdown at no additional cost. Outage requests shall include a schedule of the work to be performed, identification of areas impacted, and the time requirements.

D. The Contractor shall obtain all appropriate Owner permits for working in equipment.

3.4 HAZARDOUS LOCATIONS

A. Equipment, wiring, devices, and other components located within hazardous areas to be of appropriate type per NFPA requirements.

B. Ground exposed non-current carrying parts of entire electrical system in hazardous areas, in accordance with NEC and as instructed by Owner.

3.5 CONSTRUCTION REVIEW

A. The Engineer or Owner's representative will review and observe installation work to ensure compliance by the Contractor with requirements of the Contract Documents.

B. Review, observation, assistance, and actions by the Engineer or Owner’s representative shall not be construed as undertaking supervisory control of the work or of methods and means employed by the Contractor. The review and observation activities shall not relieve the Contractor from the responsibilities of these Contract Documents.

C. The fact that the Engineer or Owner’s representative do not make early discovery of faulty or omitted work shall not bar the Engineer or Owner’s representative from subsequently rejecting this work and insisting that the Contractor make the necessary corrections.

D. Regardless of when discovery and rejection are made, and regardless of when the Contractor is ordered to correct such work, the Contractor shall have no claim against the Engineer or Owner's representative for an increase in the Contract price, or for any payment on account of increased cost, damage, or loss.

3.6 WARRANTY

A. Provide warranties in accordance with the requirements of Uniform General and Supplementary Conditions (UGC).

END OF SECTION 260000

SECTION 260500

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Hinged cover enclosures and cabinets

B. Contactors

C. Control relays

D. Selector switches

E. Terminal blocks and accessories

1.2 APPLICABLE CODES AND STANDARDS

A. NFPA 70, National Electrical Code (latest edition)

B. American National Standard C2, National Electrical Safety Code, (latest edition)

C. Applicable publications of NEMA, ANSI, IEEE, and ICEA

D. Underwriters Laboratories, Inc. Standards (UL)

E. Federal, city, state, and local codes and regulations having jurisdiction

F. OSHA requirements

G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)

H. NEMA WD 1 - General-Purpose Wiring Devices

I. UL 98 - Enclosed Switches

1.3 INTENT

A. This Section is not, and shall not be interpreted to be, a complete listing of all materials or equipment that is Contractor furnished and erected. It is intended to clarify and further define the Contractor scope of work, procurement, and responsibilities for those incidental materials that are not specified by other specifications, but important to a complete and operational system.

B. The Contractor shall furnish all equipment and materials, whether or not specified in other Sections of specification and on drawings, for installation and connection required to place equipment into satisfactory operating service. The Contractor shall review the Drawings and specifications for clarification of his responsibility in the handling and installation of equipment and material. Where applicable, and not in contradiction with the Drawings and specifications, the Contractor shall install and connect the equipment in accordance with the manufacturer's recommendations and instructions.

C. All materials and equipment shall be of types and manufacturer specified wherever practical. Should materials or equipment so specified be unattainable, the Contractor shall submit the description and manufacturer's literature, reason for substitution request, and shall secure the approval of the Engineer before substitution of other material or equipment is purchased. This Section establishes performance requirements and the quality of equipment acceptable for use and shall in no way be construed to limit procurement from other manufacturer.

1.4 SUBMITTALS

A. Provide submittals in addition and in accordance with Section 260000, Basic Electrical Requirements, and Division 01 for submittal requirement.

B. Submit manufacturer's literature and specification data sheets for each type of basic material, which is applicable to the project.

1.5 DELIVERY, STORAGE AND HANDLING

A. Provide factory-wrapped waterproof flexible barrier material for covering materials, where applicable, to protect against physical damage in transit. Damaged materials shall be removed from project site.

B. In their factory-furnished coverings, store materials in a clean, dry indoor space, which provides protection against the weather.

PART 2 - PRODUCTS

2.1 ENCLOSURES AND CABINETS

A. Enclosures and cabinets for all Contractor furnished electrical equipment and devices shall be suitable for the location and environmental conditions and shall be of the NEMA type as shown in Table 1. Exceptions shall be as specifically designated on the Drawings.

Table 1
Enclosures

Location	Environment	Enclosure Type
Outdoor	Subject to windblown dust and rain, splashing water, and hose-directed water	NEMA 4

B. Electrical equipment enclosures shall have the following properties:
   1. As detailed on drawings.
      a. Type 1: Primed painted steel.
      b. Color/finish: Equal to S&C Green enamel (minimum 2 coats).

C. Covers: Continuous hinge, held closed by flush latch operable by hasp and staple for padlock. Where required for NEMA ratings, gaskets shall be neoprene rubber.

D. Interior Panel for Mounting Terminal Blocks or Electrical Components: 14-gauge steel, white enamel finish.

E. Provide protective pocket inside front cover with schematic diagram, connection diagram, and layout drawing of control wiring and components within enclosure.

2.2 CONTROL RELAYS

A. Acceptable Manufacturers
   1. Square D Company
   2. Siemens
   3. Eaton

B. Provide magnetic control relays, NEMA Class A: A300 (300 volts, 10 amps continuous, 7,200 VA make, 720 VA break), industrial control type with field-convertible contacts, and meeting the requirements of NEMA ICS 2.

C. Where time delay relays are specified or required, unless otherwise noted, provide magnetic control relays with a solid-state timer attachment adjustable from 0.2 to 60 seconds (minimum) or with range as indicated. Provide with field convertible from ON delay to OFF delay and vice versa.

D. Where latching (mechanically held) relays or motor thermal detector relays are specified or required, provide magnetic control relays with mechanical latch attachment with unlatching coil and coil clearing contacts.

2.3 SELECTOR SWITCHES

A. Acceptable Manufacturers
   1. Square D
   2. Siemens
   3. Eaton

B. For non-hazardous, indoor, dry locations, including control panels, and individual stations, provide heavy duty, NEMA 13, oil tight type pushbuttons, indicating lights, selector switches, and stations for these devices.

C. For non hazardous, outdoor, or normally wet locations, or where otherwise indicated, provide heavy duty corrosion resistant, NEMA 4, watertight type pushbuttons, indicating lights, or selector switches mounted in NEMA 4 watertight enclosures. Provide special gasketing required to make complete station watertight.

D. For hazardous locations, provide control station listed by UL for Class I, Divisions 01 and 02, Groups C and D; Class II, Division 01 and 02, Groups E, F, and G. Specific type shall be in accordance with area classification.

E. Provide devices meeting the requirements of NEMA ICS 2, and having individual, extra large nameplates indicating their specific function. Provide push-button stations with laminated plastic nameplates indicating the drive they control. Provide contacts with NEMA designation rating A600. Install provisions for locking pushbuttons and selector switches in the OFF position wherever lockout provisions are indicated. Nameplates shall be as specified in Section 260553.

F. Utilize selector switches having standard operating levers. All indicating lights shall be LED type, push-to-test type. Provide ON or START pushbuttons colored black. Provide OFF or STOP pushbuttons colored red.

2.4 TERMINAL BLOCKS AND ACCESSORIES

A. Signal And Control Terminals
   1. Acceptable Manufacturers
      a. Phoenix Contact

b. Buchanan
c. Weidmüller
d. Entrelec
e. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in 230000 and Division 01 for substitution requirement.

2. Signal and Control Terminals: Modular construction type, DIN 46 277/3 channel mounted; screw clamp compression connectors, rated 300 volts. Minimum terminal width of 0.24-inch, capable of holding two No. 12 or two No. 14 AWG conductors in each connector. Terminal identification numbers shall be thermoset characters (black) on a white background. Provide 25 percent spare terminals.

B. Power Terminals
1. Acceptable Manufacturers
a. Buchanan
b. Ilsco
c. Square D Company
d. Burndy
e. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in 260000 and Division 01 for substitution requirement.
2. Power Terminals: Unit construction type, closed-back type, with tubular pressure screw connectors, rated 600 volts, size as required. Provide 25 percent spare terminals.

2.5 UL LISTING

A. All equipment and materials shall be new and conform to the requirements of this Section. All equipment and materials shall be UL listed, and shall bear their label whenever standards have been established and level service is regularly furnished. All equipment and materials shall be of the best grade of their respective kind for the purpose.

PART 3 - EXECUTION

3.1 FABRICATION - CONTROL ENCLOSURES AND CABINETS

A. Shop assembles enclosures and cabinets housing terminal blocks or electrical components in accordance with NEMA ICS 6.

3.2 INSTALLATION - ENCLOSURES AND CABINETS

A. Install cabinets and enclosures plumb; anchor securely to enclosure.

B. Install trim plumb.

3.3 ERECTION OF EQUIPMENT

A. Manufacturer's Installation Instructions: Where furnished or called for by the manufacturer equipment manufacturer's installation instructions shall be considered a part of this specification and fully complied with. Where the Contractor damages the finishing coat of paint in existing or completed areas, he shall refinish with matching paint.

B. Mounting: Equipment and control devices shall be supported independent of conduit connections. Panels or cabinets shall be mounted on metal frame supports independently of equipment. Control devices and metal enclosures shall be bolted or welded to steel channel or steel plate. All electrical equipment and devices not covered by the above, such as

miscellaneous switches, photoelectrical devices, and similar electrical devices shall be located and set as suitable for the application.

3.4 COORDINATION

A. Exact location of all electrical equipment, devices and fixtures shall be determined in field by contractor and verified by Engineer's field representative prior to installation.

END OF SECTION 260500

SECTION 260512

ELECTRICAL TESTING AND LOAD BALANCING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Perform test, balance, final adjustment, etc., and record data for electrical work as described herein.

1.2 SUBMITTALS

A. Submit data record forms for approval before conducting any tests or making final adjustments, torquing, balancing, etc.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 TESTING

A. 600V Conductors:
   1. Megger test feeder conductors at 600 volts dc. Record value for each feeder conductor. Conductors which test below 50 megohms shall be replaced. Retest new conductors and record data.
   2. Perform continuity test on all feeder and branch circuit conductors.
   3. Torque all feeder and branch circuit connections and terminations to manufacturer's recommended values.

B. Grounding:
   1. Measure and record ground resistance from system neutral connection at service entrance to ground reference point using suitable ground testing equipment. Resistance shall not exceed 2 ohms.
   2. Test continuity and bonding of poles, fixtures, electrical equipment enclosures, etc.
   3. Record data for each test.

C. Control Wiring:
   1. Test for proper connection and operation.

D. Panelboards:
   1. Test insulation resistance for each panelboard and switchboard bus, component, connecting supply, feeder, and control circuit.
   2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   3. Test and adjust breakers. Replace damaged and malfunctioning equipment.

E. Other Cable, Transformers, etc.
   1. Refer to individual specification section for additional testing requirements.

3.2 DEVICE TRIP SETTINGS

A. Equipment manufacturer field service personnel shall adjust and set all devices in accordance with approved results of "System Coordination and Analysis".

3.3 BUS TORQUING

A. All bolted bus connections shall be made using a torque wrench.

B. Bus and lug connections in panelboards shall be in accordance with manufacturer's specifications.

3.4 LOAD/VOLTAGE DATA

A. Record amperage of each phase and neutral in each panelboard.

B. Record voltage line-to-neutral and line-to-line of all phases in each panelboard. Record each reading.

C. Lighting only panelboards shall be arranged so that under full load all phases carry the same load as near as possible.

3.5 PHASE ROTATION

A. Connect phases of Panelboards, Disconnects, Controllers A, B, C to Bus 1, 2, 3 from left to right.

3.6 MECHANICAL ADJUSTMENT

A. Adjust all operating mechanisms of electrical equipment for free mechanical movement.

END OF SECTION 260512

SECTION 260519

CABLE, WIRE AND CONNECTORS, 600 VOLT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Building wire.
   1. Power distribution circuitry.
   2. Control system circuitry.
   3. Outdoor lighting and power.

B. Wiring connections and terminations.

1.2 REFERENCES

A. NEMA WC 3 - Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

B. NEMA WC 5 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

C. ANSI/UL 83 - Thermoplastic-Insulated Wire and Cables

D. NFPA 70 - National Electrical Code, latest edition

E. NEFA - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

F. Where application of National Electrical Code, trade association standards or publications appears to be in conflict with the requirements of this Section, the Architect/Engineer shall be asked for an interpretation.

1.3 SUBMITTALS

A. Provide product information.

B. Qualification of cable and wire manufacturer: Company specializing in manufacturing products specified in this Section with minimum ten years experience.

1.4 DELIVERY, STORAGE AND HANDLING

A. Provide factory-wrapped waterproof flexible barrier material for covering wire and cable wood reels, where applicable; and weather resistant fiberboard containers for factory packaging of cable, wire and connectors, to protect against physical damage in transit. Damaged cable, wire or connectors shall be removed from project site.

B. Store cable, wire and connectors in a clean, dry indoor space in their factory-furnished coverings, which provides protection against the weather.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Generally, cable, wire and connectors shall be of manufacturer's standard materials, as indicated by published product information.

B. Provide factory-fabricated wire of the size, rating, material and type as indicated for each service. Where not indicated, provide proper selection as required to comply with installation requirements and with NEC standards. The minimum size wire to be used for power or lighting circuits shall be #12 copper with insulation as noted below. Minimum size for control shall be #14 copper. Refer to drawings for additional minimum conductor size requirements.

C. If more than three phase conductors are installed in a single raceway, the conductors shall be derated in accordance with the National Electrical Code. Increase wire size so that resulting ampacity, after derating factor is applied, is equal to or greater than ampacity of conductor specified.

D. The conductors of wires and cables shall be of copper (tinned where specified), and have conductivity in accordance with the standardization rules of the IEEE. The conductor and each strand shall be round and free of kinks and defects.

E. Grounding conductors, where insulated, shall be colored solid green or identified with green color as required by the NEC. Conductors intended as a neutral shall be colored solid white, or identified as required by the NEC. All motor or equipment power wiring shall be colored according to Section 260553, Electrical Identification.

F. Use compression lugs for all wiring termination's, except on breakers or terminal strips in panel boards.

2.2 BUILDING WIRE

A. Thermoplastic-insulated Building Wire: NEMA WC 5.

B. Rubber-insulated Building Wire: NEMA WC 3.

C. Feeders and Branch Circuits Larger than 10 AWG: 98% conductivity copper, soft-drawn, stranded conductor, 600 volt insulation, THHN/THWN. Use XHHW conductors where installed in conduit underground.

D. Feeders and Branch Circuits 10 AWG and Smaller: 98% conductivity copper, soft-drawn, solid conductor, 600-volt insulation, THHN/THWN. Use XHHW conductors where installed in conduit underground.

2.3 REMOTE CONTROL AND SIGNAL CABLE

A. 600 Volt Insulation Control Cable for Class 1 Remote Control and Signal Circuits, Type TC:
   1. Individual Conductors: 14 AWG, stranded copper, XHHW insulation. Rated 90 degrees C dry, 75 degrees C wet, color-coded per ICEA Method 1 plus one green equipment grounding conductor.
   2. Assembly: Bundle wrapped with cable tape and covered with an overall PVC jacket. Cable shall pass IEEE-1202 vertical tray ribbon-burner flame test (210,000 BTU) VW-1.

B. Instrumentation Cable
   1. 300 Volt Instrumentation Cable, Multiple Pairs, Overall Shield, Type PLTC:
      a. Individual Conductors: 18 AWG, stranded, tinned copper, flame retardant polyethylene or PVC insulated, rated 105 degrees C, black and white numerically printed and coded pairs.
      b. Assembly: Individual twisted pairs having a 100 percent coverage aluminum-polyester shield and 20 AWG stranded tinned copper drain wire. Conductor bundle shall be shielded with 100 percent coverage overall aluminum-polyester shield complete with 20 AWG drain wire. All group shields completely isolated from each other. Bundle wrapped with cable tape and covered with an overall flame retardant PVC jacket. Cable shall pass IEEE-383 vertical tray flame test (70,000 BTU) UL1581.

2.4 WIRING CONNECTIONS AND TERMINATIONS

A. Provide factory-fabricated, metal connectors of the size, rating, material, type and class as indicated for each service. Where not indicated, provide proper selection as required to comply with installation requirements and with NEC standards. Select from only following types, classes, kinds and styles.
   1. Type:
      a. Solderless pressure connectors.
      b. Crimp.
      c. Threaded.
      d. Insulated spring wire connectors with plastic caps for 10 AWG and smaller.
   2. Class:
      a. Insulated.
   3. Material:
      a. Copper (for CU to CU connection).
   4. Style: Pigtail connector.
      Parallel and tee connectors equal to ILSCO and GTA and GTT with ILSCO insulating cover. Parallel and tee connections shall be used only where specifically detailed. (Split bolt type connectors are not permitted.)

B. Do not splice conductors in in-grade pull boxes, unless noted otherwise. All below grade splices shall be waterproof.

C. Do not use “twist-on” type connectors in lighting poles. Use insulated compression connectors.

PART 3 - EXECUTION

3.1 INSPECTION

A. Installer must examine the areas and conditions under which cable, wire and connectors are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Inspect wire and cable for physical damage. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 GENERAL WIRING METHODS

A. Install electrical cable, wire and connectors as indicated, in accordance with the manufacturer's written instructions, the applicable requirements of NEC and the National Electrical Contractors Association's "Standard of Installation", and as required to ensure that products serve the intended functions.

B. Coordinate cable and wire installation work with electrical raceway and equipment installation work, as necessary for proper interface. Do not install the conductors until raceway system is complete and properly cleaned.

C. Conductors shall be selected on the basis of their purpose and UL listing. Generally, use Types THWN and THHN in within buildings, within electrical equipment enclosure, and other dry locations. Outdoors and underground in raceways, use Type XHHW.

D. No conductor smaller than No. 12 wire shall be used for lighting purposes. In the case of "home runs" over 50' in length, no conductor smaller than a No. 10 wire shall be used. Conductor sizes shown on drawings are minimum and shall be increased as necessary to comply with voltage drop restrictions specified herein. The sizing of all wire except remote control wire shall be accomplished in the case of both feeder and branch circuits by conforming to the following provisions.
   1. 480 Volt Branch Circuits: The voltage drop in the case of 277/480 volt circuits shall not exceed 1.0% at maximum load and 70.0% power factor.
   2. 120/208 and 120/240 Volt Branch Circuits: The voltage drop in the case of 120/208 volt circuits shall not exceed 2.0% at maximum load and 70.0% power factor.

E. Separate neutral conductors shall be provided for each phase of the same size for 120V and 277V single-phase circuits. Do not share neutrals between circuits.

F. Remote control wires shall be no smaller than No. 14 conductors. Control wires shall be run in separate conduits. Departures from the sizes so determined shall be made only in those cases in which the National Electrical Code requires the use of larger conductors. The sizes as determined from these tables shall be regarded as the acceptable minimum under all other circumstances. In no case, however, shall there be a voltage drop greater than that specified in any feeder or branch circuit. The Contractor may, if he deems it necessary or advisable, use larger sized conductors than those shown. Under no circumstances, however, shall the Contractor use any conductors sized in a manner which does not conform to the above mentioned tables without having first secured the written approval of the Owner's duly authorized representative.

G. Exposed conduit is not permitted unless specifically detailed as such. All wire and cable shall be installed in conduit.

H. Wiring within Control Enclosure: Contractor shall bundle ac and dc wiring separately within an enclosure. The Contractor shall utilize panel wireways when they are provided. Where wireways are not provided the Contractor shall neatly tag, bundle wires and secure to sub-panel at a minimum of every three inches with T&B Type TC5355 heavy duty mounting bases.

I. Do not bend any conductor either permanently or temporarily during installation to radii less than four times the outer diameter of 600-volt insulated conductors.

3.3 WIRING INSTALLATION IN RACEWAYS

A. Wire and cable shall be pulled into clean dry conduit. Do not exceed manufacturer’s recommended values for maximum pulling tension and sidewall pressure.

B. Pull conductors together where more than one is being installed in a raceway.

C. Use UL listed pulling compound or lubricant, when necessary; compound must not deteriorate conductor and insulation.

D. Do not use a pulling means, including fish tape, cable or rope, which can damage the raceway.

E. Install wire in raceway after each end has been physically protected from the weather and all other work likely to injure conductors has been completed.

F. Place an equal number of conductors for each phase of a circuit in same raceway.

G. All conduits shall contain a green equipment grounding conductor.

H. Conductors carrying more than 150 volts to ground shall not be installed in conduits with conductors carrying less than 150 volts to ground.

3.4 WIRING CONNECTIONS AND TERMINATIONS

A. Install splices, taps and terminations, which have equivalent-or-better mechanical strength and insulation as the conductor. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

B. Keep conductor splices and taps accessible and to a minimum, and in above ground junction points only, such as pole bases. Control circuit conductors shall terminate at terminal blocks only. Do not splice below grade or in outdoor pull boxes.

C. Use splice, tap and termination connectors, which are compatible with the conductor material.

D. Thoroughly clean wires before installing lugs and connectors.

E. Terminate spare conductors with electrical tape and label as spare. Do not energize.

F. Power and Lighting Circuits: Use solderless pressure connectors with insulating covers for copper wire splices and taps, 8 AWG and larger. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps on lighting and receptacle circuits.

G. Identify conductors per Section 260553 - Electrical Identification.

3.5 FIELD QUALITY CONTROL

A. Torque test conductor connections and terminations to manufacturer's recommended values.

B. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

C. Conductors in lighting poles shall be supported in the manner set forth in the appropriate section of the latest revision of the National Electrical Code.

3.6 TESTING AND ACCEPTANCE

A. Before final acceptance, the Contractor shall make voltage, insulation, and load tests, necessary to demonstrate to the Owner's representative the satisfactory installation and proper performance of all circuits.

B. Test feeder conductors clear of faults. Insulation-resistance test shall be conducted per NETA – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems. Test results below 50 megohms shall be cause for rejection of the wiring installation. Replace and retest all such rejected conductor.

C. At the completion of this project, the Contractor shall provide the Owner three (3) complete and finally corrected sets of working drawings. These sets of working drawings shall be new, unused and in good condition, and shall include the nature, destination, path, size, type of wire, and all other characteristics for complete identification of each and every conduit and circuit.

END OF SECTION 260519

SECTION 260526

GROUNDING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Power system grounding.

B. Electrical equipment and raceway grounding and bonding.

C. Pole and fixture grounding.

1.2 REFERENCES

A. NFPA 70 - National Electrical Code, latest edition

B. ANSI/UL 467 - Electrical Grounding and Bonding Equipment

C. ANSI/IEEE STD 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems

D. IEEE 81 - Guide for Measuring Earth Receptivity, Ground Impedance and earth Surface Potential of a ground System

E. ANSI/TIA/EIA 607 - Commercial Building Grounding and Bonding Requirements for Telecommunications

1.3 SYSTEM DESCRIPTION

A. Ground the electrical service system neutral at service entrance equipment to grounding electrodes. Electrical systems that are grounded shall be connected to earth in a manner that will limit the voltage imposed by lightning, line surges, or unintentional contact with higher-voltage lines and that will stabilize the voltage to earth during normal operations. Concrete encased electrodes shall be connected as the most effective grounding electrodes. Provide a completely grounded and bonded system in accordance with Article 250 of the NEC.

B. Bond together system neutrals, electrical equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, boxes, ground bus in electrical equipment enclosure, ground rods, encased electrodes, grounding conductor in raceways and cables, and receptacle ground connectors.

C. Bonding jumpers shall be installed around non-metal fittings or insulating joints to ensure electrical continuity. Bonding shall be provided where necessary to ensure electrical continuity and the capacity to conduct safely any fault current likely to be imposed.

D. Supplementary Grounding Electrode: Use driven ground rods and encased electrodes on exterior of electrical equipment enclosure.

1.4 SUBMITTALS

A. Provide product information.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Grounding system components shall be as required to comply with the design and construction of the system indicated. Components shall be as indicated in manufacturer's submittal data.

B. Ground conductors shall be stranded tinned, annealed copper cable of the sizes indicated on drawings. Bond grounding conductors at both ends of metallic conduit.

C. Grounding clips shall be Steel City Type G, or equal.

D. Ground Rods shall be copper-encased steel, 3/4" diameter, minimum length 10 feet.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install ground system as indicated, in accordance with the applicable requirements of the National Electrical Code and the National Electrical Contractors Association's "Standard of Installation".

B. Install grounding conductors continuous, without splice or connection, between equipment and grounding electrodes. Install test wells as required per drawings.

C. In feeder and branch circuits, provide a separate, insulated equipment grounding conductor. Terminate each end on a grounding lug, bus, or bushing.

D. Install fusion welded ground connectors where they are concealed or inaccessible.

E. Ground each outlet by the use of an approved grounding clip attached to the junction box in such a position to be readily inspected on removal of the cover plate; or by the use of an approved grounding yoke type receptacle.

F. No strap grounding clamps shall be used; connections requiring bolting shall be made up with monel metal bolts, washers and nuts. Connections shall be made only after surfaces have been cleaned, or ground to expose virgin metal.

G. Install external ground wire on liquid tight flexible metal conduit with grounding bushings.

H. Conductor connections shall be made by means of solderless connectors such as serrated bolted clamps or split bolt and nut type connectors. .

I. Connect grounding conductors to ground rods at the upper end of the rod with the end of the rod and the connection points below finished grade. Below grade connection shall be exothermic-welded type connectors as manufactured by Cadweld, Thermoweld.

J. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 3/0 AWG. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.2 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 2 ohms. Provide additional ground rod as required until resistance reading is 2 ohms or less.

END OF SECTION 260526

SECTION 260529

SECURING AND SUPPORTING METHODS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Raceway and equipment supports.

B. Fastening hardware.

C. Coordinate location of concrete equipment pads.

1.2 COORDINATION

A. Coordinate with other trades where conduit supports are in the same location as piping, ductwork, and work of other trades and where supports are furnished and installed under other Divisions. Supporting from the work or supports of other Contractors shall not be allowed except by express, written permission of the Owner.

1.3 SUBMITTALS

A. Provide submittals in accordance with and in addition to Section 260000, Basic Electrical Requirements, and Division 01.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Support Channel:
   1. All non-corrosive locations: Hot-dip galvanized steel.

B. Hardware:
   1. All non-corrosive locations: Hot-dip galvanized steel.
   2. Stainless steel.

2.2 CONDUIT ANCHORING

A. Conduit shall be securely anchored with conduit straps, or other devices specifically designed for the purpose. Wire ties and spring clips are specifically not permitted.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fasten conduit clamps, and outlet and junction boxes to enclosure structure. Do not use spring steel clips and clamps.

B. Install hangers, anchors, and seals as in accordance with manufacturer's written instructions and with recognized industry practices to ensure supporting devices comply with requirements. Comply with requirements of NEC for installation of supporting devices. Install supports with spacing in compliance with NEC requirements.

C. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

D. Install surface mounted cabinets and panelboards with a minimum of four anchors. Provide strut channel supports to stand cabinet 1-5/8 inches off enclosure surface.

3.2 TOUCH-UP

A. Touch-up all scratches on securing and supporting system, and paint the ends of channel after cutting with an approved zinc chromate or 90 percent zinc paint.

END OF SECTION 260529

SECTION 260533

CONDUITS AND BOXES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Conduit:
   1. Rigid metal conduit and fittings (RGS).
   2. Intermediate metal conduit and fittings (IMC).
   3. Non-metallic conduit and fittings (underground use only).

B. Boxes:
   1. Surface mounted outlet boxes.
   2. Pull and junction boxes.

C. Ductbanks

1.2 REFERENCES

A. NFPA 70 - National Electrical Code, latest edition

B. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated

C. EMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing

D. ANSI/NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)

F. ANSI/UL 467 - Electrical Grounding and Bonding Equipment

G. ANSI/UL 651 - Schedule 40 and 80 Rigid PVC Conduit (underground use only)

H. UL 6 - Rigid Metal Conduit

1.3 SUBMITTALS

A. Provide submittals in accordance with and in addition to Section 260000, Basic Electrical Requirements, and Division 01 for submittal requirements.

B. Shop drawings consisting of a complete list of equipment and materials, which will be used for the project, including manufacturer's descriptive and technical literature, catalog cuts and installation instructions.

C. Sealing materials and details.

D. Submit detailed shop drawing for all site conduits and ductbanks.

E. Submit cable pulling tension and sidewall pressure calculations for all site conduits and ductbanks.

1.4 STORAGE AND HANDLING

A. Handle materials carefully to avoid damage, breaking, denting and scoring. Damaged equipment or materials shall not be installed.

B. Store materials in a clean dry space and protected from the weather.

PART 2 - PRODUCTS

2.1 WIREWAYS

A. Wireways or gutters shall not be used.

2.2 CONDUIT AND FITTINGS

A. Conduit and fittings for all electrical systems on this project shall include the following:
   1. Service entrance
   2. Electrical power and lighting feeders
   3. Electrical power and lighting circuits

B. For each electrical wireway system indicated, provide a complete assembly of conduit with fittings including, but not necessarily limited to, connectors, nipples, couplings, locknuts, bushings, expansion fittings, other components and accessories as needed to form a complete system of the same type indicated.

C. Conduit fittings shall be designed and approved for the specific use intended. Conduit fittings, including liquid-tight flexible, shall have insulated throats or bushings. Rigid conduits shall have insulated bushings, unless grounding bushings are required by N.E.C. Article 250. Grounding bushings shall have insulated throats.

D. Rigid and intermediate metal conduit shall be hot-dipped galvanized. Fittings shall be threaded type. Expansion fittings shall be OZ Type DX.

E. Nonmetallic conduit and fittings shall be suitable for temperature rating of conductor but not less than 90°C. Nonmetallic conduit and fittings shall be molded of high impact PVC compound having noncombustible, nonmagnetic, non-corrosive and chemical resistant properties and shall be of the same manufacturer. Solvent cement shall be of the same manufacturer as the conduit and shall be of the brush-on type. Spray solvents are prohibited. PVC coated metallic fittings shall not be permitted for PVC conduit connections.

F. ENT is not acceptable.

G. Provide strain relief fittings as manufactured by OZ for cables in poles.

H. Crimp or set-screw type fittings are not acceptable.

I. Minimum conduit size shall be 3/4-inch for branch circuits. Refer to drawings for additional conduit size requirements.

J. Minimum conduit size shall be 1-inch for feeders. Refer to drawings for additional conduit size requirements.

2.3 DUCTBANKS (CONDUIT AND FITTINGS)

A. All products shall be new, first-quality materials.

B. Nonmetallic Conduit: rigid schedule 40 PVC per NEMA TC-6 & 8. Conduit shall be of standard length, with tapered end and matching solvent weld couplings. Provide fitting of the same type material as ducts.
   1. Underground 90s shall be long radius fiberglass.
   2. Stub-ups shall be schedule 40 PVC.

C. Conduit sizes:
   1. Sizes as noted for normal service entrance conduits.

D. Provide spacers with minimum 3” separation between conduits.

E. Provide polypropylene pull string full length.

2.4 DUCTBANKS (CONCRETE)

A. Cast-in-place concrete and components: Conform to the following general requirements:
   1. Provide concrete work per ACI 301.
   2. Concrete shall be normal weight, air-entrained, with 28 day strength of 2,500 psi.
   3. Slump: Performed at the point of placement shall not exceed 6 inches. Make slump tests for each nine cubic yards of concrete placed.
   4. Color: All electrical ductbank concrete shall be color dyed red by mixing red inorganic pigment (iron oxide) in cement; rate shall be 1-1/2 pounds of iron oxide per cubic yard of cement.
   5. Cylinder Tests: Make four cylinder tests from each pouring operation and not less than four cylinders for each 18 cubic yards, or part thereof, over 10 cubic yards of concrete poured and not less than once a day nor less than once for each concreting operation. Take samples at point of placement; conform to ASTM C 172 and ASTM C 31.
      a. Test two (2) cylinders at 7 days.
      b. Test two (2) cylinders at 28 days.
      c. Tests conform to ASTM C 39.
   6. Temperature limits for concrete work shall be in accordance with civil engineering standard.

2.5 DUCTBANKS (REINFORCING STEEL)

A. All ductbanks shall be steel reinforced.

PART 3 - EXECUTION

3.1 INSTALLATION - CONDUIT

A. Install products as indicated, in accordance with the applicable requirements of NEC, NEMA and the National Electrical Contractors Association's "Standard of Installation".

B. Cut conduit square using a saw or pipe cutter. De-burr cut ends. Joints in steel conduit must be painted with T&B Kopr shield and drawn up tight. Threads for rigid metal conduit and IMC shall be deep and clean. Running threads shall not be used. Wipe plastic conduit clean and dry before joining. Apply full, even coat of cement with brush to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum. Spray type of cement is not acceptable. Install raceway and conduit system from point of origin in outlets shown, complete with support assemblies including all necessary hangers, beam clamps, hanger rods, turnbuckles, bracing, rolls, clips angles, through bolts, brackets, saddles, nuts, bolts, washers, offsets, pull boxes, junction boxes and fittings to ensure a complete functional raceway system

C. Conduit system shall be installed to minimize disruption to existing vehicular and pedestrian traffic flow and access.

D. Conduit type:
   1. Within electrical equipment enclosures:
      a. Rigid wall hot-dipped galvanized steel conduit.
   2. Exposed outdoor locations (exposed only as permitted by Owner):
      a. Rigid wall hot-dipped galvanized steel conduit.
   3. Underground:
      a. PVC schedule 40 conduit where direct buried in earth.
      b. PVC schedule 40 conduit where concrete encased in ductbank.
      c. Underground 90s shall be long radius.
      d. Stub-ups shall be schedule 40 PVC.

E. Schedule 40 PVC connections shall be solvent welded.

F. Fasten conduit with the following material:
   1. Wood screws on wood
   2. Toggle bolts on hollow masonry
   3. Bolts and expansion anchors in concrete or brick
   4. Machine screws, threaded rods and clamps on steel

G. Install conduits outside of building lines at a minimum depth of 30 inches below finished grade. Refer to ductbank details for additional depth requirements. Provide additional depth as required to maintain required separation from other utilities and to avoid obstructions. Maintain twelve inches earth or two inches concrete separation between electrical conduits and other services or utilities underground.

H. Install underground conduits with sealing glands equal to OZ Type FSK exterior to the conduit and OZ type CSB, or equal internally at the point where conduits enter the building to prevent water seepage into the building.

I. Fittings shall be approved for grounding purposes or shall be jumpered with copper grounding conductors of appropriate ampacity. Leave termination of such jumpers exposed.

J. Install conduit concealed within electrical equipment enclosures, pad mounted transformers, below grade, pole footings and poles.

K. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture if cable or wire are not installed immediate after conduit run. Tape covering conduit ends is not acceptable.

L. Provide 200 lb. nylon cord full length in empty conduit.

M. Pull string shall be provided full length in conduit designated for future use.

N. Rigid steel conduit shall be taped where in contact with concrete. At the points where conduit penetrates concrete that is in contact with soil, the conduit shall be Schedule 80 PVC bedded in sand.

3.2 INSTALLATION - BOXES

A. Provide electrical boxes as shown on Drawings, and as required for wire pulling and code compliance.

B. Provide outlet box accessories as required for each installation, including mounting brackets, metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual situations.

3.3 TRENCH EXCAVATION

A. Comply with the following OSHA Part 1926 – Safety and Health Regulations for Construction, Subpart P - Excavation
   1. 1926.650 - Requirements for Open Excavations
   2. 1926.651 - Requirements for Specific Excavations
   3. 1926.652 - Requirements for Protective Systems
   4. 1926.653 - Definitions

B. Before beginning trenching operations, stake out the proposed conduit and ductbank routing including trench width and obtain approval from the Owner's representative. After trenching has begun and before any ducts or conduits are placed, notify the Owner's representative so that the trenching and installation may be inspected. Also notify the Owner's representative prior to any placement of concrete for ductbanks, so that he may observe the placement.

C. Excavate a trench of sufficient width to allow thorough compacting of the backfill under and around the conduits and ductbanks. Refer to details on drawings.

D. Where excavation is in rock, remove all rock to a depth below the grade shown on the Drawings. Rock is defined as material that cannot be ripped or excavated by a backhoe with a one cubic yard bucket with rock teeth. Water shall be continuously pumped out from the trench.

E. The Owner's approval is required for the extent of the trench excavation prior to the conduit and ductbank installation. Contractor shall schedule excavation in accordance with the Owner's requirements prior to beginning construction.

F. Provide all necessary repairs to erosion control measures and reseeding of grass in areas disturbed by trenching. Repair or replace any damaged paving to Owner's satisfaction.

G. Sheet and brace the excavation as required to prevent caving. The trench width may be increased accordingly. Maintain sheeting until the conduits and ductbank has been inspected and backfilled to either a depth over the top of the conduits and ductbank or as indicated on Drawings. Leave sheeting and shoring in place where directed by the Owner's representative.

3.4 DUCTBANK INSTALLATION

A. Secondary ductbanks (top of ductbank concrete) shall be minimum 36" below finished grade.

B. Provide conduit in one complete lot. Partial shipment is not approved.

C. Carefully handle and place all conduits to prevent breakage or other damage. Brace and support all conduits as shown on the Drawings to prevent shifting when concrete is poured.

D. Lay conduit in true straight line of a gradual or uniform sweep. Provide factory made long sweep bends for all bends 15 degrees or more, either horizontal or vertical, unless prior approval is given by Owner to bend conduit in field. Bend radius shall be 48" minimum unless noted otherwise on Drawings.

E. Space ducts or conduits a minimum of 3 inches, or in accordance with Drawings, from adjacent ducts. Place spacers or separators on not greater than 5-foot centers.

F. Stagger joints 6 inches vertically and horizontally in horizontal duct runs and make joints watertight in accordance with manufacturer's recommendations. Where necessary to cut a tapered end on a duct, make the cut with a tool or lathe designed to cut such a taper to match the taper of the particular duct used.

G. Cleanout conduits as work progresses and securely plug all open ends to prevent water, mud or debris from entering the duct.

H. Prior to acceptance of ductbank by the Owner, the Contractor shall pull an approved mandrel through each conduit witnessed by the Owner's representative. Mandrel must not be less than 12 inches long with a diameter approximately 1/2-inch less than the inside diameter of the duct or conduit. Swab all conduits clean immediately before pulling cable.

I. Form conduits into ductbanks as shown on the Drawings. Quantity of spacers shall be as required to ensure conduit is supported to maintain a true straight line without sagging. Spacers shall be nonmetallic, non-decaying material as manufactured by Formex. Conduits shall be secured to the spacers using plastic ties; use of wire is not acceptable.

J. Install steel reinforcing as detailed on drawings.

K. Backfill around conduits using concrete as detailed on drawings.

L. Do not install ductbank under permanent fixtures.

M. Concrete shall be thoroughly mixed with red dye.

N. All unused ductbank conduits shall have a nylon or polypropylene pull strung installed for future use. The pull string shall be Greenlee or equal with minimum of 240 lbs. tensile strength, and shall be rot and mildew resistant. Wire shall not be used as pull string.

O. Ductbank penetrations of foundation wall shall comply with the following:
   1. The conduit shall make individual penetrations of the foundation wall.
   2. The conduit shall penetrate the foundation wall in the following manner:
      a. For new construction, the foundation wall shall have a steel sleeve installed that is 2" larger in diameter than the conduit to be installed. For existing construction, the hole shall be core drilled. In multiple duct situations, sufficient space shall remain between the penetrations to maintain the structural integrity of the foundation wall.
      b. A rubber seal, equal to Link-Seal, shall be installed in the space between the conduit and the sleeve or drilled hole, near the interior surface of the foundation wall. The same space shall have waterproofing installed on the exterior side of the rubber seal.

P. Identify the ductbank location with metallic safety tape or vinyl tape with magnetic tracer marked "CAUTION! BURIED HIGH VOLTAGE ELECTRICAL LINE". Tape shall be 6" wide located 8 inches below grade, above each edge and center of the ductbank as detailed on drawings. Identify each individual conduit by termination point in adjacent switchgear, ATS, transformer, etc.

Q. Refer to drawings for additional requirements.

3.5 TRENCH BACKFILLING

A. Backfill above conduits and concrete ductbank with select fill, not sand. Backfill shall be mechanically compacted in 6-inch lifts to 95% at optimum moisture content as determined by ASTM D 698.

B. Consolidate the conduit and ductbank fill material under roads or similar traffic areas in such a manner as to provide an unyielding foundation for the paving. Remove all excess materials.

C. Backfill shall be free of all organic material or any other material that would cause subsequent settlement.

D. Contractor shall assume full responsibility for any deficiency in quantity of material or filling of depressions caused by settlement of backfill material. Damage to other trade's work caused by settling shall be corrected at the Contractor's expense. Contractor shall assume full responsibility for damages to any underground utility lines or other structure.

E. Dispose of all excess material from the construction site as directed by the Owner. Contractor should remove excess spoils and other material from the site.

3.6 RECORD DRAWINGS

A. Provide all concrete test reports required per Division 03 specifications.

B. All conduit and ductbank locations shall be located with respect to site horizontal controls. All conduit and ductbanks shall be located at ends and change of directions. Record accurately all conduit and ductbank bends (radius and center point) ±1-foot by 0-inch accuracy on the construction As-Built drawings.

C. Record the installed length of each conduit and ductbank to the nearest foot and transmit to the Owner's representative.

END OF SECTION 260533

SECTION 260553

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Nameplates and tape labels

B. Wire and cable markers

C. Conduit color coding and labeling

1.2 REFERENCES

A. NFPA 70 - National Electrical Code (latest edition)

1.3 SUBMITTALS

A. Provide submittals in accordance with and in addition to Section 260000, Basic Electrical Requirements, and Division 01 for submittal requirement.
   1. Furnish nameplate identification schedules listing equipment type and nameplate data with letter sizes and nameplate material.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Equipment Nameplates:
   1. Provide engraved three-layer laminated plastic nameplates, engraved white letters on a black background.

B. Underground Warning Tape
   1. Manufactured polyethylene material and unaffected by acids and alkalines.
   2. 3.5 mils thick and 6 inches wide.
   3. Tensile strength of 1,750 psi lengthwise.
   4. Printing on tape shall include an identification note BURIED ELECTRIC LINE, and a caution note CAUTION. Repeat identification and caution notes over full length of tape. Provide with black letters on a red background.

C. Conductor Color Tape and Heat Shrink:
   1. Colored vinyl electrical tape shall be applied perpendicular to the long dimension of the cable or conductor.

D. Warning labels: Provide warning labels with black lettering on red background with a minimum of 1/2" lettering.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Degrease and clean surfaces to receive nameplates or tape labels.

B. Install nameplates parallel to equipment lines.

C. Secure plastic nameplates to equipment fronts using screws or rivets. Use of adhesives shall be per Owner's approval.

3.2 WIRE IDENTIFICATION

A. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits. Label control wire with number as indicated on schematic and interconnection diagrams or equipment manufacturer's shop drawings for control wiring.

B. Conductors for power circuits to be identified per the following schedule. Verify existing color code and notify Engineer if different than below.

	System Voltage		
Conductor	**480/277V**	**208/120V**	**240/120V Single Phase**
Phase A	Brown	Black	Black
Phase B	Orange	Red	Red
Phase C	Yellow	Blue	NA
Neutral	White	White	White
Grounding IG	Green/Green N/A	Green Green w/Yellow	Green Green w/Yellow

3.3 NAMEPLATE ENGRAVING SCHEDULE

A. Provide nameplates of minimum letter height as scheduled below. Nameplates shall be same as equipment names indicated on the Drawings.

B. Individual circuit breakers, contactors, timeclocks and photocells: 1/4-inch; identify source to device and the load it serves, including location.

C. Panelboards: 3/8-inch; identify equipment designation. 1/4-inch; identify source, voltage and bus rating.

D. Electrical equipment enclosures: 3/8-inch; identify equipment designation. 1/4-inch; identify source, voltage and bus rating.

3.4 ARC-FLASH LABEL

A. Switchgear shall be labeled to include arc-flash labels, personal protective equipment (PPE) and other information as required by NEC 110.16 and as described in the standards and guidelines referenced in FPN Nos. 1 and 2.

END OF SECTION 260553

SECTION 260573

SYSTEM COORDINATION AND ANALYSIS (Arc-Flash Study)

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide a complete analysis of the operation of the electrical power system under overcurrent and short circuit conditions (L-G, L-L and 3Ø bolted fault).

B. Provide complete arc-flash study and equipment labeling.

1.2 SUBMITTALS

A. Analysis shall be performed by one of the following:
   1. Square D
   2. Siemens
   3. Cutler Hammer

B. Submit a preliminary analysis of the system for approval prior to a release for fabrication of electrical equipment.

C. Submit final analysis of the system prior to the installation or energization of equipment.

1.3 REFERENCED STANDARDS

A. The analysis of overcurrent operation shall be based on IEEE "Overcurrent Protective Device Coordination by Computer".

B. The analysis of short circuit current operation shall be based on IEEE "Procedure for Determining Maximum Short Circuit Value in Electrical Distribution Systems".

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 SCOPE OF ANALYSIS

A. The analysis shall be comprehensive from existing oil-filled pad mounted transformer through the distribution system to the last overcurrent device serving equipment or outlets.

3.2 BASIS OF COMPUTATION

A. Computation shall be based on infinite bus method. For arc-flash ratings, use actual available fault current values to determine recommended rating.

B. Device characteristics and equipment impedances shall be obtained in writing from the equipment supplier.

C. The preliminary analysis shall be based on the Contractor's estimation of feeder types and lengths and the proposed equipment characteristics.

D. The final analysis shall be based on the equipment and materials actually installed at the project. Conductor and raceway type, lengths, and characteristics shall be supplied by the Contractor on the actual materials and routings to be installed.

E. Coordination TCC's shall include all pertinent data including MAG-I, FLA, cable damage limit, fault current, partial one-line of devices plotted, motor stall, etc.

3.3 RESULTS

A. The overcurrent device coordination analysis shall present a graphic representation of the required time-current settings for every protective device in the system and a tabular listing for equipment calibration. All devices which are not able to be fully selectively coordinated shall be noted along with recommended action.
   1. All corrective action shall be included in bid.
   2. Provide additional trip features as required for code required coordination.

B. The short circuit analysis shall list the phase and ground fault current available at each switchgear, switchboard and panelboard bus in the system, and define whether each device in the system is adequately rated for the duty imposed. Contractor shall furnish equipment with AIC rating which exceeds maximum available fault current regardless of rating specified on drawings. Equipment ratings on drawings are minimum AIC duty and shall not be reduced.

C. Series rating is permitted.

D. Label switchgear based on results of arc-flash study.

E. Provide breakers with additional trip features as required for code required coordination.

F. Provide equipment and/or breaker features as necessary to limit arc-flash energy per NEC.

END OF SECTION 260573

SECTION 260936

LIGHTING CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following lighting control devices:
   1. Photocell.
   2. Lighting contactors.

1.2 SUBMITTALS

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

B. Shop Drawings: Show installation details for occupancy and light-level sensors.
   1. Interconnection diagrams showing field-installed wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.4 COORDINATION

A. Coordinate photocell mounting in each pad mounted electrical enclosure. Locate and orient away from exterior ambient lighting sources to prevent nuisance off.

PART 2 - PRODUCTS

2.1 PHOTOCELL

A. Manufacturers:
   1. Intermatic, Inc.
   2. Paragon

B. Photocell with adjustable ambient lighting level.

2.2 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Allen-Bradley/Rockwell Automation.
   2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
   3. Square D; Schneider Electric.

B. Description: Electrically operated and mechanically held, combination type with nonfused disconnect, complying with NEMA ICS 2 and UL 508.
   1. Current Rating for Switching: Listing or rating consistent with type of load served.
   2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
   3. Enclosure: Comply with NEMA 250.
   4. Provide with control and pilot devices as required, matching the NEMA type specified for the enclosure.
   5. Minimum contactor rating of 30 amps.
   6. Provide auxiliary relays as required.

2.3 HOA SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Allen-Bradley/Rockwell Automation.
   2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
   3. Square D; Schneider Electric.

B. Description: Hand – off – automatic control switch.
   1. Rotary type.
   2. Housed in separate enclosure, within electrical equipment enclosure.
   C. Automatic position (controlled by photocell).

PART 3 - EXECUTION

3.1 CONTACTOR INSTALLATION

A. Mount lighting contactors with elastomeric isolator pads.

3.2 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
   1. After installing lighting control devices and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
   2. Operational Test: Verify operation of each lighting control device.

END OF SECTION 260936

SECTION 262416

PANELBOARDS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Branch circuit panelboards.

1.2 REFERENCES

A. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches

B. NEMA PB 1 - Panelboards

C. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less

D. NEMA PB 1.2 - Application Guide for Ground-fault Protective Devices for Equipment

E. NEMA AB 3 - Molded Case Breakers and Their Application

F. ANSI/UL 67 - Electric Panelboards

G. ANSI/UL 50 - Cabinets and Boxes

H. ANSI/UL 508 - Industrial Control Equipment

1.3 SUBMITTALS

A. Provide product information.

B. Submit dimensioned drawings showing size, circuit breaker arrangement and equipment ratings including, but not limited to, voltage, main bus ampacity, integrated short circuit ampere rating, and temperature rating of circuit breaker terminations.

C. Submit 1/4” scale drawing of each electrical equipment enclosure with electrical equipment to demonstrate that all equipment being submitted will fit in the space and all clearances are obtained. This drawing must be included with the submittal for equipment specified in this section.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver distribution panelboards in factory-fabricated water-resistant wrapping.

B. Handle panelboards carefully to avoid damage to material component, enclosure and finish.

C. Store in a clean, dry space and protected from the weather.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Square D
B. Siemens
C. Eaton

2.2 PANELBOARD CONSTRUCTION

A. General: Provide surface mounted, circuit breaker type panelboards with electrical ratings and configurations, as indicated on the drawings and schedules. Load center type panelboards are not acceptable.

B. Enclosure:
   1. Enclosure shall be proper NEMA type as indicated.
   2. NEMA 1 (within electrical equipment enclosure)
      a. Back box shall be galvanized steel for flush mounted branch circuit panelboards. Back box shall have gray enamel electro-deposited finish over cleaned phoshatized steel for all other type panelboards.
      b. Provide panelboard fronts with door-in-door cover.
   3. Construct cabinet in accordance with UL 50. Use not less than 16-gauge galvanized sheet steel, with all cut edge galvanized. Provide a minimum 4-inch gutter wiring space on each side. Provide large gutter where required to accommodate the size and quantity of conductors to be terminated in the panel, and where required by code.
   4. Exterior and interior steel surfaces shall be cleaned and finished with gray enamel over rust inhibiting phosphatized coating. Color shall be ANSI 61 gray.
   5. Doors shall be equipped with flush-type combination catch and key lock. All locks shall be keyed alike.
   6. Branch circuit panelboards shall be 5-3/4-inches deep.
   7. A directory holder with heavy plastic plate, metal frame, and index card shall be mounted inside of each door.
   8. Reinforce enclosure and securely support bus bars and overcurrent devices to prevent vibration and breakage in handling.
   9. Rating: Minimum integrated short-circuit rating, voltage and current rating as shown on drawings.
   10. Labeling: The Contractor shall furnish and install engraved, laminated plastic nameplates on the trim per Section 260553, Electrical Identification

C. Bus:
   1. Provide panelboards with copper rounded edge phase, neutral and ground buses, rated full capacity as scheduled on drawings. Buses shall be full-length and braced for the maximum available fault current as shown on drawings.
   2. Phase bussing shall be stacked front-to-back, A-B-C.
   3. The neutral and ground bus bars shall have termination locations for each of the individual feeders and the lugs sized appropriately. In addition, space shall be provided to terminate the neutrals and grounds in two feeders equal to the largest size circuit breaker that can be installed in the panelboard. The ground bus shall be mounted in the panelboard, opposite the incoming line and neutral lugs and shall be accessible to allow easy installation of bolts, nuts and lock washers used to attach ground lugs. The neutral and ground buses in branch circuit panelboards shall have spaces to terminate separate neutral and ground for each breaker position.
   4. All lugs for phase, neutral, and ground buses shall be tin-plated copper.
   5. Neutral and ground buses shall be tin-plated copper.

2.3 SWITCHING AND OVERCURRENT PROTECTIVE DEVICES

A. Provide molded case circuit breakers with manufacturer's standard construction, bolt on type, with integral inverse time delay thermal and instantaneous magnetic trip in each pole. Circuit breakers shall be constructed using glass reinforced polyester insulating material providing superior dielectric strength.

B. Circuit breakers shall have an over center, trip-free, toggle operating mechanism that will provide a quick-make, quick-break contact action.

C. Piggyback breakers are not permitted.

D. Provide handle padlock attachments on circuit breakers where required. Device shall be capable of accepting a single padlock. All circuit breakers shall be capable of being individually padlocked in the off position.

E. The circuit breakers shall be connected to the bus by means of solidly bolted connection. In multi-pole breakers, the phase connections on the bussing shall be made simultaneously without additional connectors or jumpers. Multi-pole breakers shall be two or three pole as specified. Handle ties are not permitted. The circuit breaker shall have common tripping for all poles.

F. All circuit breakers shall be provided with visible ON and OFF indications.

G. Provide GFI circuit breakers as indicated on drawing and per NEC requirement.

H. Breaker voltage and trip rating shall be per drawings. Breaker faceplate shall indicate UL certificate standards with applicable voltage systems and corresponding short current rating as per drawings.

I. Molded Case Circuit Breakers:
   1. Breakers 400 ampere frame and less shall be manufacturer's standard industrial construction, bolt-on type, integral inverse time delay thermal and instantaneous magnetic trip. Breakers 225 ampere through 400 ampere shall have continuously adjustable magnetic pick-ups of approximately five to ten times trip rating.

J. Provide mission critical breakers or breakers with additional trip features as required for code required coordination.

K. Provide equipment and/or breaker features as necessary to limit arc-flash energy per NEC.

2.4 SURGE PROTECTION

A. Each panel shall be equipped with stand-alone surge-protective device adjacent to panel. Include 2-Pole breaker for single phase panels, and 3-pole breaker for three phase panels in panelboard and conduit/conductors to surge protective device. Breaker and conduit/conductors shall be size as recommended by manufacturer. Breaker is not shown on Panel Schedule.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Square D
   2. Siemens
   3. Eaton

C. Surge Protection Device: IEEE C62.41-compliant, integrally mounted, solid-state, parallel-connected, modular (with field-replaceable modules) type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the panelboard short-circuit rating, and with the following features and accessories:
   1. Fabrication using bolted compression lugs for internal wiring.
   2. Integral disconnect switch.
   3. Redundant suppression circuits.
   4. Redundant replaceable modules.
   5. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
   6. LED indicator lights for power and protection status.
   7. Audible alarm, with silencing switch, to indicate when protection has failed.
   8. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of system operation. Contacts shall reverse position on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
   9. Six-digit, transient-event counter set to totalize transient surges.

D. Minimum Surge Current Capability (single pulse rated) per phase:
   1. Panelboards: 100 kA

E. SPD shall be UL labeled as Type 1 (verifiable at UL.com), intended for use without need for external or supplemental overcurrent controls. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal over-temperature controls.

F. SPD shall provide surge current paths for all modes of protection: L-N, L-G, and N-G for Wye systems; L-L, L-G in single phase systems.

G. UL 1449 Third Edition Listed Voltage Protection Ratings (VPRs) shall not exceed the following:

System Voltage	L-N	L-G	L-L	N-G
480Y/277	1200V	1200V	1200V	1200V
208Y/120	700V	700V	1200V	700V

H. UL 1449 Third Edition Listed Maximum Continuous Operating Voltage (MCOV):

System Voltage	Allowable System Voltage Fluctuation (%)	MCOV
480Y/277	15%	320V
208Y/120	25%	150V

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards in accordance with manufacturer's written instructions and the applicable requirements of the NEC, NEMA, ANSI and the National Electrical Contractors Association's "Standard of Installation".

B. Anchor enclosed firmly to support structure within electrical equipment enclosure.

C. Install panelboards plumb. Adjust trim to cover all openings. Seal all conduit openings and cap all used knockout holes.

D. Provide blank plates for unused open spaces in panelboards. Keep the front door closed after work to protect from damage, dirt, and debris at all times.

E. Install identification nameplates in accordance with Section 260553, Electrical Identification.

3.2 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:
   1. Test insulation resistance for each component, connecting supply, feeder, and circuit.
   2. Test continuity of each circuit.

B. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Panelboards will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports, including a certified report that identifies panelboard and that describes test results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.3 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Division 26 Section "Overcurrent Protective Device Coordination Study".

3.4 PANELBOARD CIRCUIT INDEX CARD

A. The Contractor shall provide typewritten circuit index card and place in plastic sleeve furnished with panel.

B. The Contractor shall fill the index directory inside the front door of branch circuit panelboards identifying each existing and new circuit. Where changes are made, the schedule shall reflect the changes. At the end of the job, these schedules shall reflect as-built record conditions.

END OF SECTION 262416

SECTION 262726

WIRING DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Wiring Devices:
   1. Receptacles in lighting poles.
   2. Weatherproof covers.

1.2 REFERENCES

A. ANSI/UL 943 - Ground Fault Circuit Interrupters.

B. NEMA WD 1 - General-Purpose Wiring Devices.

C. NEMA WD 5 - Specific-Purpose Wiring Devices.

D. Texas Accessibility Standards. (TAS)

1.3 SUBMITTALS

A. Provide product information.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver wiring devices individually wrapped in factory-fabricated containers.

B. Handle wiring devices carefully to avoid damage, breaking and scoring.

C. Store in a clean dry space and protected from the weather.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide factory fabricated wiring devices in the type and electrical rating for the service indicated. Where type and grade are not indicated, provide proper selection to correspond with branch circuit wiring and overcurrent protection. Attachment of wires to devices shall be by screw pressure under the head of binding screws. Arrangements depending on spring pressure or tension are not acceptable. All binding screws shall be brass or bronze.

B. Device color:
   1. Receptacles shall be gray.

2.2 RECEPTACLES

A. Acceptable manufacturers
   1. Arrow-Hart
   2. Hubbell
   3. General Electric

4. Leviton
5. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in Section 260000 and Division 01 for substitution requirement.

B. Material
1. GFCI receptacles shall be rated 20 amperes, 125 volt with integral ground fault current interrupter; Arrow-Hart GF5342 Series.
2. Weatherproof receptacles at select pedestrian lighting poles (Clark Park area) shall be mounted in pole receptacle opening provided by pole manufacturer, gasketed, weatherproof cover to match pole color.

PART 3 - EXECUTION

3.1 INSPECTION

A. Installer must examine the areas and conditions under which wiring devices are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Inspect devices for physical damage. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:
1. Install wiring devices as indicated, in accordance with the applicable requirements of the latest release of NEC, NEMA, and ANSI.
2. Feed through to non-GFCI receptacles is not permitted.

END OF SECTION 262726

SECTION 262816

ENCLOSED CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Molded-case circuit breakers (MCCBs).
   2. Enclosures.

1.3 SUBMITTALS

A. Provide product information.

B. Submit dimensioned drawings showing size, circuit breaker arrangement and equipment ratings including, but not limited to, voltage, main bus ampacity, integrated short circuit ampere rating, and temperature rating of circuit breaker terminations.

C. Submit 1/4” scale drawing of each electrical equipment enclosure with electrical equipment to demonstrate that all equipment being submitted will fit in the space and all clearances are obtained. This drawing must be included with the submittal for equipment specified in this section.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver distribution panelboards in factory-fabricated water-resistant wrapping.

B. Handle panelboards carefully to avoid damage to material component, enclosure and finish.

C. Store in a clean, dry space and protected from the weather.

PART 2 - PRODUCTS

2.1 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Square D
   2. Siemens
   3. Eaton

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: For frame sizes 250 amp and below, inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits and adjustable magnetic trip setting.

D. Current-Limiting Circuit Breakers: Frame sizes 600 amp and below.

E. Features and Accessories:
   1. Standard frame sizes, trip ratings, and number of poles.
   2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.

2.2 ENCLOSURES

A. Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
   1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
   2. Outdoor Locations: NEMA 250, Type 3R.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install within electrical equipment enclosure or as noted/detailed on drawings.

3.2 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:
   1. Test insulation resistance for each enclosed circuit breaker, component, connecting supply, feeder, and circuit.
   2. Test continuity of each circuit.

B. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Enclosed circuit breakers will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports, including a certified report that identifies enclosed circuit breakers and test results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.3 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Division 26 Section "Overcurrent Protective Device Coordination Study".

END OF SECTION 262816

SECTION 265100

EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Exterior luminaires with LEDs and drivers.
   2. Poles and accessories.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color-rendering index.

C. LER: Luminaire efficacy rating.

1.4 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

A. Dead Load: Weight of luminaire and its horizontal and vertical supports, and supporting structure, applied as stated in AASHTO LTS-4-M.

B. Live Load: Single load of 500 lbf, distributed as stated in AASHTO LTS-4-M.

C. Ice Load: Load of 3 lbf/sq. ft., applied as stated in AASHTO LTS-4-M Ice Load Map.

D. Wind Load: Pressure of wind on pole and fixtures, calculated and applied as stated in AASHTO LTS-4-M.
   1. Basic wind speed for calculating wind load for poles is minimum 115 mph.
      a. Wind Importance Factor: 1.0.
      b. Minimum Design Life: 50 years.
      c. Velocity Conversion Factors: 1.0.
   2. Verify local code requirements and increase design wind load for pole/foundation if necessary.

1.5 SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
   1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
   2. Details of attaching luminaires and accessories.
   3. Details of installation and construction.
   4. Luminaire materials.

5. Photometric data based on laboratory tests of each luminaire type, complete with indicated LEDs, drivers, and accessories.
    a. Testing Agency Certified Data: For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
    b. Manufacturer Certified Data: Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
6. Drivers, including energy-efficiency data.
7. LEDs, including life, output, CCT, CRI, lumens, and energy-efficiency data.
8. Materials, dimensions, and finishes of poles.
9. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
10. Submit point-by-point (10'-0" centers) for parking areas, drives, streets, sidewalks, open areas, and include with fixture/pole submittal.
11. Anchor bolts for poles.
12. Submittal shall include the following certification:
    a. Where existing pole footings are being reused, anchor bolt pattern and dimensions shall match existing anchor bolt pattern, anchor bolt size, anchor bolt height, and anchor bolt dimensions.
    b. Provide custom anchor base as necessary to facilitate use of existing footings and anchor bolts without modification of existing pole footing.
    c. Shorten existing anchor bolts if necessary to facilitate installation of new base covers on existing footings. Coordinate with Owner prior to cutting of anchor bolt.

B. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations by a professional engineer.

C. Operation and Maintenance Data: For luminaires and poles to include in emergency, operation, and maintenance manuals.

1.6 SAMPLES AND MOCKUP

A. Prior to placing complete pole/fixture order, furnish samples of the following:
1. (1) Pedestrian pole and fixture.
2. (1) Parking/drive/street/area pole and fixture.

B. Provide working mockup to demonstrate fixture performance and color temperature.
1. Upon approval by Owner, place order for balance of poles/fixtures.
2. If rejected by Owner, submit alternate color temperature as selected by Owner and Engineer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

B. Retain factory-applied pole wrappings on metal poles until right before pole installation.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
   1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
   2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
   3. Warranty Period for Color Retention: Five years from date of Substantial Completion.
   4. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than five years from date of Substantial Completion.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Pedestrian fixtures: (2) of each beam pattern at each specified wattage
   2. Parking/drive/street/area fixtures: (2) of each beam pattern at each specified wattage.
   3. Pedestrian poles: (2) of each fixture mounting arrangement.
   4. Parking/drive/street/area poles: (2) of each fixture mounting arrangement and pole height.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR LUMINAIRES

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.

C. Housings: Corrosion-resistant cast aluminum, rigidly formed, weather and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit maintenance without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during maintenance and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect driver when door opens.

E. Exposed Hardware Material: Stainless steel.

F. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

G. Diffusing Specular Luminaire Finish: Match finish process and color of pole and support materials.

H. Factory-Applied Labels: Comply with UL 1598. Include recommended LEDs and drivers. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when LEDs are in place.

I. Factory-Painted Finish: As noted in fixture schedule.

2.2 LEDS

A. All LED luminaires shall be UL Listed and be furnished complete with LEDs and integral drivers (power supplies). Each fixture shall bear the UL Label, and shall comply with Code Requirements.

B. Luminaires shall meet the US Department of Energy's Energy Star performance criteria.

C. LED luminaires shall be designed with heat sinking adequate such that the junction temperature of the LEDs in maintained to meet the rated life as published by the LED manufacturer. Luminaire manufacturer shall provide validation documentation. Heat sinking shall not become compromised with time, lack of maintenance, and/or vibration resistance so that the heat-sink does not become detached from the LED PCB.

D. The LED luminaire shall have a complete 5 year warranty from date of installation

E. The LED luminaires shall be UL, or ETL listed and be furnished complete with LEDs and power supplies.

F. LED power supplies shall operate LEDs within the current limit specification of the manufacturer

G. Shall operate from 60Hz or 50Hz input source and have input power factor above 90% and a minimum efficiency of 70-% at full rated load of the driver.

H. Shall have short circuit and overload protection.

I. Shall have a minimum starting temperature of 0°F and a maximum case temperature rating of at least 70°C.

J. Power supply output shall be regulated to +/-5% across published load range.

K. Shall have a Class A sound rating.

L. Shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47CFR part 15, non-consumer (Class A) for EMI/RFI.

M. Shall have a 5 year warranty from date of manufacturer against defects in material or workmanship, including a replacement, for operation at or below the maximum case temperature specification.

N. Manufacturer shall have a 15 year history of producing power supplies for the North American market.

O. All LEDs shall have a color temperature of 5000K with CRI as noted in Light Fixture Schedule.

P. L70 rated life shall be a minimum of 50,000 hours.

Q. All LED modules, unless noted otherwise, shall be provided by the light fixture manufacturer and integral to the luminaire.

R. LED modules/arrays shall be replaceable in the field. If luminaires are still under warranty, the Owner shall be compensated for the labor to do replacement work or the manufacturer shall send a factory representative to the site to do the work.

S. Replacement modules should have the ability to be “tuned” to match the output of remaining adjacent luminaires in the event that some time has passed and there has been light loss.

2.3 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

A. Structural Characteristics: Comply with AASHTO LTS-4-M.
   1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.
   2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
   1. Materials: Shall not cause galvanic action at contact points.
   2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
   3. Anchor-Bolt Template: Plywood or steel.

D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws. Provide on all poles.

E. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete."

2.4 POLES

A. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Division 16 Section "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

B. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable times a 5.0 safety factor.

C. Factory-Painted Finish: As noted in fixture schedule.

D. Label poles as directed by Owner. UNT electric shop will confirm numbering system indicated on drawings, or provide different numbering system. Obtain final pole numbering scheme prior to ordering labels.

2.5 POLE ACCESSORIES

A. Base Covers: Ornamental, heavy gauge metal, arranged to cover pole's mounting bolts and nuts. Finish same as pole.

B. Vibration Dampening: Provide vibration dampening system for all 30 foot poles, manufactured by pole supplier.

C. Receptacles as noted on drawings.

PART 3 - EXECUTION

3.1 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

B. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Division 03 Section "Cast-in-Place Concrete."

C. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
   1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
   2. Do not grout void between pole base and foundation.
   3. Install heavy duty metal base covers.

D. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with ¼ inch wide gap between the pole foundation and the edge of adjacent concrete. Fill unpaved ring with material as directed by Owner to a level even with paving.

E. Poles and Pole Foundations Set in Asphalt Paved Areas: Repair surrounding area and restore to match existing paving.

F. Verify exact pole locations and footing height above grade prior to installation of footings.

G. Raise and set poles using web fabric slings (not chain or cable).

3.2 GROUNDING

A. Ground metal poles and support structures according to Division 16 Section "Grounding and Bonding for Electrical Systems."
   1. Install equipment grounding to each pole and bond to pole ground lug.
   2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
   3. Provide ground rod at each pole and bond to pole ground lug and equipment grounding conductor.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
   1. Verify operation of controls.

END OF SECTION 265100