REVISED
CONSTRUCTION DOCUMENTS SPECIFICATIONS:

Northern Kentucky University
Astronomical Observatory
Bid # NKCC-22-14

June 25, 2014

Project Architect:
GBBN Architects, Inc.
332 East 8th Street
Cincinnati, OH 45202
513/241-8700
www.gbbn.com

Structural Engineer
THP Limited Inc.
100 E. 8th Street #9
Cincinnati, OH 45202
513.241.3222

MEP Engineer
KLH Engineers
1538 Alexandria Pike #11
Fort Thomas, KY 41075
859.442.8050
PROCUREMENT AND CONTRACTING REQUIREMENTS GROUP

DIVISION 00 PROCUREMENT AND CONTRACTING REQUIREMENTS

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**NOTE:** Bold text found within the individual sections is modifications that occurred in Addendum 2, dated 05.14.14
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SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Application and Conflict:
   1. This section applies to all portions of the Work. In the event of conflict between provisions herein and those otherwise required by the Owner for the Contractor, consult with Owner for resolution.
   2. References herein to, or repetition of, any portions of Project Manual preceding Division 01 shall not nullify any un-referenced or un-repeated portions thereof.

B. Section includes:
   1. Definitions.
   2. Specification language.
   3. Responsibility for means of construction and safety on Site.
   4. Separate related work.
   5. Owner furnished products.
   6. Work sequence.
   7. Contractor use of Site.

C. Work covered by Contract Documents: Material, equipment and tools and services for Demolition; General; Plumbing; Fire Protection; Heating, Ventilating and Air Conditioning; and Electric Work for construction of:

   Astronomical Observatory
   for:
   Northern Kentucky University
   Bid # NKCC-22-14

1.2 DEFINITIONS

A. Lead Contractor: Contractor for Demolition

B. Subcontractor: Person having agreement with Contractor for portion of the Work.

C. Architect: GBBN Architects, Inc.

D. Work: As described under Work Covered by Contract Documents above.

E. Site: Site, whether or not capitalized, shall be defined as the area, or a portion thereof, within the Owner's property lines for the Project, and properties adjacent to Owner's Property Lines, affected by construction of the Project.


H. The term "provide" includes both furnishing and installation.

I. The terms "warranty" and "guaranty", or "guarantee", shall be interpreted interchangeably to describe the responsibility of a manufacturer, contractor, subcontractor or sub-subcontractor relative to the manufacture, furnishing or installation of a product or combination of products as described in each applicable section of the Specifications.

J. The pronouns "he", "his" and "him" are used for brevity and shall apply to both the males and females.

K. Contract Completion: Stage in the progress of the Work when the Work or designated portion thereof is complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended purpose.

L. Owner's Representative: Person designated by Owner to act on Owner's behalf.

1.3 SPECIFICATION LANGUAGE

A. The imperative and streamlined language used in the Contract Documents is directed to the Contractor, unless specifically noted otherwise. The words "shall be" shall be included by inference where a colon (:) is used within sentences or phrases.

1.4 RESPONSIBILITY FOR MEANS OF CONSTRUCTION AND SAFETY ON SITE

A. Architect and Engineer shall not be responsible for Contractors’ means, methods, techniques, sequences or procedures of construction.

B. Contractor shall be solely and completely responsible for conditions of Site including safety of all persons and property during performance of the Work. This requirement shall apply continuously and not be limited to normal working hours. When on Site, Architect and Engineer are not responsible for safety of personnel or safety conditions at Site.

1.5 PRODUCTS FURNISHED BY OWNER AND INSTALLED BY CONTRACTOR

A. Owner's Responsibilities:
   1. Arrange for and deliver shop drawings, product data, and samples to Contractor.
   2. Arrange and pay for products delivered to Site.
   3. On delivery, inspect products jointly with Contractor.
   4. Arrange for replacement of damaged, defective, or missing items.
   5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:
   1. Review shop drawings, product data, and samples.
   2. Receive and unload products at Site; inspect for completeness, for damage, jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged by Work of this Contract.

C. Work by Owner: Owner has the right to perform Work concurrently or simultaneously on Project.
1.6 **WORK SEQUENCE**

A. Construct Work in stages indicated on Drawings to accommodate Owner's occupancy requirements during construction period; Coordinate schedule and operations with Lead Contractor.

B. Prior to occupancy, execute Certificate of Completion for designated areas.

1.7 **CONTRACTOR USE OF SITE**

A. Perform Work at Site in areas permitted by law, permits, and Contract Documents.

B. Do not unreasonably encumber Site with materials or equipment, and do not load structure with weight that will endanger structure.

C. Assume full responsibility for protection and safekeeping of products stored on Site. Obtain and pay for use of additional storage or work areas needed for operations.

D. Limit use of Site for Work and storage:
   1. Do not block or interfere with vehicular or pedestrian access to any buildings or other portions of Site required for conducting Owner's normal operations.
   2. Perform the Work with a minimum of disruption by noise, odors, dust or other disruptive causes to Owner's normal operations.
   3. Provide access for utility work or, if notified by Owner, work of Owner's other Contractors.
   4. Coordinate with Owner and Architect prior to storing materials and equipment within building, except at areas designated on Drawings.

**PART 2 - PRODUCTS**

Not Applicable.

**PART 3 - EXECUTION**

Not Applicable.

END OF SECTION
SECTION 01 3100
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Application and Conflict:
   1. This section applies to all portions of the Work. In the event of conflict between provisions herein and those otherwise required by the Owner for the Contractor, consult with Owner for resolution.
   2. References herein to, or repetition of, any portions of Project Manual preceding Division 01 shall not nullify any un-referenced or un-repeated portions thereof.

B. Section Includes: Administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. Project Management.
   2. Coordination Drawings.
   3. Administrative and supervisory personnel.
   4. Project meetings.

1.2 PROJECT MANAGEMENT

A. GENERAL PROJECT COORDINATION:
   1. All work and information requests by the Contractor shall be coordinated through the assigned NKU Project Manager. Any direction provided by the campus Operations & Maintenance Staff and/or the project user group shall NOT be considered official direction from the University unless authorized in writing from the assigned NKU Project Manager. Contractor will NOT be compensated for work performed without written authorization from the assigned NKU Project Manager or NKU-hired Architect of Record.
   2. Unless noted otherwise for a specific project, at least seven (7) calendar day notice is required for any campus utility shutdowns and/or any road/parking lot closures necessary for the Contractor to perform their work. All utility shutdowns and closures shall be coordinated with the assigned NKU Project Manager, and the University reserves the right to schedule these shutdowns and closures at night and/or on weekends to minimize disruptions to the campus community.
   3. The NKU project manager will research and provide whatever information is available and known for the existing utilities in the area of concern. However, NKU generally prefers the contractor hire an outside utility locating service for marking the location of all existing utilities. Outside utility locating services will be required for locating all public utilities (when applicable), and most of the underground utilities on campus are private “house” lines owned & maintained of NKU. All requests for assistance from NKU's Operations & Maintenance staff in locating existing utilities shall also be submitted to the assigned NKU project manager at least (3) calendar days in advance.
B. BACKGROUND CHECKS:
   1. The Contractor shall furnish the University with written documentation that verifies each of their employees working on the property of the University has cleared a background check, has no felony convictions, is not a sex offender, and has the legal right to work in the United States.

C. DRUG-FREE WORKPLACE:
   1. Northern Kentucky University is a drug-free and alcohol-free workplace, and all employees of Contractors and subcontractors are subject to this policy while working on University property. If there is verifiable suspicion or probable cause that an employee of the contractor or subcontractor is under the influence of drugs or alcohol, the University reserves the right to require the Contractor to have the employee tested immediately at no expense to the University. If the test results are positive the employee will be prohibited from working on University property for a period of one (1) year from the positive test, or the duration of the project, whichever is longer. The banned employee of the Contractor must pass a drug and alcohol test before working again on university property.

D. CONTRACTOR PRESENCE ON CAMPUS:
   1. All persons working for (or on behalf of) the Contractor whose duties bring them on campus shall obey the rules and regulations that are established by the University and shall comply with the reasonable directions of the University representatives. Contractor’s employees shall never enter or use existing areas of campus where they are not required to be performing work. Contractors and subcontractors are always responsible for providing and maintaining portable restroom facilities for all their workers working on the project.

   2. Contractor shall be responsible for the acts of his employees and agents while on campus. Accordingly, Contractor agrees to take all necessary measures to prevent injury and loss to persons or property located on campus. Contractor shall be responsible for all damages to persons or property caused by Contractor or any of his agents or employees. Contractor shall promptly repair any damage that he, or his employees or agent may cause to the campus or to the University equipment.

   3. Contractor agrees that in event of an accident or incident of any kind on university property, Contractor will immediately notify the University’s Department of Public Safety (859-572-5500), who will prepare and furnish a full written report of the accident or incident.

   4. All Contractor employees and subcontractors shall present a neat and clean appearance while on University property, and be able to present proper individual and company identification upon request.

E. General Contractor will schedule and coordinate the Work. He shall direct arrangements for storage of materials. He will coordinate and expedite the Work of all trades so that progress of the project will be kept on schedule.

   1. Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work.

   2. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

   3. 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.

   4. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
5. Make adequate provisions to accommodate items scheduled for later installation.
6. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
7. 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.

F. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of Contractor's Construction Schedule.
   2. Preparation of the Schedule of Values.
   3. Installation and removal of temporary facilities and controls.
   4. Delivery and processing of submittals.
   5. Progress meetings.
   6. Preinstallation conferences.
   7. Project closeout activities.
   8. Startup and adjustment of systems.
   9. Project closeout activities.

1.3 SUBMITTALS

A. General requirements:
   1. Prepare drawings for overlay drafting so that any coordination drawing within the same area can be superimposed on any other coordination drawing, regardless of the floor level.
   2. Provide coordination drawings as specifically indicated hereinafter, and as otherwise required by Coordination Drawing Schedule.
   3. Architect will provide Electronic (CAD) Drawings to the Contractor for use in preparing submittals. Refer to Section 01 3300, Submittal Requirements.

B. Coordination Drawings: Prepare Coordination Drawings to ensure maximum utilization of space for efficient installation of components and coordination for installation of products and materials fabricated by separate entities.
   1. Indicate relationship of components shown on separate Shop Drawings.
   2. Indicate required installation sequences.
   3. Refer to Facility Services Subgroup Divisions for specific Coordination Drawing requirements for Fire Protection, Plumbing, HVAC, Electrical, and Communications installations.
   4. Include the following information, as applicable:
      a. Indicate functional and spatial relationships of components of architectural, structural, fire protection, plumbing, HVAC, electrical and communication systems.
      b. Indicate required installation sequences.
      c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts.
Minor dimension changes and difficult installations will not be considered changes to the Contract.

C. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.4 COORDINATION DRAWINGS

A. General requirements:

1. Prepare drawings for overlay drafting so that any coordination drawing within the same area can be superimposed on any other coordination drawing, regardless of the floor level.
2. Each Contractor shall provide coordination drawings as specifically indicated hereinafter, and as otherwise required by Coordination Drawing Schedule.
3. Each Contractor shall be responsible for drawing reproduction costs as specified hereinafter.

B. Electrical Coordination Drawings:

1. Lay out conduit, wireway, and other equipment to clear beams, columns, and other construction. Avoid conflicts with HVAC ductwork, piping, and equipment indicated on the HVAC Coordination Drawings. Avoid conflicts with Plumbing piping and equipment indicated on the Plumbing coordination drawings. Avoid conflicts with Fire Protection piping and equipment indicated on the Fire Protection coordination drawings. Maintain required vertical and horizontal clearances, as specified.

2. Show routings of individual power and lighting conduits larger than 3/4 inch, and racks of conduits 3/4 inch and larger.
3. Show routings of conduits for auxiliary electric systems.
4. Indicate and show sizes of Electrical equipment. Dimension locations from column center lines or walls, as may be appropriate. Note items requiring access for maintenance. Indicate location and type of required access panels.
5. Draft details, sections, and elevations, where required, or directed, for clarity.

1.5 PROJECT MEETINGS

A. General:

1. The Architect shall conduct meetings and take complete meeting notes at preconstruction and progress meetings, type and distribute to all attendees and those absent who normally would be in attendance.

2. Attendees: Contractor, Authorized representatives of Owner, Architect, and their consultants; Designated subcontractors and their respective project superintendents; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

B. Preconstruction Meeting: Prior to commencement of the Work at place and time designated by the Architect or Owner, a preconstruction meeting shall be held with the Owner or his designated representative, the Architect, the Contractor and his designated project superintendent, Subcontractors for Plumbing, Fire Protection, Heating, Ventilating and Air Conditioning, and...
Electric and their respective project superintendents in attendance. In addition to requirements of General Conditions, Parties shall be prepared to discuss items including but not limited to the following:

1. Coordinative and administrative requirements of the Owner, Trade Contractors and all Subcontractors.
2. Review Construction Schedule.
3. Ensure that Contractor and Subcontractors have complete Addenda and other Contract Documents.
4. Major equipment deliveries and priorities.
5. Procedures and processing of field decisions, proposal requests, submittals, change orders and applications for payment.
6. Procedures for maintaining record documents.
7. Temporary facilities, utilities and controls.
8. Temporary use of elevators.
10. Security procedures.
11. Days and times of progress meetings.

C. All parties present at the preconstruction meeting shall state their authority and identify the parties with the authority to schedule and administer their branch of the Work throughout the construction period.

D. Job Progress Meetings: Contractor, and selected Subcontractors shall meet at the site at least weekly, as agreed-on in the preconstruction meeting, during construction, to review the various phases and schedule of completion of the Work. In addition to requirements of General Conditions, Parties shall be prepared to discuss items including but not limited to the following:

1. Review and approval of previous meeting.
2. Review of Work progress since previous meeting.
3. Field observations, problems and conflicts.
4. Problems which impede Construction Schedule.
5. Review of off-site fabrication, delivery schedules.
6. Corrective measures and procedures to regain Construction Schedule if not being met.
7. Revisions to Construction Schedule.
8. Plan progress and schedule during succeeding period of Work.
9. Coordination of schedules.
10. Review submittal schedules and expedite and as required.
12. Review proposed changes for effect on Construction Schedule and completion date, and effect on all Contractors.

E. Preinstallation Conferences: Schedule and conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Owner’s project representative of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
   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. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

4. 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.

5. All submittals to be approved and returned to Contractor prior to pre-installation conference

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

Not Applicable

END OF SECTION
SECTION 01 3300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Application and Conflict:
   1. This section applies to all portions of the Work. In the event of conflict between provisions herein and those otherwise required by the Owner for the Contractor, consult with Owner for resolution.
   2. References herein to, or repetition of, any portions of Project Manual preceding Division 01 shall not nullify any un-referenced or un-repeated portions thereof.

B. Section includes:
   1. Schedule of values.
   2. Progress schedule.
   3. Shop drawings and product data.
   4. Samples.
   5. Warranties.
   6. Project record drawings and specifications.

C. Related Sections:
   1. Division 01 Sections – Execution and Closeout Requirements: Closeout submittals.
   2. Facility Services Subgroup: Additional requirements specified therein for work specified therein.

1.2 SCHEDULE OF VALUES

A. Submit schedule of values allocated to each of the various parts of the Work.

B. Indicate labor and material amounts for each line item; indicate any other necessary information for payment procedure.

C. The initial Application for Payment will not be approved unless the Schedule of Values has been submitted and approved prior to Application for Payment.

1.3 PROGRESS SCHEDULE

A. Coordinate with Architect information required in Progress Schedule including but not limited to:
   1. All on-site operations in proper sequence.
   2. All lead time for shop fabrication drawings.
   3. Lead time for manufactured items.
   4. Normal days to be lost due to weather.
   5. Date of Substantial Completion.
   6. Date of Final Completion of the Project.
B. When requested by Architect, or as otherwise required, revise and resubmit progress schedule based on the current state of the Work

C. Should an extension of time due to an excusable delay be granted, revise and resubmit schedule showing all revised dates and information due to this extension.

1.4 SHOP DRAWINGS AND PRODUCT DATA

A. General:
   1. Architect will provide Electronic (CAD) Drawings to the Contractor for use in preparing submittals. Contractor will be required to sign Architect's waiver form.
      a. Electronic drawings are not construction drawings.
      b. Submittals that are merely reproductions of Architect's and/or Engineer's electronic drawings will be rejected.
      c. CAD Drawings have been prepared by the Architect and Engineer’s in 3D format. 3D models may be used for coordination and submittal process.
   2. Clearly indicate project name and Section number on cover sheet or transmittal.
   3. Review for compliance with Construction Documents and stamp submittals with approval prior to submittal to Architect.
      a. Stamp may be affixed electronically or submittals may be wet stamped and scanned to pdf format.
      b. Submittals not marked as reviewed for compliance with Contract Documents and bearing Contractor's stamp of approval will be returned without review.
   4. Submittals not required by the Contract Documents may be returned by the Architect without action.

B. The Architect's review of Contractor's submittals will be limited to examination of an initial submittal and one (1) resubmittal. The Architect's review of additional submittals will be made only with the consent of the Owner after notification by the Architect. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for evaluation of such additional resubmittals.

C. 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 requiring sequential activity.
   2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

D. The Architect's review is for: "Verifying conformance with information provided and the design concept expressed in the contract documents only".

E. The Architect will return illegible or incomplete submittals without the Contractor’s “reviewed” stamp, “Rejected: Resubmit”.

F. Submit one (1) full size Electronic PDF submittal for all shop drawings and product literature.
1. Affix an electronic stamp to PDF submittals. Submittals with wet stamps and scanned to PDF are acceptable.

G. Shop drawings:
   1. Do not submit traced or reproduced Architect's drawings, with or without Architect's name, for shop drawings. Do not submit "standard information" that contains information not pertinent to the Work, or information not clearly indicated as pertinent to the Work.
   2. Clearly indicate project name on each sheet.
   3. Review for compliance with Construction Documents and stamp with approval each drawing prior to submittal to Architect. Drawings not marked as reviewed for compliance with Contract Documents and bearing Contractor's stamp of approval will not be reviewed.
      a. By approving and submitting Shop Drawings, Product Data, Samples, and similar submittals, Contractor represents he has determined and verified materials, field measurements and field construction criteria related hereto, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.
   4. Architect will affix an electronic stamp to reviewed PDF Submittals.
      a. If not in compliance as noted beyond “FURNISH AS CORRECTED”, make corrections and resubmit with corrections indicated.
      b. When in compliance and not required to be resubmitted, Architect will stamp and mark as “NO EXCEPTIONS TAKEN” or “FURNISH AS CORRECTED”. Use this document as stamped and marked to obtain and distribute prints of shop drawings required by all parties.
      c. Do not submit further submittals beyond "FURNISH AS CORRECTED" unless specifically directed to by Architect. Such further submittals, when not directed by Architect, will be returned to Contractor without review.

H. Product data:
   1. Annotate / Identify specific products, model/style names, numbers and letters in product data and catalogues. The Architect/Engineer will return Product Data and catalogues not marked / annotated.

I. Samples and Color Selection
   1. Samples and color selection shall not be reviewed electronically.
   2. Unless otherwise noted submit samples in duplicate for approval. Architect will retain one approved sample from each submittal.
   3. Samples shall be sufficient size and quantity as specified to clearly illustrate:
      a. Functional characteristics of the product, with integrally related parts and attachment devices.

J. Processing: Allow sufficient time for submittal review, including time for resubmittals.
   1. Allow a minimum, of fifteen (15) calendar days for review.
      a. Allow additional time if the Architect must delay processing to permit coordination with subsequent submittals.
      b. The Architect will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
   2. No extension of Contract Time will be authorized because of:
      a. Failure to comply with approved Submittal Schedule.
b. Failure to transmit submittals for Architect’s review, sufficiently in advance of the Work to permit processing.

3. Time as specified for Architect’s review commences upon receipt of submittals by Architect.

1.5 MANUFACTURER’S AND CONTRACTOR’S CERTIFICATES AND TESTS REPORTS

A. Submit certificates and test reports, in duplicate, in accordance with requirements of each Specification Section.

1.6 WARRANTIES

A. Provide duplicate notarized copies and submit to Architect.

1. Execute and assemble documents from subcontractors, suppliers, and manufacturers.

2. Provide Table of Contents and assemble in three-ring binder with durable plastic cover.

3. Submit prior to final Application for Payment.

4. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

B. Where a warranty is specified to be submitted for more than 1 year, a sample of the warranty should be submitted with the product data to assure that the manufacturer can comply to the specified duration prior to approving the product data prior to the Operation and Maintenance manuals being assembled.

1.7 AS-BUILT DATA

A. Methods & Implementation

1. The Contractor is responsible for the following at their expense for the reproduction of (1) full size blueline print of each contract sheet within the project’s entire complete drawing package. This original reproduction shall be marked accordingly to reflect all deviations incurred during the actual construction phase of the project, which differs from the contract drawings. All marks shall be made and must be permanent. The color green shall be used to indicate all additions and red to indicate all deletions. The remarked data must indicate all deviations without exception, which include the following required data.

   a. All utility locations, such as electric transmission lines, gas lines, etc., along with related description of said elements.

   b. All existing components of any kind or description must be noted to exist within the project’s construction boundaries. The data shall include position relative to permanent features by using appropriate dimension guidelines.

   c. The locations and dimension of any Changes to the building or structure, which includes changes to: dimension or location shall be included.

   d. All underground utilities and/or facilities shall be accurately located, which includes dimensions relative to permanent structural features.

   e. Any changes to topography, drainage grade, elevations, structures, utilities, roads, road alignment or any other physical feature, which deviate from the contract plans. This includes all additions and deletions, along with any change that may affect drainage patterns due to the projects scope.

   f. Any deviations, additions or deletions to any project design detail, which includes any information related to working drawings specified to be provided by and/or furnished by the Contractor.
g. All information related to the Contractor’s furnishment and/or provision of: fabrication, erection, installation, and placing details along with size specifics, (i.e., such as pipes, insulation material, etc.),
h. All changes and/or modifications which differ from the original design intent or from final inspection.
i. Indication of option used in construction where contract documents and drawings allow for options.
j. All options not used for construction shall be deleted.
k. All deviations shall be indicated consistently and in accordance as the general detail and information utilized in the contract drawings. Continuous effort shall be made consistently without fail during construction to keep all “As-Built” marks up to date through and until the completion of work has been exercised. All data sheets are to be marked as “As-Built Field Marks” and shall not be used for purposes. This information shall be available at all times for review by the University’s designated representative as identified in the project contract. NKU will require a joint review of all marks as defined in the project contract. Failure to maintain current marks is considered sufficient justification to withhold a monetary retainage from the monthly pay applications until marks are brought current to date.

2. All “As-Built Field Marks” drawings will be returned for correction, if upon review the University deems them to be in error and/or exists with omissions. Deficiencies, error and/or omissions must be corrected immediately. The drawings must be returned to NKU’s designated representative within 10 calendar days upon receipt of returned drawings noting all said corrections. Production of all record drawings shall include joint efforts between the Project Architect/Engineer and Contractor. The Architect/Engineer is responsible for review and verification of said documents and must note any necessary revision to reflect "as-built" conditions based upon observations of the project work. The Contractor shall be responsible for incorporating all comments made by the Architect/Engineer. The Contractor may opt to contract the project Architect/Engineer to produce the project’s As-Built CAD files. The Contractor must coordinate with NKU’s designated representative to determine how to achieve this task for all projects designed inhouse by the University.

B. Submittal Requirements

1. The As-Built data is to be submitted to the University Architect or designated NKU representative for review, as identified in contract documents. Substantial Completion will not be granted until these items are received and approved in writing by Northern Kentucky University.
   a. (1) Electronic set of scanned pdf files for each drawing sheet from the related original “As-Built Field Marks” sheet contained on a compact disc. Multiple discs may be used if necessary. Files shall not be zipped. Each drawing/sheet will be scanned to a 400 dpi pdf format (black and white). Each scanned pdf file shall be named the same as the drawing sheet number and marked as, "As-Built Field Marks."
   b. (4) Sets of hardcopy drawings from CAD as-builts.
   c. (1) Electronic set of PDF files created for each sheet of the CAD as-builts contained on a compact disc. Provide two copies of files on (2) separate hard drives. Files shall not be zipped.
   d. (1) Electronic set of all CAD drawings each sheet within contained on two copies of files on (2) separate hard drives. Files shall not be zipped. All drawings shall comply with the current NKU standards.
1.8 OPERATION AND MAINTENANCE MANUALS – GENERAL

A. Assemble:
   1. Compile electronic data in pdf format on a disk format. Organize data in files per Division, and Section.
   2. Maintenance materials in packaging provided by manufacturers or as required to facilitate clean and organized storage by Owner.
   3. Comply with requirements of General in addition to the following requirements herein.

1.9 OPERATION AND MAINTENANCE MANUALS AND MATERIALS FOR OPERATING ITEMS

A. Obtain from manufacturers of equipment and products, operating and maintenance booklets, spare parts lists, and approved shop drawings relevant to the proper care and operation of the equipment.
   1. Refer to Mechanical and Electrical for additional requirements for operation and maintenance manuals.

B. Provide:
   1. Data describing operation of systems and equipment and a recommended maintenance schedule including such information as location, function, calibration procedures, performance curves, maintenance procedures and requirements, and valve schedules.
   2. Names, addresses and telephone numbers of suppliers of replacement parts for all equipment.

1.10 MAINTENANCE DATA AND MATERIALS FOR FINISH MATERIALS WHERE SPECIFIED

A. Obtain from manufacturers of products maintenance data and replacement materials for proper maintenance of finish materials.

B. Provide:
   1. Data describing recommended maintenance schedules, materials and methods.
   2. Names, addresses and telephone numbers of suppliers of replacement materials and maintenance materials.
   3. List of replacement materials required by specifications and provided by manufacturers. Indicate type of materials, location in building and quantities.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

Not Applicable

END OF SECTION
SECTION 01 3300.01

ELECTRONIC TRANSFER AGREEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Comply with all sections of Division 1 and General and Supplementary Conditions for the Project.
2. Release of Architect’s electronic files for use by contractors and subcontractors.

1.2 SUBMITTAL PROCEDURES

A. General: Architect will provide Electronic Drawings to the Contractor, subcontractor or Vendor thru General Contractor for use in preparing submittals. Contractor, subcontractor or Vendor will be required to sign Architect's waiver form (provided at end of section).

1. Electronic drawings are not construction drawings.
2. Submittals that are merely reproductions of Architect's and/or Engineer's electronic drawings will be rejected.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 RELEASE OF ARCHITECT’S AND ENGINEERS ELECTRONIC FILES

A. The attached Electronic Data Transfer Agreements as provided by the respective parties originating the drawings shall set forth the Terms and Conditions for the transfer of the party’s Electronic Data to the General Contractor, or Sub-Contractor, exclusively for its use in connection with the construction of this Project and this Project alone. All other rights fully reserved by Architect or Architect’s Consultant.

B. Applications for files:

1. By General Contractor: Made directly to Architect.
2. By Subcontractor: Made indirectly to Architect through General Contractor.

C. Requests:

1. In triplicate.
2. Fully executed prior to submittal to Architect.

PART 4 - ATTACHMENTS

4.1 ELECTRONIC DATA TRANSFER WAIVER

A. Agreement Between Architect and General Contractor for Transfer of Electronic Data:
AGREEMENT BETWEEN ARCHITECT AND GENERAL CONTRACTOR AND/OR SUBCONTRACTOR - VENDOR FOR TRANSFER OF ELECTRONIC DATA

The Project: Astronomical Observatory
The Owner
Northern Kentucky University
Highland Heights, KY

The Architect: GBBN Architects, Inc.
The General Contractor:
332 E. 8th Street
Cincinnati, OH 45202

This Electronic Data Transfer Agreement shall set forth the Terms and Conditions for the transfer of the Architect’s Electronic Data to the General Contractor, Sub-Contractor or Vendor for its use in connection with the construction of this Project only.

References to the Architect, Owner, General Contractor, Sub-Contractor and Vendor apply equally to their agents, contractors, sub-contractors and consultants for the project noted above and transfer thereto of Electronic Data is hereby authorized.

Electronic Data includes but is not limited to; Revit Files (rvt) including native file formats (DWG) and drawing exchange formats (DXF), files produced by word processing, spread sheet, scheduling, data base and other software programs. The Electronic Data may be provided in an original format produced by GBBN ARCHITECTS or an alternate, “translated” format as requested by other parties to this Agreement. Regardless of the method of transfer used, Architect shall transfer data to Owner and General Contractor only. Further distribution and management of Electronic Data is responsibility of the recipient.

The means by which the Electronic Data is transferred may include, but are not limited to, electronic mail, File Transfer Protocol sites, project websites, and disc copies transmitted between the parties in this Agreement. Owner and General Contractor acknowledge that Electronic Data transferred in any manner or translated from the system and format used by GBBN ARCHITECTS to an alternate system or format is subject to errors that may affect the accuracy and reliability of the data and that the data may be altered, whether inadvertently or otherwise. Owner and General Contractor further acknowledge that changes to the Electronic Data by anyone other than GBBN ARCHITECTS may result in adverse consequences which GBBN ARCHITECTS can neither predict nor control. Accordingly, GBBN ARCHITECTS makes no warranty, express or implied, as to the accuracy, completeness, or permanence of Electronic Data nor for their merchantability or fitness for a particular purpose. Addenda information or revisions made after the date indicated on the Electronic Data may not have been incorporated. The Electronic Data are not the Construction Documents and differences may exist between these electronic files and corresponding hard-copy Construction Documents. GBBN ARCHITECTS will retain hard copies in addition to electronic copies of the Electronic Data transferred, which originals shall be referred to and shall govern.

The Architect will transfer files by one of the methods above without charge to the General Contractor, on a limited basis. Repeated requests for files, and conversion of files to formats other than (dwg or rvt) will be at Architect’s standard hourly billing rates, but not less than $100.00 per request.

Owner, General Contractor, Sub-contractors and Vendors acknowledge that the Architect does not provide support services in connection with the use of the referenced Electronic Data.

The use of Electronic Data prepared by the Architect shall not alter the General Contractor’s nor the Sub-Contractor’s or Vendor’s responsibility for the preparation, checking and coordination of required submittals.

General Contractor, Sub-contractors and Vendors acknowledge that the data contained in Electronic Data are the instruments of service of the Architect. The use of the referenced Electronic Data for completion of this project by others, for additions to this project, for solicitation of other projects, or for use on other projects is strictly prohibited, excepting only such use as may be authorized, in writing, by GBBN ARCHITECTS.

This agreement shall be governed by the laws of the state of Ohio.
Therefore, in consideration of the Architect’s agreement to deliver the Electronic Data as its instruments of professional service, Owner, General Contractor, Sub-contractors and Vendors agree to the fullest extent permitted by law to waive and release and to hold harmless and indemnify the Architect from and against any and all claims, demands, liabilities, losses, damages, and costs including, but not limited to, attorney's fees arising out of, or in any way connected with, the transfer, use, modification, misinterpretation, misuse or reuse of the machine-readable information and data provided by the Architect under this agreement.

The transfer to any party not authorized by this agreement or use of this data by any person not a party hereto is prohibited. The undersigned understand and agree that equitable and injunctive relief is appropriate in the event of any such transfer or unauthorized use since monetary damages alone are inadequate.

IN WITNESS WHEREOF, the parties hereto have executed this agreement as of the dates stated below. Witness of signing required for each party participating in this agreement.

ARCHITECT:
GBBN Architects, Inc.

By: 
Title: 

WITNESS
Title

Date of Execution: 

GENERAL CONTRACTOR:

By: 
Title: 

WITNESS:
Title

Date of Execution: 

CONTRACTOR (SUBCONTRACTOR):

By: 
Title: 

WITNESS:
Title

Date of Execution: 

VENDOR:

By: 
Title: 

WITNESS:
Title

Date of Execution:

END OF SECTION
SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Application and Conflict:
   1. This section applies to all portions of the Work. In the event of conflict between provisions herein and those otherwise required by the Owner for the Contractor, consult with Owner for resolution.
   2. References herein to, or repetition of, any portions of Project Manual preceding Division 01 shall not nullify any un-referenced or un-repeated portions thereof.

B. Section Includes:
   1. Administrative and procedural requirements for quality assurance and quality control.
      a. Regulatory Requirements
      1) Applicable Codes and Regulatory Agencies
      2) Permits
      b. References
      1) Reference Standards
      2) Definitions
      c. Quality Assurance
      d. Quality Control

1.2 RESPONSIBILITIES

A. Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, Contractor shall provide quality-control services required for his work as specified elsewhere in the Contract Documents and as required by authorities having jurisdiction. Costs for these services are included in the Contract Sum.

B. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Owner's responsibility, the Owner will employ and pay a qualified independent testing agency to perform those services.

1.3 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect
   2. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products
   3. Specified inspections, tests, and related actions do not limit Contractor's quality control procedures that facilitate compliance with Construction Documents
4. Requirements for Contractor to provide quality control services required by the Owner, Architect, or authorities having jurisdiction are not limited by provisions of this Section

1.4 SUBMITTALS

A. Copies of Regulations: Obtain copies of applicable regulations and retain at Project site to be available for reference by parties who have a reasonable need to examine them

B. Submit certified written reports in duplicate for each inspection or test required by the Contract Documents
   1. Submit additional copies directly to authorities having jurisdiction

C. Testing Agency Reports:
   1. Date of issue
   2. Project title and address
   3. Name, address, and telephone number of testing agency
   4. Dates and locations of samples and tests or inspections
   5. Ambient conditions at time of sample taking and testing
   6. Names of persons responsible for inspections, sampling, and tests
   7. Designation of the Work and test method
   8. Identification of products and Specification sections
   9. Complete inspection or test data
   10. Test results and interpretations of results
   11. Comments or professional opinion on whether inspected or tested Work conforms to Contract requirements
   12. Recommendations regarding re-testing
   13. Name and signature of laboratory inspector

D. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

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

1.5 REGULATORY REQUIREMENTS

A. Applicable Codes and Regulatory Agencies
   1. The "Kentucky Building Code" (latest edition) including all amendments as administered shall govern in addition to any other code authority indicated in the Specifications.
   2. Specified requirements in excess of requirements of codes referenced herein shall take precedence over codes referenced herein.
   3. The repetition of or reference to any portion of codes referenced herein shall not negate any unrepeated or unreferenced portions of codes referenced herein.
4. Requirements of The Occupational Safety and Health Administration (OSHA) and The Environmental Protection Agency (EPA) that apply to work places and to building construction shall govern the Work in addition to any other code authority referenced herein.

5. Requirements for persons with disabilities: Comply with building code referenced above and with The Americans with Disabilities Act Accessibility Guideline (ADAAG).

B. Permits:
   1. Architect will obtain building permit.
   2. Contractor shall apply for, obtain and pay all costs for plan examinations, permits, fees and inspections which may be required by state laws, ordinances, rules and regulations for various portions of the Work.
   3. Expedite obtaining of permits for fire protection, fire detection and all other permits so as not to delay installation of or coordination with the Work.
   4. File copies of permits and inspection certifications with Architect.
   5. Comply with requirements of governing building authorities for procedures to be followed in preparation for obtaining occupancy permit.

1.6 REFERENCES

A. Applicable Standards:
   1. Code Listing: Any reference to standards of any society, institute, association, or governmental agency which is part of the referenced Building Code shall comply with the edition date published in the referenced Building Code.
   2. Non-Code Listings: Any reference to standards of any society, institute, association, or governmental agency which is not a part of the referenced Building Code shall be the edition in effect at the time of opening of Bids, except as otherwise specifically stated in this Project Manual.
   3. In case of conflict between the published standard and the Contract Documents, the latter shall govern. The repetition of or reference to any portion of a standard shall not negate unrepeated or unreferenced portions thereof.
   4. No claim for additional compensation will be permitted due to failure to be fully informed of requirements of referenced standards, or other published standards referenced in the Contract Documents.

B. Conflicting Requirements
   1. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
   2. 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 Architect for a decision before proceeding.
1.7 QUALITY ASSURANCE

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

B. 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.

C. 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.

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. 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.

F. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

G. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities recognized as experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

H. Testing Agency Qualifications: Engage agencies that comply with the American Council of Independent Laboratories’ “Recommended Requirements for Independent Laboratory Qualification” and that specialize in the types of inspections or tests required.

1. Where testing or inspection is required to demonstrate compliance with codes, statutes, or other public regulations, employ agencies acceptable to authorities having jurisdiction for enforcing those regulations.

1.8 PROJECT CONDITIONS

A. Testing agencies are not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents, nor to approve or accept any portion of the Work.

B. Coordination: Coordinate sequence of activities to accommodate required services with minimum delay. Coordinate activities to avoid necessity of removing and replacing construction to accommodate inspections and tests.

1. Contractor is responsible for scheduling times for inspections, tests, taking of samples, and similar activities.
1.9 MANUFACTURER'S FIELD SERVICES

A. Where required by specifications or needed for execution of warranty, arrange for manufacturers to provide authorized technical representatives to attend pre-installation conferences, and to observe field conditions, quality of workmanship, testing, and start-up of equipment, as applicable, and to make recommendations for quality control.

B. Submit copies of written reports by technical representatives to Architect as informational submittals

1.10 MOCKUPS

A. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.

1. Where required by specifications, erect complete full-scale mockups of assemblies at project site in conformance with requirements for final Work, unless otherwise specified. Use same products and execution intended for final Work.

2. Place mockups where directed by Architect.

3. Provide foundations, bracing, and supports needed for strength and stability.

4. Alter or remove and reconstruct mockups that do not conform to requirements for the Work as necessary to demonstrate conformance.

5. Mockups are subject to same testing as final Work.

6. Accepted mockups shall serve as comparison standards for final Work. Maintain mockups in clean, undamaged condition until removed.

7. Remove mockups, including temporary foundations, bracing, and supports, from site when acceptable to Architect.

1.11 QUALITY CONTROL

A. Each Contractor shall be responsible for performing work in compliance with Contract Documents.

B. If a portion of the Work is covered contrary to the Architect’s request or to requirements specifically expressed in the Contract Documents, it must, if required in writing, be uncovered for observation and be replaced at the Contractor’s expense without change in the Contract Time.

C. If a portion of the Work has been covered which the Architect has not specifically requested to observe prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such Work is not in accordance with the contract Documents, the Contractor shall pay such costs unless the condition was caused by the Owner in which event the Owner shall be responsible for payment of such costs.

D. The Contractor shall promptly correct Work rejected by the Architect as failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear costs of
correcting such rejected Work, including additional testing and inspections and compensation for the Architect’s services and expenses made necessary thereby.

E. The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

F. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
   1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
   2. Notifying Architect, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
   3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect, with copy to Contractor and to authorities having jurisdiction.
   4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
   5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
   6. Retesting and reinspecting corrected work.

1.12 REPAIR AND PROTECTION

A. Upon completion of testing, inspection, sample taking, and similar activities, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes.

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

C. Repair and protection is the Contractor's responsibility, regardless of assignment of responsibility for testing, inspection, or similar services.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

Not Applicable

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Application and Conflict:
   1. This section applies to all portions of the Work. In the event of conflict between provisions herein and those otherwise required by the Owner for the Contractor, consult with Owner for resolution.
   2. References herein to, or repetition of, any portions of Project Manual preceding Division 01 shall not nullify any un-referenced or un-repeated portions thereof.

B. Section Includes:
   1. Temporary utilities.
   2. Construction facilities.
   3. Temporary construction.
   5. Vehicular access and parking.
   6. Temporary barriers and enclosures.
   7. Temporary controls.
   8. Project identification.

1.2 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction.

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

1.3 TEMPORARY UTILITIES

A. Coordinate all electric power and utility interruptions with the Owner providing a minimum forty-eight (48) hour advance notice.

B. Utility, Fuel and Water Costs:
   1. Utilities required by the Contractor to perform their work can be obtained from the University. The University reserves the right to require the Contractor to furnish a meter to record the usage of each provided utility for the duration of the project. For projects requiring utility metering, a deduct change order will be issued at the end of the Project to reimburse the University for the Contractor utility usage. The Contractor is responsible for determining and coordinating the procurement of any utility where the University cannot reasonably provide.

   2. Contractors shall pay fuel costs for temporary units not connected to the building’s utility systems.
3. If Owner's existing utilities are inadequate, provide facilities specified below.
4. Do not waste utilities, fuel and water by unnecessary running of equipment, unnecessary opening of windows and doors and other unnecessary or wasteful actions.
5. Where a service of a type other than the specified is required, the Contractor or Subcontractor requiring special service shall install and pay all costs for special service.

C. Temporary Electric:
1. Temporary electric work specified below shall be performed by Electrical subcontractor.
2. Connect to existing electrical service and provide temporary electrical distribution as specified herein and in Division 26, all in compliance with The National Electrical Code and other codes referenced in the Construction Documents.
3. Install temporary wiring throughout project and provide electrical outlets for single phase tools or extension lines.
   a. Maintain a minimum lighting intensity throughout the buildings based on a minimum of one (1) two-hundred (200) watt lamp for each four-hundred and fifty (450) square feet of floor area. Provide a higher intensity where the nature of the Work being performed requires. Provide one-hundred and twenty (120) volt outlets for extension cords within one-hundred feet (100'-0") of any part of the buildings. Extend two-hundred and eight (208) volt power to locations as required and as directed by the Contractor. Each Subcontractor shall furnish his own additional lamps and extension cords.
   b. Provide 3 phase current or other electric facilities required in excess of those herein specified.
   c. Provide ground fault circuit interrupters (G.F.C.I.) on all panels and receptacles.

D. Temporary Heating, Ventilating and Air Conditioning:
1. General requirements:
   a. After approval for temporary use, protect existing heating, ventilating and air conditioning (HVAC) system from abnormal usage, damage or abuse during construction.
   b. Do not waste heat, ventilation or air conditioning through exterior openings being left open, or by heating or cooling interior spaces above or below specified temperatures.
   c. For odor control within building, provide sufficient ventilation to outdoor air prior to, during and after installation of materials specified in other divisions of Specifications. Comply with EPA and other applicable standards for indoor air quality.
      1) Prevent hazardous accumulations of dusts, fumes, mists, vapors or gases in areas occupied during construction.
      2) Provide exhaust ventilation to prevent harmful hazardous substance dispersal into occupied area atmosphere.
      3) Dispose of exhaust materials in manner which will not result in harmful exposure to persons.
      4) Ventilate storage spaces containing hazardous or volatile materials.
   d. Provide high efficiency throw-away type air filters in all units. Maintain and replace filters at intervals to ensure that adjacent occupied areas receive air quantities being received at the start of construction and to prevent spread of dust to these areas.
   e. Protect hydronic systems from freezing; provide sufficient glycol in the system's water.
2. Portable temporary units:
a. Provide portable temporary HVAC units of the number and size necessary to provide adequate heating, ventilating or air conditioning of interior space as required to permit work of all trades to proceed according to the Progress Schedule once building is enclosed.
b. Remove portable HVAC units at end of heating or cooling season or at the time permanent system is ready and approved for use for temporary HVAC.

3. Use of permanent HVAC system for temporary heating, ventilating and air conditioning to maintain specified requirements for temperatures, humidity and ventilation prior to Substantial Completion:
   a. Work specified in the following subparagraphs shall be provided by Heating, Ventilating and Air Conditioning Contractor.
   b. After Architect's and Owner’s approval, make transition from temporary units to the permanent system.
   c. Make necessary final connections for use of permanent heating system.
   d. Provide high efficiency throw-away type air filters in all units and maintain and replace them as required.
      1) Provide filter fabric at all return Grilles and replace as necessary. Remove at Contract Completion.
   e. Protect hydronic systems from freezing; provide sufficient glycol in the system's water.
   f. Provide temporary heating, ventilating and air conditioning and provide all necessary maintenance and operating personnel to maintain specified requirements for temperatures, humidity and ventilation for 24 hours a day, seven days a week.
   g. Immediately prior to transition from temporary use to permanent use, remove filters and replace with specified filters; drain hydronic systems, flush and refill, and thoroughly clean equipment.
   h. Correction of work associated with use of permanent system, although started prior to Contract Completion, shall extend for the full one-year period following Contract Completion.

E. Temporary Water

1. Obtain water from existing building or exterior hose bib. Provide service sink or other facility to allow use for construction purposes and prevent damage to any areas of building. If the existing systems are insufficient, provide temporary water services from the existing services designated by the Owner.

1.4 CONSTRUCTION FACILITIES

A. Temporary Sanitation Facilities:
   1. Coordinate with Owner to designate permanent sanitation facilities within building. Facilities shall be cleaned and maintained daily.

B. Temporary Portable Fire Protection Equipment:
   1. Provide temporary portable fire protection equipment throughout Contract Time to meet the requirements of codes referenced in Division 01; keep equipment accessible at all times in compliance with said codes.
   2. Do not reduce or diminish fire alarm or fire protection for building occupants, at any stage of construction, to less than that existing at the start of construction.
C. Debris Control:
   1. Maintain all areas occupied by Owner, and areas under the Contractor’s control free of extraneous debris.
   2. Containers for Waste Materials:
      a. Provide on-site containers for collection of waste materials, debris and rubbish; empty at regular intervals.
      b. Prohibit truck overloading to prevent spillage on access roads and haul routes. Provide periodic traffic areas inspection to enforce requirements.

D. If loading dock area is utilized for delivery and removal of materials, coordinate with Architect and Owner’s requirements to provide separation between construction and Owner’s use. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

E. Smoking and Tobacco: Refer to General and Supplemental Conditions.
   1. The use of smokeless tobacco is prohibited on job site.

1.5 VEHICULAR ACCESS AND PARKING

A. Keep existing driveways and entrances serving the premises clear and available to the Owner and his employees at all times. Do not use these areas for parking or storage of materials.

B. Keep fire lanes and access for emergency vehicles free and clear at all times.

C. Refer to General Conditions for Contractor personnel parking.

1.6 CONSTRUCTION AIDS

A. Provide, operate and maintain portable lifts, hoists and other equipment as necessary to vertically transport equipment and material required by all trades; comply with all codes referenced in the Contract Documents for such equipment. Locate only at windows designated by Owner. Review with Owner the construction and support of portable lifts, hoists and other equipment before installation due to difficulties of site, shoring of roofs, or other requirements.

B. Scaffolding: Contractor shall provide and install all materials required for staging, platforms, temporary flooring, railings, and ladders as required by Local and State Laws for the protection of employees on the work. The Contractor shall be held responsible for installation, maintenance and removal of all scaffolding and equipment required for the construction.
   1. At no time should Contractor borrow any equipment, ladders, scaffolds, containers, tools, etc., from Northern Kentucky University or its personnel.

C. Temporary Signs: Prepare signs to provide directional information to construction and Owner’s personnel, and visitors.

1.7 PROJECT WORK SITE SAFETY & SECURITY

A. The University does not, and will not, assume any responsibility for any tools, materials, equipment, or property belonging to the Contractor, his employees or agents, which may be lost or stolen from University property. All contractors and subcontractors are solely responsible for properly securing and protecting their tools and equipment.
B. When working within or on top of an existing building, the Contractor shall work with the assigned University project manager in developing a strategy for securing the project work site and protecting the campus staff and community from the project work site. When working in an open area on campus, the Contractor shall provide securable barricades/fencing around the project site to protect the campus community from the dangers within the project work site. The Contractor shall maintain this project work site protection 24 hours a day, 7 days a week for the duration of the project.

C. Protection of Persons:
   1. Contractors shall each provide temporary construction, such as protection of openings in floors and roof, barricades at open excavations, and protection of other hazardous conditions, for each of their respective portions of the Work, to ensure compliance with requirements of General Conditions, and Applicable Codes and Regulatory Agencies specified in Division 01, for protection of persons throughout Contract Time.
   2. Refer to other sections of Specifications for further requirements for protection of persons.

D. Temporary Enclosure of Exterior Openings:
   1. Provide temporary weathertight enclosures for all exterior openings cut in walls of existing building as required for each of their respective portions of the Work, to protect existing building from weather and to meet the Progress Schedule; equip exterior doors with self-closing hardware, padlocks.
   2. Temporary enclosures in openings in existing building shall be as secure at all times during construction as the openings in the existing building at the start of construction. At no time shall construction work cause the existing building to be less secure than it was at the start of construction.

E. Provide temporary enclosures to separate Work areas from areas of existing buildings occupied by Owner to prevent penetration of dust or moisture into occupied areas, prevent damage to existing equipment, and protect the Owner’s employees and operations from construction Work.
   1. Temporary Partition and Ceiling Enclosures including framing, sheet materials and door openings which comply with structural and fire rating requirements of applicable codes and standards.
      a. Close joints between sheet materials, and seal edges and intersections with existing surfaces, to prevent penetration of dust or moisture. Paint “occupied” side of partition with two (2) coats of latex paint.
      b. In locations where fire protection is required, paint both sides of partitions and ceilings with fire-retardant paint to provide maximum flame spread of twenty-five (25) in conformance with ASTM E84 and as required by local fire officials.
      c. Provide mechanical ventilation systems to maintain uninterrupted ventilation of Work areas adjacent to occupied space and ensure air flow from occupied space to Work areas. The Contractor shall be responsible to prevent airborne materials from contaminating adjoining areas.
   2. Walk off mats are to be utilized at all entrances to Owner-occupied areas from the Project Area. Two mats are required, a carpet mat inside the entrance door and a sticky mat outside the entrance door. Provide walk-off mats at entrances of stairways and elevators.
F. Protection of Surfaces:
   1. Protect items, exposed unfinished surfaces and finish surfaces as specified below. If items, exposed unfinished surfaces or finish surfaces are stained, discolored, damaged, or otherwise rendered in unacceptable or unusable condition, as determined by Architect, restore to new condition or replace with new, to satisfaction of Architect, with materials approved by Architect and manufacturer of items, exposed unfinished surfaces and finish surfaces being restored.
   2. Cover jambs of door frames in finished masonry openings to 72-inch height above floor.
   3. Provide box protection for non-ferrous metal work wherever exposed to possible damage.
   4. Protect unfinished surfaces that are to be left exposed in the finished work from oil or any other substances which could cause staining, discoloration or other damage to appearance of surface.
   5. Protect surfaces that are to be finished with transparent materials from oil or any other substances which could cause staining, discoloration or other damage to appearance of surface after application of transparent materials.
   6. Protect surfaces that are to be finished with other materials from oil or any other substances which could inhibit adherence of finish materials.
   7. Protect finished flooring surfaces with heavy corrugated kraft paper walkways and hardboard overlay or other suitable means approved by Contractor for the use of workmen. Limit construction traffic over such surfaces to that necessary to complete the Work.
      a. Tape seams and edges of overlay to prevent debris from becoming trapped underneath and damaging floors. Do not tape to finished surfaces.
      b. Protection shall be maintained regularly and damages to temporary covering in a timely fashion to prevent damage to flooring.
      c. Where overhead work is performed over finished flooring provide tempered hardboard over cardboard protection layer.
      d. Repair damages to protective covering in a timely manner. Do not allow covering that becomes wet or stained to remain on finished flooring.

G. Removal, storage and replacement of existing building components
   1. Remove, store, protect and replace windows and other building components required for access for construction as coordinated and approved by Owner.
   2. Clean, repair and restore to condition when removed, or replace with new to match existing, any items soiled or damaged by removal, storage or replacement as approved by Architect.

H. Temporary Fence:
   1. Provide temporary fence around areas of construction including material storage areas and waste management; comply with OSHA and other applicable regulations for exclusion of unauthorized persons.

I. Repair of Temporary Barriers and Enclosures:
   1. Other Contractors removing or damaging protection shall reinstall same in a timely fashion.
   2. Provide all necessary labor, material and equipment to repair or reconstruct Barricades and fencing damaged as a result of his work.

1.8 TEMPORARY CONTROLS

A. Cleaning During Construction: Refer to Division 01 Section – Execution Requirements.
B. Vibration, Noise, and Dust Control:
   1. Refer to General Conditions.
   2. Noise Control: Coordinate noisy operations with the Owner providing a minimum forty-eight (48) hour advance notice.
   3. Dust Control: Provide positive methods and apply Dust Control materials to minimize construction operation dust, and provide positive means to prevent airborne dust from dispersing into the atmosphere.
      a. All materials transported through building shall be covered with an approved material to prevent spread of dust and dirt.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials; if acceptable to the Architect, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended and not create unsafe conditions but not violate applicable codes and regulations.

B. Lumber and Plywood: Comply with requirements in Section 061050 – Miscellaneous Rough Carpentry.
   1. For job-built temporary offices, shops and sheds within construction area, provide UL labeled, fire treated lumber and plywood for framing, sheathing, and siding.
   2. For signs and directory boards, provide exterior type, Grade B-B High Density Concrete Form Overlay Plywood conforming to PS-1, of sizes and thickness indicated.

C. Tarpaulins: Provide waterproof, fire-resistant, UL labeled tarpaulin with flame spread rating of 15 or less. For temporary enclosures, provide translucent, nylon reinforced, laminated polyethylene of polyvinyl chloride fire retardant tarpaulins.

D. Water: Provide potable water approved by local health authorities.

PART 3 - EXECUTION

3.1 PREPARATION

A. Contractor shall review, with the Owner and Architect, site conditions which affect Construction Procedures and Construction Aids, including adjacent properties and public facilities which may be affected by execution of the Work.

3.2 GENERAL

A. Comply with applicable requirements specified in Divisions 2 through 28.

B. Relocate Construction Aids as required by construction progress, by storage or Work requirements, and to accommodate the Owner’s requirements and other Contractors and Subcontractors.
3.3 REMOVAL / RESTORATION

A. Completely remove temporary materials, equipment and services from the site without additional cost to the Owner when:
   1. Construction requirements are satisfied by use of permanent construction or;
   2. Project is complete or as directed by the Owner.

B. Clean and repair damage caused by installations or by use of temporary facilities.

C. Restore permanent facilities including existing stairs and elevators used for Construction Aids to their original condition.

END OF SECTION
SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Application and Conflict:
   1. This section applies to all portions of the Work. In the event of conflict between provisions
      herein and those otherwise required by the Owner for the Contractor, consult with Owner for
      resolution.
   2. References herein to, or repetition of, any portions of Project Manual preceding Division 01
      shall not nullify any un-referenced or un-repeated portions thereof.

B. Section Includes:
   1. Product Dates.
   2. Product Options.
   3. Quality Assurance
   4. Product Identification
   5. Delivery and Storage

C. This Section includes administrative and procedural requirements governing the Contractor's
   selection of products for use in the Project.

1.2 PRODUCT DATES

A. Manufacturer's products required by Contract Documents shall be the latest available at the time of
   opening of bids.

B. Subsequent improvements to manufactured products that are available at no increase in cost to the
   Owner shall be supplied if available at time of ordering, subject to acceptance by Architect. If
   such improvements are available at an increase in cost to the Owner, notify Architect.

1.3 PRODUCT OPTIONS

A. The intent of these specifications is to provide open bidding among qualified manufacturers. Those
   manufacturers not listed are given the opportunity to bid by following the requirements below.

B. 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," Architect will make selection.


C. Methods of specifying products, and options permitted up to bid date:

1. Reference or performance standards: Select product meeting standards by any manufacturer and approved by Architect prior to Contract signing.

2. One manufacturer as standard and other manufacturers specified: Provide product of manufacturer as standard, or select product of same design, quality and performance characteristics by one of the other manufacturers listed. Any substitute product shall have been approved by addendum or listed on Substitution Sheet of Bid Form and approved by Architect prior to Contract signing.

3. One manufacturer only: Provide product by manufacturer specified. Any substitute product shall have been approved by addendum or listed on Substitution Sheet of Bid Form and approved by Architect prior to Contract signing.

4. One or more manufacturers with term "Acceptable Manufacturers" or similar wording, or followed by the term "or equal", "or approved equal", or similar term: Provide product by manufacturer or one of manufacturers specified. Any substitute product for approval of "or equal", "or approved equal", or similar term shall have been approved by addendum or listed on Substitution Sheet of Bid Form and approved by Architect prior to Contract signing.

D. Substitutions:

1. The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

2. If the Architect approves a proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum.

3. No substitutions will be considered after the Contract award except as allowed in General Conditions or specifically provided in the Contract Documents.

4. Substitution Requests prior to receipt of bids: Coordinate with requirements specified in Instructions to Bidders.

   a. Substitution Request Form: Use attached Substitution Forms. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles. Failure to properly execute the following substitution forms shall be basis for rejection.

      1) Substitution Request Form.
      2) Product Substitution History Form
      3) Effect of Substitution Form

5. Conditions for Consideration: Architect will consider Contractor's request for Comparable Product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

   a. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

   b. 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.

   c. Evidence that proposed product provides specified warranty.
d. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.

e. Samples, if requested.

### 1.4 QUALITY ASSURANCE

**A. Source Limitations:** To the fullest extent possible, provide products of the same kind from a single source.

**B. Compatibility of Options:** When the Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. Each prime contractor is responsible for providing products and construction methods that are compatible with products and construction methods of other prime or separate contractors.

2. If a dispute arises between prime contractors over concurrently selectable, but incompatible products, the Architect will determine which products shall be retained and which are incompatible and must be replaced.

**C. Measurements and Dimensions:** Take measurements of constructed conditions before ordering products or doing work requiring same. Notify Architect of discrepancies between Contract Documents and constructed conditions before any affected work is started.

### 1.5 PRODUCT IDENTIFICATION

**A. Product Identification:** Manufacturer's permanent product identification marks, labels and logos shall be located as inconspicuously as practicable and as approved by Architect.

1. Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous. Provide layout and type of label and indicate location on shop drawings.

### 1.6 DELIVERY, STORAGE AND HANDLING

**A. Delivery, Store and Handle:** Deliver, store and handle products in compliance with manufacturer's requirements, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
   a. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

   b. Deliver products to the site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. No other containers or packaging will be permitted on the Site.

   c. Immediately inspect products upon delivery to ensure that products are undamaged and properly protected, that they comply with the Contract Documents, and that quantities are correct.

   d. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.

   e. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.
f. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.

B. Storage within building shall meet above requirements and shall not overload structure or create dangerous conditions.

1.7 EXTRA MATERIALS

A. Prior to Substantial Completion provide to Owner materials and quantities in properly identified cartons
   1. Furnish extra materials from same manufacturing lots as installed products.
   2. Store extra materials in original packaging with intact labels. Mark packages with locations of installed products.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Perform work in accordance with Specifications and manufacturer's instructions and specified requirements; notify Architect in case of conflict.
   1. Should there be a conflict between the Specifications and the manufacturer's recommendations, identify the conflict in a Request for Information to the Architect and await direction.
   2. The Contractor is responsible for the most complex, most extensive and most costly installation should there be a conflict between the Specifications and the manufacturer's recommendations, unless directed otherwise. Should an issue arise regarding this criteria, the Owner will make the determination.
   3. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

3.2 ATTACHMENTS

A. Substitution Forms:
   1. Substitution Request Form
   2. Product Substitution History Form
   3. Effect Of Substitution Form

END OF SECTION
SUBSTITUTION REQUEST FORM

PROJECT:            NKU Astronomical Observatory
PROJECT NUMBER:    GBBN 13372.01

TO:                  Northern Kentucky University
                     Procurement Services
                     1 Nunn Drive
                     617 Lucas Administrative Center
                     Highland Heights, KY  41099

FROM: ______________________________________________________

ABOVE FIRM HEREBY REQUESTS CONSIDERATION OF FOLLOWING PRODUCT OR
SYSTEMS AS SUBSTITUTION IN ACCORD WITH PROVISIONS OF CONTRACT
DOCUMENTS.

SPECIFIED PRODUCT OR SYSTEM:
Substitution request for:  __________________________________________
Specification Section Number:  ______________________________________
Article(s)/paragraph(s):  __________________________________________

SUPPORTING DATA:
Attach product description, specifications, drawings, photographs, performance data, test data, and any
additional data or information for evaluation of the proposed substitution in accord with requirements of
Section 01 6000.

Sample is attached:   Yes: _______   No: _______
Sample will be sent if requested: Yes: _______   No: _______

COMPARISON:
Name, brand:  ___________________________________________________
Catalog No:  ___________________________________________________
Manufacturer:  ___________________________________________________
Variations:  _____________________________________________________

Maintenance Service Available:   Yes: _____   No: _____
If yes, location:  _________________________________________________
Spare Parts Source:  _____________________________________________
### PRODUCT SUBSTITUTION HISTORY FORM

List minimum of 3 previous installations giving data regarding projects on which proposed substitution was used:

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<th>General Contractor:</th>
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EFFECT OF SUBSTITUTION FORM

REASON FOR NOT GIVING PRIORITY TO SPECIFIED ITEMS:

__________________________________________________________

__________________________________________________________

EFFECT OF SUBSTITUTION:
Proposed substitution affects other parts of Work: Yes: ____ No: ____
(If yes, explain)

__________________________________________________________

STATEMENT OF CONFORMANCE OF PROPOSED SUBSTITUTION TO CONTRACT REQUIREMENTS:

I/we have personally investigated the proposed substitution and determined that it is equal or superior in all respects to specified product or system and will perform intended function, except as stated above:

- will provide same warranty as specified;
- is in full compliance with applicable code requirements
- have included complete cost data and implications of substitution;
- will pay redesign, special inspection and other costs caused by use of this substitution;
- will pay additional costs to other contracts caused by substitution;
- will coordinate incorporation of proposed substitution in Work;
- will modify other parts of Work as may be needed, to make all parts of Work complete and functioning;
- waive future claims for added cost or time to Contract caused by substitution.

Comments: ____________________________________________________________

Acknowledgement: ____________________________________________________

Firm: ____________________________
Address: ____________________________
Date: ____________________________
by: ____________________________
Position with Firm: ____________________________
SECTION 01 7300
EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Application and Conflict:
   1. This section applies to all portions of the Work. In the event of conflict between provisions herein and those otherwise required by the Owner for the Contractor, consult with Owner for resolution.
   2. References herein to, or repetition of, any portions of Project Manual preceding Division 01 shall not nullify any un-referenced or un-repeated portions thereof.

B. Section Includes; general procedural requirements governing execution of the Work including, but not limited to, the following:
   2. General installation of products.
   3. Coordination of Owner-installed products.
   4. Progress cleaning.
   5. Starting and adjusting.
   6. Protection of installed construction.
   7. Correction of the Work

1.2 SUBMITTALS

A. Qualification Data: For professional engineer/surveyor.

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

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
   1. Before construction, verify the location and points of connection of utility services.
B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
   1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
      a. Description of the Work.
      b. List of detrimental conditions, including substrates.
      c. List of unacceptable installation tolerances.
      d. Recommended corrections.
   2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
   3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
   4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
   5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. 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.

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


3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to existing conditions. If discrepancies are discovered, notify Architect promptly.

B. Each Contractor is responsible for layout as required to complete their scope of work.

C. General:
   1. Establish benchmarks and control points to set lines and elevation 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 Contractor and Architect when deviations from required lines and levels exceed allowable tolerances.

3.4 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
   4. Maintain minimum headroom clearance of 8-feet in spaces without a suspended ceiling.

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

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

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

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

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

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

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

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

3.5 OWNER-INSTALLED PRODUCTS

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

B. Coordination: Coordinate with Contractor for construction and operations of the Work with work performed by Owner's construction forces.
   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. Preinstallation Conferences: Include Owner's construction forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully. Comply with General Conditions and the following:
   1. Cooperate with Architect to clean to condition satisfactory to Owner when directed by Owner or Architect.
   2. Requirements specified herein for progress cleaning, apply to Project Site and portions of existing building not indicated in Contract Documents as part of the Work but are affected by prosecution of the Work.
   3. Cleaning materials and methods shall be as recommended by manufacturer of material being cleaned, and in compliance with EPA and applicable regulations for maintaining indoor air quality.
   4. Execute cleaning to insure that building, grounds, and adjacent private and public properties are maintained free from accumulations of waste materials and rubbish caused by the Work.
   5. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.
   6. Refer to Section 017700 and General Conditions for final cleaning.

B. Cleaning During Construction:
   1. Keep entire Project area clean, orderly and in conformance with the requirements below. Coordinate progress cleaning for joint-use areas where more than one installer has worked.
   2. Except within building, wet down dry materials and rubbish to lay dust and prevent blowing dust.
   3. Handle materials in a controlled manner; do not drop or throw materials from heights.
   4. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.
   5. Conduct cleaning and disposal operations to comply with ordinances and laws which apply to the place of the Work, plus the following:
      a. Store volatile wastes in covered metal containers, and remove from site daily.
      b. Prevent accumulation of wastes that create hazardous conditions.
      c. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
   6. During construction, inspect stud cavities and concealed areas prior to start of gypsum board installation. Remove all debris from and vacuum clean. Keep cavities clean during drywall installation.

C. Site: Maintain Project site in order and free of waste materials and debris.

D. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
3. Provide walk-off mats at entrances to Owner-occupied areas. Mats shall be of the type to ensure that dust and dirt will be removed from shoes. Ensure that workmen do not track dust, dirt, grease or other floor soiling material onto occupied floors. If so soiled, immediately, and not less often than daily, restore floors to condition acceptable to Architect.

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

1. Remove grease, dust, dirt, stains, fingerprints, and other foreign materials, from sight-exposed interior and exterior finish surfaces; polish surfaces to match adjacent where applicable.
2. Repair, patch or touch up marred surfaces to match adjacent surfaces.

F. Waste Disposal:

1. Remove rubbish and waste from concealed spaces prior to enclosing.
2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains, or plumbing fixtures.
3. Clean with cleaning materials and methods recommended by manufacturer of material being cleaned, and in compliance with EPA and other applicable regulations for maintaining indoor air quality.
4. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.

G. 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 Contract Completion.

H. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period.

1. Adjust and lubricate operable components to ensure operability without damaging effects.

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

3.7 STARTING AND ADJUSTING

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

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

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

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

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

3.9 CORRECTION OF THE WORK

A. Comply with General Conditions.

B. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."
   1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

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

D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
   1. Includes area of Project Site and portions of existing building not indicated in Contract Documents as part of the Work but affected by prosecution of the Work.

E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Application and Conflict:
   1. This section applies to all portions of the Work. In the event of conflict between provisions herein and those otherwise required by the Owner for the Contractor, consult with Owner for resolution.
   2. References herein to, or repetition of, any portions of Project Manual preceding Division 01 shall not nullify any un-referenced or un-repeated portions thereof.

B. Section Includes:
   1. Administrative and procedural requirements for cutting and patching.

C. Related Sections:
   1. Division 01 Section, Coordination: Procedures for coordinating cutting and patching with other construction activities.
   2. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
      a. Requirements of this Section apply to mechanical, electrical, and communication installations. Refer to Facility Services Subgroup specifications for requirements and limitations applicable to cutting and patching mechanical, and electrical installations.

1.2 DEFINITIONS

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

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

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
   1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
   2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements. Identify extent of refinishing.
   3. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
   4. Products: List products to be used and firms or entities that will perform the Work.
5. Dates: Indicate when cutting and patching will be performed.

6. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.

7. Prior to cutting and patching done on instruction of the Architect submit cost estimate.
   a. Indicate designation of party responsible for cost of cutting and patching.

8. Architect’s Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

A. Cutting and patching of structural members and work affecting structural members or the structural integrity of any portion of the building: Notify Architect of necessity for cutting structural members and work affecting structural members or the structural integrity of any portion of the building; do not proceed until approved by Architect.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

D. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner.
   1. If possible retain the original Installer or fabricator to cut and patch the exposed Work listed below. If it is impossible to engage the original Installer or fabricator, engage another recognized experienced and specialized firm.

E. 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.

1.5 WARRANTY

A. In-place and existing warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or in-place.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.
B. Use materials identical to in-place and existing materials. For exposed surfaces, use materials that visually match in-place and existing adjacent surfaces to the fullest extent possible.
   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place and existing materials.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed.
   1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
   2. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of work to be cut.
B. Protection: Protect in-place and existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
D. Avoid cutting existing pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

A. General: Employ skilled workmen capable of matching the existing workmanship quality to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
   1. Quality and fire-rating of patched or extended Work shall not be less than that specified for New Work.
   2. Cut in-place and existing 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.
   3. Execute cutting (including excavating), fitting or patching of Work required to:
      a. Make several parts fit properly.
      b. Uncover work as necessary to provide for correction of ill-timed work.
      c. Remove and replace defective work.
      d. Remove and replace work not conforming to requirements of Contract Documents.
      e. Remove samples of installed work as specified for testing.
      f. Install overlooked specified work in completed new construction.
   4. Do not endanger any work by cutting or altering work or any part of it.
5. Materials and installation for patching:
   a. Meet all requirements of applicable sections of Specifications.
   b. Where cut surfaces are of unspecified products, provide material to match adjacent.
   c. Refinish entire surfaces as necessary to provide an even finish:
      1) Continuous Surfaces: To nearest intersections.
      2) Assembly: Entire refinishing.

B. Responsibility for cutting and patching:
   1. Each Contractor, shall perform cutting and patching, for work normally associated with their portions of the Work, in compliance with requirements specified above.
   2. Contractor shall coordinate cutting and patching for all branches of the Work in compliance with requirements specified above.

C. Cut using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
   4. Proceed with patching after construction operations requiring cutting are complete.

D. Patching:
   1. General: Refinish interior of existing buildings to extent specified and indicated without additional cost to the Owner:
      a. Provide materials and comply with installation requirements specified in other Sections.
      b. Prepare existing surfaces to receive new finishes and materials specified.
      c. Sand and clean existing painted surfaces prior to application of new paint. Ensure substrate will retain new paint without peeling or cracking.
         1) If existing painted surfaces will not match the existing workmanship quality, remove existing finishes and refinish as directed by the Architect/Engineer.
      d. Remove and patch loose plaster or other finishes prior to repainting or applying new finishes.
      e. Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible.
   2. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
   3. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
      a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
      b. Restore damaged pipe covering to its original condition.
4. Floors and Walls: 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, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
5. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
6. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
7. At fire rated walls, patch wall to maintain rating as indicated on Drawings.

E. Additional costs:
   1. Cost caused by ill-timed or defective work, or work not conforming to Contract Documents, including costs for additional services of Architect or Engineer: Contractor.
   2. Work done on instructions of Architect, other than ill-timed, defective or nonconforming Work: Owner.

F. Damaged Surfaces:
   1. Patch and replace any portion of an existing finished surface damaged, lifted, discolored, or showing other imperfections, with matching material.
      a. Provide adequate support of substrate prior to patching the finish.
      b. Refinish patched portions of painted or coated surfaces in a manner to produce uniform color and texture over entire surface.
      c. When existing surface finish cannot be matched, refinish entire surface to nearest intersections as directed by the Architect.

G. Existing To New Work Transitions:
   1. When New Work abuts or finishes flush with Existing Work, provide a smooth and workmanlike transition. Patched Work shall match existing adjacent Work in texture and appearance to insure the patch or transition is invisible at a distance of five feet (5'-0’’). When finished surfaces are cut and a smooth transition with New Work is not possible, terminate existing surfaces in a neat manner along a straight line at a natural line of division, and provide trim appropriate to finished surface as directed by the Architect.

3.4 CLEANING

A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials.

END OF SECTION
SECTION 01 7700
CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Application and Conflict:
   1. This section applies to all portions of the Work. In the event of conflict between provisions herein and those otherwise required by the Owner for the Contractor, consult with Owner for resolution.
   2. References herein to, or repetition of, any portions of Project Manual preceding Division 01 shall not nullify any un-referenced or un-repeated portions thereof.

B. Section includes:
   1. Project completion procedures.
   2. Project closeout submittals.
   3. Instructions to Owner.
   4. Final cleaning.

1.2 COMPLETION PROCEDURES

A. Comply with requirements of General and Supplemental Conditions.

B. Completion Inspection shall occur at one time for all Contractors.

C. Preliminary Procedures: Before requesting final inspection for determining final acceptance, complete the following:
   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 tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
   7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
   8. Complete startup testing of systems.
   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.
15. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
16. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
17. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

D. Inspection: Contractor shall 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. Final Inspection shall occur at one time for all Contractors.
   2. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

E. Should Architect consider that Work is not finally complete:
   1. Contractor(s) will be notified in writing, stating reasons.
   2. Contractor(s) shall immediately remedy the stated deficiencies and shall send second written notice to Contractor and Architect certifying that Work is complete.
   3. Architect will reinspect Work.

F. Should Architect consider that Work is finally complete in accordance with requirements of Contract Documents, Contractor will be requested to submit Project Closeout submittals.

1.3 PROJECT CLOSEOUT SUBMITTALS

A. Contractor shall submit his portion of the following documents, as applicable, in accordance with all requirements of the Contract Documents:
   1. Project record documents.
   2. Submit four (4) sets of maintenance manuals.
      a. Operation and maintenance manuals and materials where specified for mechanical and electrical equipment.
      b. Operation and maintenance data and materials for operating items other than mechanical and electrical equipment where specified.
      c. Maintenance materials and spare parts required.
      d. Maintenance data and materials for finish materials where specified.
      e. Replacement materials.
      f. Special maintenance tools if required by manufacturer for proper maintenance, or if specified.
   4. Guarantees, warranties and bonds required.
   5. Affidavits.
6. Evidence of compliance with requirements of governing authorities as applicable.
7. Release of liens and other related project closeout data, if required by Owner.

B. Attic Stock & Replacement Parts:
   1. For all project materials and systems, attic stock quantities consistent with accepted industry standards for college campuses shall be included in the project specifications. Replacement parts necessary from contractors/vendors shall either be in stock or available within 24 hours. The following minimum level of attic stock quantities shall be included in the project specifications:
      a. (1) Complete replacement cycle of filters for all HVAC equipment.
      b. (1) Replacement belt for each device or piece of HVAC equipment.
      c. 5 percent ballasts/lamps.
      d. 5 percent plumbing parts.
      e. 3 percent floor base.
      f. 3 percent floor tiles.
      g. 3 percent ceiling tiles.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 INSTRUCTIONS TO OWNER

A. After final acceptance coordinate with Architect to provide verbal instructions to Owner or Owner's designated personnel for all items specified to require same.
   1. Provide authorized factory representatives or factory-authorized personnel for instructions.
   2. Coordinate training with Owner 30 days prior to training date with training syllabus being provided.

B. Operating and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:
   1. Maintenance manuals.
   2. Record documents.
   3. Spare parts and materials.
   4. Tools.
   5. Lubricants.
   6. Fuels.
   7. Identification systems.
   8. Control sequences.
   9. Hazards.
   10. Cleaning.
   11. Warranties and bonds.
   12. Maintenance agreements and similar continuing commitments.
C. As part of instruction for operating equipment, demonstrate the following procedures:
   1. Start-up.
   2. Shutdown.
   3. Emergency operations.
   5. Safety procedures.
   7. Effective energy utilization.

D. Refer to Divisions 02 through 28 for additional requirements.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Completion. Comply with General Conditions.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
   1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
   2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
      a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
   3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
   4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

3.3 FINAL CLEANING

A. Requirements specified herein for final cleaning, apply to Project Site and portions of existing building not indicated in Contract Documents as part of the Work but are affected by prosecution of the Work.
   1. Coordinate through Architect to clean to condition satisfactory to Owner when directed by Owner or Architect.
   2. Execute cleaning to ensure that site is maintained free of accumulated waste materials. Public safety is to be maintained.
   3. Repair, patch or touch up marred surfaces to match adjacent surfaces.
   4. Clean surfaces after construction is complete, to same level of cleanliness as surfaces were before construction.
   5. Comply with safety standards and governing regulations for cleaning operations. Do not discharge volatile or other harmful or dangerous materials into drainage systems. Remove waste materials from site and legally dispose of it.
6. Remove labels that are not permanent labels.
7. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
8. Clean exposed exterior and interior hard-suraced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Vacuum carpeted surfaces.
10. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

B. Materials: Only as recommended by manufacturer for each type of surface. Ensure that materials comply with requirements of EPA and other applicable standards for indoor air quality.

C. Concrete floors to be left exposed:
   1. Clean with broom to remove loose dirt.
   2. Scrub/Mop thoroughly to remove loosened dirt.
   3. Mop thoroughly with clear water to remove all traces of cleaning solution and dirt.

D. Complete cleaning operations before requesting inspection for Certification of Completion.
   1. Maintain cleaning until project, or portion thereof, is occupied by Owner.

END OF SECTION
SECTION 02 4119
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Procedures for Demolition of non-asbestos interior items and portions of existing building indicated in Contract Documents and determined by Contractor's verification at Site.
   2. Demolition and removal of selected portions of building or structure
   3. Demolition and removal of selected site elements
   4. Salvage of existing items to be reused.
   5. Protection of existing/in-place construction assemblies scheduled to remain.

B. Responsibility for work of this Section:
   1. Unless indicated otherwise there is no intent in this section or by reference to this section to indicate that Demolition is to be performed by one subcontractor or to determine which subcontractors are to perform Demolition.
   2. Each Contractors shall determine for themselves which portions of Demolition are to be performed by their respective subcontractors, and shall coordinate Demolition with each other and for Owner's operations.

C. Storage and cleaning for reinstallation of items salvaged.

D. Related Sections:
   1. Section 07 013 – Preparation for reroofing.
   2. Facility Services Subgroup Sections: Additional details for Demolition.

1.2 DEFINITIONS

A. Demolition: Removal and disposal off Site, or salvaging and storage, of portions of existing building

B. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled

C. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
   1. Include fasteners or brackets needed for reattachment elsewhere.

D. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

E. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

F. Recycle: Recovery of demolition waste for subsequent processing in preparation for reuse.
1.3 SYSTEM DESCRIPTION

A. Non-salvaged demolition:
   1. Removal and disposal off Site of demolished masonry, roofing and insulation not scheduled to be reused, also removal of doors, frames, and floor finishes, finishes on interior of exterior walls, mechanical work, electrical work and other interior items indicated on Drawings and determined at Site as specified in Para. 1.1 herein. For floor removal use processes approved by EPA and OSHA; no other processes will be acceptable.
   2. Removal of free-standing debris. Items of debris include, but are not limited to, clothing, paper, miscellaneous equipment and all container products, e.g., cleaners, paint and similar items.
   3. Removal of items attached to building components to remain, e.g., mirrors, shelves and associated components, cabinets, counters, wall anchors and similar items.
   4. Removal of existing material to permit construction of new work specified in other sections.
   5. Removal of portions of building required for mechanical and electrical work. (Refer to Mechanical and Electrical Drawings and Specifications for removal of pipes, ducts, conduit and mechanical and electrical equipment by those trades.)

B. Salvaged demolition: Salvaging and storage of the following materials for reinstallation:
   1. Insulation.
      a. Where possible, salvage roofing insulation - if it is in good shape and can be reused without detriment to the quality of the installation and R-value.
   2. Salvage existing lightning protection system as indicated on the drawings.
   3. Other items indicated on Drawings.

C. Environmental and Safety Controls:
   1. Measures, processes and controls to insure the air quality of Owner’s adjacent ongoing operations.
   2. Dust control: Practices used to reduce and/or prevent the surface and air transport of dust during construction.
   3. Barriers and Enclosures: Erect types necessary to insure environmental control and maximum safety for workers and non-workers including Owner, Owner’s employees, patrons, clients and other persons adjacent to and traveling through area of work. Coordinate with Division 01 Section Temporary Facilities and Construction.

1.4 SUBMITTALS

A. Submit items indicated below prior to start of work
   1. Pre-construction conference will not take place until all submittals are in and have been approved

B. Qualification Data: For demolition firm.

C. Schedule of Selective Demolition Activities: Indicate the following:
   1. Proposed methods and operations of Demolition for review
   2. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner’s operations are uninterrupted.
   3. Interruption of utility services. Indicate how long utility services will be interrupted.
   4. Coordination for shutoff, capping, and continuation of utility services.
5. Use of elevator and stairs.

6. Locations of proposed dust- and noise-control temporary partitions and means of egress, including for other tenants affected by selective demolition operations.
   a. Include in sequence plan the installation and removal of all temporary enclosures and environmental and safety control elements or constructions.

7. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

8. Means of protection for items to remain and items in path of waste removal from building.

D. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

E. Predemolition Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.

F. Proposed methods and operations of Demolition for review prior to starting work. Include coordination for interruption, shut-off, capping and continuation of utility services as required.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. For testing, removal and disposal of lead paint: Firm and personnel performing such work shall be EPA-trained and EPA-certified and shall certify performance of minimum 10 projects meeting EPA and OSHA regulations.


D. Pre-Demolition conference: Prior to commencement of Demolition, schedule and hold a meeting at Site with Contractor, subcontractor or subcontractors, Architect, and Owner’s Representative to review Contract Documents, scope of work, areas of Demolition, and sequential coordination and other requirements. Review methods and procedures related to selective demolition including, but not limited to, the following:
   1. Coordination with Owner's requirements
      a. Hours of operation.
   2. Inspect and discuss condition of construction to be selectively demolished.
   3. Review structural load limitations of existing structure.
   4. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
   5. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
   6. Review areas where existing construction is to remain and requires protection.
   7. Storage and protection of existing items to be salvaged, stored and/or reinstalled.

E. Perform work specified herein in strict conformance with Owner's standard policies.
F. Coordination with Owner's requirements
   1. At all times coordinate with Owner through Owner's authorized personnel or Architect to ensure Owner's uninterrupted use of adjacent or other occupied facilities on Site.
   2. All materials transported through building shall be covered with an approved material to prevent spread of dust and dirt.
   3. Any extended loud procedures required for work specified herein shall be approved by Owner at a minimum of one full business day in advance.
   4. At any time during performance of work specified herein, be prepared to meet all Owner's requests for scheduling, cleanliness or other requirements to ensure Owner's uninterrupted use of Site.
   5. Perform work specified herein in strict conformance with Owner's standard policies.

G. Field verify existing conditions indicated on Drawings and specified herein; report discrepancies to Architect.

1.6 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
   1. Comply with requirements specified in Division 01 Section, Summary of Work.

B. Vacating of areas of work: As coordinated with Division 01 Section, Summary of Work, areas of Demolition will be vacated and discontinued in use prior to start of Demolition in those areas.

C. Field verify existing conditions indicated on Drawings and specified herein; report discrepancies to Architect.

D. At all times coordinate with Owner through Owner's authorized personnel or Architect to ensure Owner's uninterrupted use of adjacent or other occupied facilities on Site.

E. All materials transported through building shall be covered with an approved material to prevent spread of dust and dirt.

F. Any extended loud procedures required for work specified herein shall be approved by Owner at a minimum of one full business day in advance.

G. At any time during performance of work specified herein, be prepared to meet all Owner's requests for scheduling, cleanliness or other requirements to ensure Owner's uninterrupted use of Site.

H. Condition of structure:
   1. Conditions existing at time of inspection for bidding purposes will be maintained by Owner so far as practicable. Variations within structure may occur as a result of Owner's removal and salvage operations prior to start of demolition work.
   2. Owner assumes no responsibility for actual condition of structures and items included in Demolition.

I. Traffic:
   1. Conduct Demolition to ensure minimum interference with Owner's use of and circulation through occupied interior spaces, streets, walks, and other adjacent occupied or used facilities.
   2. Do not obstruct or close adjacent occupied interior spaces and access thereto, required building exit system, streets, walks or other occupied or used facilities without permission from
Architect. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

J. Environmental Control:
1. Do not allow dust and debris to be blown off of roof. All materials shall be appropriately secured and stored so that nothing can be carried off by strong winds.
2. Do not permit dust to enter adjacent building openings including doorways and windows.
   a. Owner and Architect will identify buildings to be protected.
3. Do not permit dust to enter air intakes of nearby buildings
   a. Do not locate diesel or other engines that emit exhaust near air intakes of buildings.
   b. Owner’s Representative and Architect will identify buildings to be protected.
4. Provide dust control measures when engaged in any of the following activities:
   a. Demolition at the project site in all its forms.
   b. Bulk material hauling off-site onto paved public roadways
   c. Bulk material hauling on-site within the boundaries of the work site.
   d. Transporting of materials that could result in spillage, carryout, erosion, and/or trackout.
   e. Traversing unpaved hauling and access roads.
5. Sweep area on a daily basis.

K. Protection:
1. Exercise extreme caution when removing work adjacent to existing to remain.
2. Provide protection for Owner’s equipment.
3. Provide barricades and covered passageways, and conduct Demolition to ensure safe passage of persons around area of Demolition and to prevent injury to persons, or damage by falling debris or other cause to adjacent areas within building, adjacent buildings, structures, and other facilities.
4. Provide shoring, bracing, or support to prevent movement, settlement or collapse of items and areas of Demolition and adjacent facilities to remain.
5. Equipment:
   a. Confirm through Architect from Structural Engineer that demolition equipment placed inside structures can safely be support by those structures.
   b. No mobile equipment may be used where that equipment cannot be supported by that particular structure.
   c. Verify structural viability before the work commences.
   d. Secure Owner approval for use of mobile equipment within structures that are to remain prior to commencing the work.
6. Protect adjacent finish surfaces and other items to remain.
7. Ensure that building remains secure and watertight at all times.
8. Coordinate with Architect and Owner’s representative for other requirements for protection.

L. Coordination where new replacement work occurs:
1. Coordinate Demolition of items that are to be replaced with new items specified in other sections with work of those other sections in order to facilitate Owner's uninterrupted operations and progress of the Work. (Also refer to Para. 1.1.B herein).
2. Examples of such new replacement items are: Roofing, replacement material for other exterior openings, electrical work, and any other interior and exterior items where removal and replacement timing and coordination are critical to Owner's operations and progress of the Work.

3. Include in coordination determining exact details of portions to be removed in order to allow installation of new replacement items as required by manufacturer's and installers of said items.

M. Hazardous Material:
   1. In the event Contractors encounters on the Site material reasonably believed to be asbestos, polychlorinated biphenyl (PCB), or otherwise deemed hazardous, which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to Architect in writing.
   2. Perform demolition to minimize contamination of air from lead. Comply with regulations and recommendations of the Kentucky Department for Environmental Protection, and OSHA.
      a. Where lead-bearing paint is encountered, arrange for and pay costs of testing, removal and disposal by firm meeting requirements specified in Quality Assurance specified herein.

N. Existing Utilities:
   1. Maintain existing utilities, indicated on Drawings to remain, and protect from damage during performance of work specified herein. Do not interrupt existing utilities serving occupied or used facilities, except when authorized by Architect. Provide temporary services during interruptions to existing utilities, as acceptable to Architect.
   2. Before starting work specified herein, disconnect and seal utilities indicated on Drawings to be disconnected.

O. Notwithstanding any information provided in this document, Contractor shall perform work in accordance with all applicable federal, state, and local regulations and accepted safety practices.
   1. When use or storage of hazardous materials or equipment or unusual methods are necessary, the Contractor shall give the Owner reasonable advance notice.

1.7 ITEMS FOR REUSE AND OF NO VALUE TO OWNER

A. Items to be removed and disposed of off Site which are of no value to Owner, but may be of value to Contractors or Subcontractors participating in the Work, shall be removed from structure as work progresses. Transport such items from Site as they are removed from existing locations. Do not store or sell such items on Site. Do not interrupt or in any way interfere with progress schedule or work of other trades.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.
B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
   1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect

D. Survey of Existing Conditions: Record existing conditions by use of preconstruction photos or video tape.
   1. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
   2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Comply with requirements for access and protection specified in Division 01 Sections addressing temporary facilities, controls and waste management.

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   1. **Provide water/moisture infiltration protection to the areas of the roof that has been demolished. Protect from weather and potential water run-off. Maintain protection until the final roof system has been installed.**
   2. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
   3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
   4. Cover and protect furniture, furnishings, and equipment that have not been removed.
   5. Restore damaged improvements to their original condition, as acceptable to Owner.

C. Pollution controls: Provide temporary enclosures and other suitable methods acceptable to Architect to limit amount of dust and dirt rising and scattering in the air, to the lowest level of air pollution practical for the conditions of the work.
   1. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Temporary Facilities and Controls and required by Architect or Owner’s Representative.

D. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
   1. Strengthen or add new supports when required during progress of selective demolition.
3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
   1. Comply with requirements for existing services/systems interruptions specified in Summary of Work.

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Coordinate with Owner’s Representative to arrange shut off indicated services/systems when requested by Contractor.
   2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
      a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.4 SELECTIVE DEMOLITION, GENERAL

A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
      a. Do not remove any portions indicated to remain.
   2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
   3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
   5. Maintain adequate ventilation when using cutting torches.
   6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
   7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
   8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
   9. Unless in conflict with installation of new work replacing items to be removed, or in conflict with Owner's operations, complete Demolition prior to start of new work.
  10. Cut only such holes in the existing work as necessary to install new work.
11. Coordinate with Mechanical and Electrical trades for removal herein of portions of building required for mechanical and electrical work.

12. Dispose of demolished items and materials promptly.

B. Removals: carefully remove items indicated to be salvaged for reinstallation in the Work, as indicated on Drawings or specified in other sections. Tag, protect in wrappings or cartons as required and store at a location designated by Architect.
   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.

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

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

E. Miscellaneous: On existing surfaces that will be exposed in the finished building, remove protruding items including, but not limited, wood items, metal items such as bolts, spikes, hangers, and similar. Also remove such items from surfaces that will be finished with other materials if such items will interfere with installation of new finish materials, or will be visible in the finished work. Remove in such manner to avoid repair or require minimal repair.

F. Removal techniques: All removal techniques and procedures shall be appropriate for the individual situation. Where portions of supported or on-grade concrete to to be removed abut concrete to remain, the area shall be saw-cut to provide a neat, straight and true demarcation between the remaining and removed areas.

G. Structural Support: Where structural support is required, provide as required, whether or not indicated in Contract Documents. Consult with Architect to determine structural requirements if not indicated in Contract Documents. Pay all costs for providing such structural supports.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.

B. Built-Up Asphalt Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Division 07 Section "SBS-Modified Bituminous Membrane Roofing" for new roofing requirements.
   1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

E. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.6 PATCHING OF VOIDS IN EXISTING CONSTRUCTION LEFT AFTER REMOVAL OF EXISTING WORK

A. Each Contractor shall each be responsible for and pay all costs for patching voids in existing construction left after removal of existing work of their respective portions of the Work, whether or not specifically indicated in Contract Documents, and not otherwise required by Contract Documents to be patched or finished.

B. Patching shall be done by trades appropriate for and normally experienced in patching materials and procedures required. Provide materials and installation procedures for patching equal in appearance and quality to existing adjacent materials as acceptable to Architect, or other materials and installation procedures if otherwise indicated in Contract Documents.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Disposal: Except for salvaged items, transport demolished materials off Owner's property and legally dispose of them.

3.8 CLEANING AND ADJUSTMENT

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

B. Immediately remove stains, soiled spots, dust and similar from adjacent finish surfaces and other items to remain.

C. Damages to existing facilities and services: Properly repair damages caused within areas of Demolition or to adjacent areas and material movement routes damaged by work specified herein, as directed by Architect and at no cost to Owner. If repairs are not satisfactory to Architect, replace damaged items with new of equal quality and appearance as acceptable to Architect.

END OF SECTION
SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. All labor, materials, equipment, special tools and services to complete cast-in-place concrete work required for the Project, as herein specified, and as indicated on the Drawings.

B. Related Sections:
   1. Section 05 12 00 – Structural Steel.
   2. Section 05 30 00 – Metal Decking.
   3. Divisions 21 through 26 – Pads, inserts, sleeves and embedments for mechanical and electrical items specified therein.

1.2 REFERENCES

A. Note: A copy of each reference shall be kept in the field office at the site at all times. The reference standards shall govern the work except as modified herein.

B. American Concrete Institute (ACI) 301-10 Specifications for Structural Concrete is hereby incorporated as part of this Section. Supplemental requirements and modifications listed herein take precedence over the requirements of ACI 301. All ACI 301 items unless modified by the Contract Documents are incorporated as written. When any part of any item is modified or voided, the unaltered provisions of the part shall apply as written.

C. ACI 305.1-06 Specification for Hot Weather Concreting.


E. ACI 318-11 Building Code Requirements for Structural Concrete.


G. Other ACI references as noted in this Section.

H. American Association of State Highway and Transportation Officials (AASHTO) Specifications as noted in this Section.

I. ASTM International (ASTM) Specifications as noted in this Section.


1.3 SUBMITTALS

A. General.

1. Shop drawings shall be produced by the Contractor and submitted to the Architect/Engineer for review. The Architect/Engineer will endeavor to complete review of a shop drawing submittal within 14 days of receipt of the submittal. Fabrication of material prior to the receipt of approved shop drawings for that material shall be at the Contractor's risk.

2. The Contractor is responsible to furnish field-verify information, coordinate material requirements, and review shop drawings prior to submittal of shop drawings to the Architect/Engineer. Receipt of shop drawings by Architect/Engineer will be an assumption by Architect/Engineer that this has been done.

3. Notations by the Architect/Engineer made on the shop drawings do not authorize additional compensation for the Contractor.

4. The Contract Documents (Drawings and Specifications) govern all concrete work. Errors on shop drawings or discrepancies between shop drawings and Contract Documents shall be governed by the Contract Documents. Even if shop drawings contain errors after review by the Architect/Engineer, no additional compensation is due Contractor to correct work to what is shown on Contract Documents.

5. Architectural and mechanical drawings supplement the structural drawings. Requirements for concrete work may be shown on architectural and mechanical drawings.

6. The Architect's and Engineer’s review of details and construction operations shall not relieve the Contractor of responsibility to successfully complete the work in accordance with these Specifications and within the Contract time.

7. Shop drawings may be received and returned electronically. If paper copies are submitted no more than two copies will be returned to the Contractor or Construction Manager.

B. Submit mix designs and test results conforming to the requirements of Section 4 of ACI 301. Submit request for approval to use admixtures, if any. A complete mix design submittal must be furnished at least three weeks prior to the planned use of that mix. The Contractor is cautioned to undertake mix design preparation and submittal procedures immediately after authorization to proceed with the Project.

1. The submitted mix designs shall address weather conditions that are expected to occur during the concrete construction phase. Concrete mixes shall not only be designed for average temperature and humidity conditions, but also for adverse conditions (hot and cold weather), as applicable to this project.

C. Submit letter stating that concrete subcontractors and suppliers are familiar with the reference standards.

D. Submit a Quality Control Plan in accordance with Section 1 of ACI 301.

E. Submit reinforcing steel shop drawings in accordance with Section 3 of ACI 301.

F. Submit procedures and records required in hot and cold weather concreting work.
G. Submit the following certifications:
1. All coating, floor covering and surface treatment manufacturer’s approvals (in writing) of concrete curing compounds that are not removed prior to the product’s installation.
2. Subsequent treatment manufacturers’ approvals (in writing) of form release agent.

H. The following submittals shall be provided in accordance with ACI 301 and Division 01 - General Requirements.
1. Contractor’s proposed Testing Agency.
2. Field and Laboratory tests that are the Contractor’s responsibility.
3. Data and test documentation on proposed materials including but not limited to:
   a. Cement.
   b. Aggregates.
   c. Admixtures.
   d. Reinforcing.
   e. Curing materials.
   f. Related materials for concrete construction specified herein.
   g. Material for repair of surface defects if other than site-mixed portland-cement mortar.
4. Construction joints not shown on the drawings.
5. Method of developing bond at joints (except slabs on grade).
7. Procedure for adding water to ready-mixed concrete at site, including method of measuring water.
8. Method(s) for preserving moisture in the concrete.
10. Thermal control plan for all mass concrete placements.

I. Submit Certificate of Conformance for concrete production facilities by NRMCA.

1.4 QUALITY ASSURANCE

A. Regulatory requirements:
1. Comply with applicable laws, ordinances, and the Kentucky Building Code (KBC).
2. Comply with the referenced ACI publications, as modified and supplemented in this Section.

B. Tests and inspections:
1. The Owner will employ a testing and inspection agency to provide the services specified in Section 1.6.3 of ACI 301, including supplemental requirements defined in Article 1.7 of this Specification.
2. The Contractor shall select an independent testing agency, subject to the Architect/Engineer’s approval, to perform all testing required by the Contractor for qualification of proposed materials and the establishment of mix designs, for his use in determining concrete strengths for early form removal, and for all other testing services needed or required by the Contractor.

C. Flatwork finishers certification:
1. All flatwork finishers must be ACI Concrete Flatwork Technician certified.
2. The on-site flatwork supervisor must be ACI Concrete Flatwork Finisher and Technician certified.

D. Ready-Mixed Plant Certification:

1. All ready-mixed concrete production facilities shall be certified by the NRMCA Program for Certification of Ready-Mixed Concrete Production Facilities.

E. Preconstruction Meeting:

1. A preconstruction meeting shall be arranged by the Contractor to review concrete pre-placement and placement activities, inspection and testing requirements, formed and unformed concrete finishes, hot and cold weather concreting procedures, form removal, and critical tolerances.
2. Ready-mix supplier, Contractor, concrete finishers, Construction Manager, Owner’s concrete testing agency, and Architect/Engineer shall attend.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcement to the project site bundled, tagged and marked. Use durable tags indicating bar size, lengths, etc., and other information corresponding to markings shown on placing drawings.

B. All reinforcement at the site shall be stored off the ground and protected from damage, accumulation of dirt and excessive rust.

C. Comply with CRSI “Field Handling Techniques for Epoxy-Coated Rebar at the Job Site” and as modified by this Section.

D. All formwork at the site shall be stored in a clean, dry location off the ground, covered and protected from damage and accumulation of dirt, etc.

1.6 SUBSTITUTIONS

A. Requests for product substitutions must be submitted for review and approval, with all necessary documentation, a minimum of 10 days before bids are due. Product substitutions will only be permitted if incorporated into the bid documents by addendum.

1.7 SUPPLEMENTAL REQUIREMENTS AND MODIFICATIONS TO ACI 301-10

A. The following statements modify and supplement ACI 301. All unaltered parts of ACI 301 shall apply as written.

B. The Section and paragraph numbers correspond to those in ACI 301. Note that each technical section of ACI 301 includes General requirements, Products, and Execution per the Three-Part Section Format of the Construction Specification Institute.

Section 1 (ACI 301) - General Requirements
1.5.2.1 The Contractor shall submit a quality control plan that addresses the following.

a. Control and maintenance of project documents.
b. Subcontractor/supplier services and verification of purchased products and materials.
c. Concrete production inspection and testing.
d. Pre-placement inspection including formwork, reinforcing and embedments.
e. Placement inspection including consolidation, finishing and initial curing of concrete.
f. Post-placement inspection including monitoring of moist curing and curing temperatures, verification of in-place strength before removal of shoring, and protection of exposed surfaces.

1.6.2.2.c The Contractor is required to arrange for all testing, giving the Owner’s testing agency at least 24 hours advance notice.

1.6.2.2.d.1 The Contractor shall provide curing boxes as required by ASTM C 31. Coordinate quantity and location with the Construction Manager and Testing Agency.

1.6.3.1.c The Owner’s testing agency shall report in writing all test results to Architect/Engineer, Contractor, Construction Manager and concrete supplier within three (3) working days after the tests are performed. Report by phone or email the results of early break cylinders to Contractor and Construction Manager. Reports of strength tests shall contain the name of the project, date and time of placement, location of placement, placement method, water added at site, sample location, weather conditions, batch ticket number, batch size, mix identification, specified strength, breaking strength and type of break, specimen diameter and weight, types of admixtures, percentage of entrained air, slump, concrete temperature, and detailed information of storage and curing of specimens before testing.

1.6.3.2.d.1 Unless noted otherwise concrete shall have at least one strength test for each 150 cubic yards, or fraction thereof, placed in any one day, nor less than one test for each 5000 square feet of surface area of slabs or walls, or fraction thereof. Strength tests are not required for backfill concrete.

1.6.3.2.d.2 Determine the slump (ASTM C 143) for each batch of concrete that high-range water-reducer (superplasticizer) is added to in the field. Test and report slump both before and after superplasticizer is added.

1.6.3.2.e.1 When 6 by 12 in. cylinders are used make four test specimens for each sample (five required for mixes requiring 56 day strength tests). When 4 by 8 in. cylinders are used make five test specimens for each sample (six required for mixes requiring 56 day strength tests). One specimen shall be a hold specimen, to be tested only if a defective specimen is found.

1.6.3.2.e.2 Age of concrete for acceptance shall be 28 days unless otherwise shown in TABLE 4.2.2.8.b. Concrete mixes with strength specified at 56 days shall have one cylinder tested at 7 days, one at 28 days, and two 6 by 12 in. cylinders or three 4 by 8 in. cylinders at 56 days.
1.6.3.2.g Air content tests shall be conducted on the first three batches in each placement of all mixes in which air entrainment is specified and until three consecutive batches have air contents within the range specified, at which time every third batch shall be tested. This test frequency shall be maintained until a batch is not within the range specified, at which time testing of each batch will be resumed until three consecutive batches have air contents within the specified range.

1. For pumped concrete the second or third batch in the placement, and periodically throughout the placement but not less than once for each 100 cubic yards, shall have air content checked at both the end of the truck discharge and at the end of the hose.

2. Concrete that does not satisfy air entrainment requirements shall be rejected.

1.6.3.2.h Testing services provide the basis for acceptance or rejection of concrete furnished by this contract. Therefore, it is necessary that testing for air content and slump not only be done after all adjustments have been made, but before the concrete is discharged.

1.6.3.3.a The Owner will employ an inspection agency to visually inspect the placement of reinforcing steel. Do not place concrete until all outstanding issues cited in the inspection reports have been corrected. Inspection of reinforcing steel to include, but not limited to:

1. Size, spacing, and quantity of bars.
2. Bar splices.
3. Embedments.
4. Concrete cover.
5. Support and securement.
6. Coatings.

1.6.3.3.b The Owner will employ an inspection agency to inspect concrete operations including, but not limited to:

1. Use of proper concrete mix.
2. Consolidation.
3. Finish and finishing operations.
4. Curing methods, materials, and procedures.
5. Shoring removal and reshoring operations.
6. Formwork materials.

1.6.7.4 Concrete which fails to meet the requirements of this Specification shall be rejected.

1.7.1.5.a The Contractor shall bear all costs of correcting rejected work, including the cost of the Architect’s and Engineer’s additional services thereby made necessary.

1.8.3 Masonry shall not be placed on or supported off of structural floors until the concrete is at least 28 days old and all shoring has been removed.

Section 2 (ACI 301) - Formwork and Formwork Accessories

2.1.2.1.f Form tie configuration and spacing for all exposed-to-view concrete shall be submitted for review and approval of the Architect.
2.2.1.3 Form release agent shall be a commercial formulation form coating compound that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces. The form release agent manufacturer shall certify that the form release agent is chemically and physically compatible with all subsequent treatments of concrete surfaces. Furthermore, the form release agent shall be approved in writing by the manufacturers of all subsequent treatments.

2.2.1.4 Preformed Expansion Joint Filler: Non-impregnated type, closed cell resilient polyethylene foam, 1/2 in. thick unless otherwise noted on the Drawings.

2.2.1.5.a Waterstops:

1. Bentonite rope joint sealant shall be installed in all vertical and horizontal construction joints in concrete walls below and exposed to grade, including slab/wall construction joints, unless otherwise noted. Secure with manufacturer’s adhesive and mechanical fasteners as required for a secure installation. Construction joint shall be clean and dry. Prior approved products: Volclay Waterstop-RX 101T, HYPER STOP DB-2515, QUELLMAX 18x24.

2. Unless otherwise noted provide ribbed type, virgin PVC waterstop meeting Corps of Engineers CRD-C 572 at expansion joints in below grade and exposed to grade walls. Expansion Joint Waterstop shall be type with center bulb, and center bulb shall be 100% within joint. Do not embed center bulb in concrete. Expansion Joint Waterstop to be minimum 9 in. wide, and all butt joints shall be cut in miter box and welded per manufacturer's recommendations. Provide premolded unions, fittings and appropriate adhesive. Thoroughly clean joint, secure waterstop to reinforcing mat with hog rings, and vibrate concrete to eliminate voids.

2.2.2.1 Design and engineering of formwork shall be the responsibility of the Contractor. Design of formwork and preparation of formwork drawings shall be under the supervision of a professional engineer registered in the state where the Project is located. Formwork drawings shall be sealed by the professional engineer responsible for the design of the formwork.

2.2.2.3 Earth cuts may be used for vertical forms for footings below ground where the ground stands vertical and is approved by the Owner’s testing agency prior to placement of concrete.

2.2.2.5.f Construction joints shall be located such that the maximum placement length of a continuous concrete wall will not exceed 100 feet in any one day.

2.2.3.2.a Exposed edges of columns, walls, slabs and beams shall have 3/4 in. bevels, unless otherwise noted.

2.2.3.3.a Form ties for exposed-to-view concrete walls shall leave a 1 in. diameter cone hole. This hole will be left open or epoxy mortared at the discretion of the Architect. The ties shall be one of the following:

1. Stainless steel “snap-ties” with a 1 in. breakback.
2. Galvanized “coil-bolt” type tie.
3. “She-bolt” tie with the inner male unit galvanized.
4. Other removable type tie with approval of the Architect.

2.3.1.5.a Concrete construction tolerances, even portions above 100 feet in elevation, shall be in accordance with ACI 117 with the following exceptions:

1. Variation in concrete edges supporting masonry and surfaces behind masonry and glass curtain wall shall not exceed plus or minus 1/2 in. from theoretical plan dimension.
2. Variation of beam soffit supporting masonry shall not exceed plus or minus 1/2 in. from theoretical elevation.
3. The class of surface for offset between adjacent pieces of formwork facing material shall be Class A for all surfaces exposed to view, and class C for all surfaces not exposed to view when the project is complete. Refer to 5.3.3.7 for ribbed slabs formed with metal pans.
4. Tolerances for placing anchor bolts and other embedded items for structural steel work (Section 05 1200) shall be in accordance with the AISC Code of Standard Practice for Steel Buildings and Bridges.

2.3.1.5.b A preconstruction meeting shall be arranged by the Contractor for the purpose of reviewing critical tolerances, methods of making measurements, and the basis for acceptance or rejection of completed work to avoid misunderstandings at the time of final acceptance.

2.3.1.6.a If required, retighten forms and bracing after concrete placement, but before concrete has taken its initial set, to eliminate mortar leaks and maintain proper alignment.

2.3.1.12.a All sleeves, inserts and embedded items required by mechanical trades shall be furnished and placed by the appropriate mechanical contractor. All other sleeves, inserts, reglets, dovetail anchor slots, anchors and embedded items shall be furnished by the appropriate supplier and placed by the Contractor performing the work of this Section.

2.3.1.12.b Sleeves, inserts, anchors and embedded items not shown on structural drawings must be approved by Architect/Engineer before placement of concrete.

2.3.1.14.a Remove chips, wood, sawdust, dirt and debris just before concrete is placed.

2.3.1.18 Provisions for Other Trades: Provide openings in concrete and concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms. Size and location of openings, recesses and chases not shown on structural drawings must be approved by Architect/Engineer before placement of concrete.

2.3.3.6.a Reshoring is required for multistory construction. The Architect/Engineer has the prerogative of disallowing any specific procedures that he may consider to be deleterious to the performance of the structure in its completed form.

2.3.3.6.b The attention of the Contractor is directed to the following:
1. Live load and superimposed dead load capacities of each level are noted on the Drawings. Live loads are typically reduced per the building code for the design of beams and girders.

2. In general, the weight of newly placed concrete for a level, plus adequate construction load allowance, will exceed the combined live and superimposed dead load capacity of the level below.

3. When shores or reshores must extend to the ground to provide the required load-carrying capacity, the floors above the ground shall not be considered to be contributory to the shoring and reshoring capacity.

2.3.4.2.b.1 When Windsor Probe tests are used to evaluate the in-place strength of the concrete for form removal, the tests shall be performed by an approved testing agency in accordance with ASTM C 803, with at least one test for each 1800 square feet of elevated structure. Windsor Probe tests shall be correlated to laboratory cured cylinders or drilled cores of the same material and mix-design to be tested.

2.3.4.3 Forms may be removed when the in-place concrete reaches the specified 28-day compression strength, or when the concrete reaches 75% of the specified 28-day compression strength and is no less than 7 days old. The 7-day minimum age requirement may be waived pending review of the proposed mix designs, forming systems, reshoring procedures and in-place concrete strengths.

2.3.4.4 Forms may not be removed until the actual in-place strength of the concrete is demonstrated by field-cured test cylinders, Windsor Probes, pullout tests, or the maturity method (ASTM C 1074), regardless of the results of tests on laboratory-cured cylinders. These additional test cylinders or other tests must be arranged and paid for by the Contractor.

Section 3 (ACI 301) - Reinforcement and Reinforcement Supports

3.2.1.1.a All reinforcing steel shall have a minimum $F_y$ of 60 ksi. In addition, all reinforcing steel to be welded shall meet ASTM A 706 and have a maximum carbon equivalent of 0.45%.

3.2.1.2.b.1 Provide epoxy coated steel where shown on the Drawings.

3.2.1.2.b.2 Since the epoxy coating is flammable, the coated bars shall not be exposed to any fire or flame. Cutting coated bars by burning will not be permitted.

3.2.1.2.b.3 Repairs of coatings on epoxy coated bars and coated accessories shall be made at all breaks, abrasions, etc. exceeding an area of 0.01 sq. in., and at cut ends.

3.2.1.2.b.4 Every reasonable effort shall be made to repair all damaged areas of epoxy-coated reinforcing steel and accessories before any rusting occurs. If infrequent and small damaged areas do rust, the rust shall be thoroughly removed by sandblasting or other approved method before the areas are repaired. The Contractor shall exercise care to ensure that coated bars, when incorporated into the work, are free from dirt, paint, oil, grease, or other foreign substances. The Architect/Engineer reserves the right to require
cleaning of the reinforcement without additional compensation due to the Contractor. It is the intent of this specification that an entirely rust-free and completely coated steel reinforcement system be provided before the concrete is placed. Placing of concrete shall be performed with methods and equipment that will not damage the coated materials.

3.2.1.7.a.1 Welded wire reinforcement shall be in accordance with ASTM A 185 (smooth wire) unless noted otherwise on the Drawings. Furnish in flat sheets.

3.2.1.11.a.1 All clips, chairs and bar supports and other metallic materials used for installation of epoxy-coated reinforcing shall be entirely coated with epoxy or another polymer approved by the epoxy coating manufacturer.

3.2.1.13 Bar supports touching forms in concrete exposed to view, exterior or interior, shall be stainless steel, except use plastic or epoxy coated bar supports where bars are epoxy coated. Provide bar spacers for reinforcement in all walls.

3.2.1.14 Tie wire for holding reinforcing steel in position for Architectural Concrete shall be stainless steel except where bars are epoxy coated. Tie wire for all epoxy-coated bars shall be mylar or plastic-coated. Typically, ends of tie wire must have a minimum of 1 in. clear distance to face of concrete.

3.2.1.15 Mechanical connections for reinforcing steel shall be in accordance with ACI 318 and ACI 439.3R and approved by the Architect/Engineer.

3.2.2.2.a.1 Welding of reinforcing steel and welded wire reinforcement is not permitted without the approval of the Architect/Engineer.

3.3.2.8.d Bending of reinforcing steel partially embedded in concrete is not permitted, unless otherwise detailed on the Contract Documents.

3.3.2.11 Placement of bars shall also be in accordance with the detailed recommendations given in the Concrete Reinforcing Steel Institute’s “Placing Reinforcing Bars”, 9th Edition.

3.3.2.12 Provide material and placement of contingency reinforcement as noted on the drawings. Bars are to be cut, bent and placed as directed by the Architect/Engineer as extra reinforcement without additional cost.

Section 4 (ACI 301) - Concrete Mixtures

4.1.1.1 The ready-mix concrete producer is completely and solely responsible for the design, production, and delivery of the concrete mixes to satisfy this Specification. The Contractor shall coordinate the review of the mix designs between the Ready-Mix Producer, Forming Contractor, and Placing/Finishing Contractor. The Contractor is responsible for informing the Ready-Mix Producer of the conditions at the job site, such as methods being used for placing concrete. Adjustments required to facilitate placing and achieve the desired results shall fall within the criteria of this Specification and shall be at no additional cost to the Owner. All mix designs and proposed adjustments to the same shall be submitted to the Architect/Engineer for review.
4.2.1.1.a Cement for all concrete shall be ASTM C 150, Type I unless otherwise noted. Air-entrained cement shall not be used. Air requirements shall be met by use of separate admixtures.

4.2.1.1.d.1 Class C and Class F fly ashes shall comply with ASTM C 618, except that in addition to the requirements of ASTM C 618, Type F fly ash shall have a maximum Loss on Ignition of 3%, with a maximum variation of 1%. Contractor's mix design submittal for mixes which include fly ash must be accompanied by complete chemical and physical analyses and quality control records for the proposed fly ash source for at least two years immediately prior to the proposed use on this project.

4.2.1.1.d.2 When fly ash is used, the maximum amount shall be limited to 25% by weight of the total cementitious materials.

4.2.1.1.e.1 Ground granulated blast-furnace slag shall be Grade 100 or Grade 120 per ASTM C 989.

4.2.1.1.e.2 When ground granulated blast-furnace slag is used, the maximum amount shall be limited to 40% by weight of the total cementitious materials.

4.2.1.2.a All normal weight aggregates shall be graded, a mix of fine, intermediate, and coarse aggregates, and shall also conform to Kentucky Transportation Cabinet (KYTC).

1. Aggregate certification submittal shall include copies of test reports on the fine, intermediate, and coarse aggregates proposed to be used, made by a testing laboratory acceptable to the Architect/Engineer, showing source of the materials and conformance with specification requirements. Date of test shall not be more than six months prior to date of submittal. Contractor shall furnish similar copies, of current date, when there is a change in source of material and at any time upon demand by the Architect/Engineer.

4.2.1.3.a Concrete mixer washout water shall not be used in any concrete except Backfill Concrete.

4.2.1.4.a Calcium chloride, calcium nitrate, or admixtures containing more than .05% chloride ions are not permitted. Admixtures containing sodium thiocyanate shall contribute no more than 0.20% sodium thiocyanate by mass of cement to the concrete, and the Contractor shall submit independent test data regarding the corrosion of steel in concrete within the intended dosage range.

4.2.1.4.b High-range water-reducing admixture (superplasticizer) conforming to ASTM C 494, Type F or G shall be used in all concrete with a specified maximum water-cementitious materials ratio below 0.42. The admixture may also be used at Contractor's option in other mixes, with the written approval of the Architect/Engineer, at no additional cost to the owner.

4.2.1.4.c Water-reducing, non-chloride, non-corrosive, accelerating admixture conforming to ASTM C 494, Type C or E, shall be used when early initial set is required. The admixture must have non-corrosive test data of a year's duration from an
independent testing laboratory using an acceptable, accelerated corrosion test method such as that using electrical potential measures.

4.2.1.4.d Water-reducing, retarding admixture conforming to ASTM C 494, Type D shall be used when delay of the setting time for concrete is required.

4.2.1.4.e Extended set-control admixtures, if used shall be added to the concrete during or immediately after the batching process. The dosage rate for each Mix Type shall be pre-determined by trial mixtures in which the admixture is added to a minimum 8 cu. yd. batch.

4.2.1.4.f All admixtures shall be approved by the cement manufacturer.

4.2.1.5.a Materials used for exposed concrete shall be furnished from the same source throughout the project unless otherwise approved by the Architect/Engineer.

4.2.2.2 Slump – Concrete shall be produced to have a maximum slump at the point of placement of 4 inches with a tolerance of one inch. This maximum slump may not be exceeded except by the job site addition of high-range water-reducer (superplasticizer). In those portions of the structure where member dimensions or congestion due to reinforcing steel prevent the proper placement and consolidation of the concrete at the maximum slump specified, superplasticizer shall be used by the Contractor in lieu of increasing the slump of non-superplasticized concrete by the addition of water. Approved mix designs, with smaller size aggregates, may also be used in congested areas to facilitate concrete placement.

a. When superplasticizer is used, the maximum pre-adjusted slump shall be 4”, and the maximum superplasticized slump shall be 8”.

4.2.2.4.a For pumped concrete, air content shall be periodically tested at both the truck discharge and end of hose. The required air content for acceptance at the truck discharge shall be adjusted, if necessary, to account for loss of air content during pumping.

4.2.2.6.a Maximum concrete temperature at time of discharge shall not exceed 95 °F. If necessary, use nitrogen cooling to maintain concrete temperature.

4.2.2.7.d.1 Chloride ion concentration - Maximum water-soluble chloride ion concentrations in hardened concrete at an age of 28 to 42 days contributed from all ingredients, including water, aggregates, cementitious materials and admixtures shall not exceed the limits indicated in Table 4.2.2.8.b. Immediately after receipt of contract, Contractor shall test proposed individual concrete ingredients for total chloride ion content. If the total chloride ion content calculated on the basis of the proposed concrete mix proportions exceeds the specified limits, it will be necessary to test hardened concrete samples of the proposed mix for water-soluble chloride ion content. If these test results exceed the specified limits, it will be necessary to vary ingredients and material sources and retest until specified limits are met.
a. Testing shall be performed by an independent testing laboratory employed and paid by the Contractor following ASTM C 1218 test procedures.

4.2.2.8.b Strength - Minimum concrete strengths shall be in accordance with Table 4.2.2.8.b. Note that some mixes may be specified with compressive strength requirements at other than 28 days.

Table 4.2.2.8.b - Mixes and Locations

<table>
<thead>
<tr>
<th>MIX TYPE</th>
<th>LOCATION</th>
<th>SPECIFIED STRENGTH H (psi at days) (1)</th>
<th>MIN. PORTLAND CEMENT (lb. / cu. yd.) (2)</th>
<th>MAX % OF CHLORIDE BY WEIGHT OF CEMENT</th>
<th>MAX W/C M RATIO</th>
<th>AIR % (1,3)</th>
<th>AGG. SIZE (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Lightweight concrete</td>
<td>4000 LW at 28</td>
<td>565 + 120 flyash</td>
<td>0.15</td>
<td>0.50</td>
<td>5.5 +/- 1.5</td>
<td>LW</td>
</tr>
</tbody>
</table>

NOTES:
1. Concrete which is placed and does not meet strength or air content requirements shall be removed and replaced at no cost to the Owner.
2. Including fly ash or ground granulated blast-furnace (GGBF) slag in mixes where permitted. Not applicable if a specified amount of fly ash or GGBF slag is listed with the mix. The minimum cement requirement may be met by substituting 1.33 lb. of fly ash for each 1.0 lb. of portland cement replaced, or 1.0 lb. of GGBF slag for each 1.0 lb. of portland cement replaced. The ratio of fly ash to total cementitious materials shall be no less than 15% and no greater than 25%; the ratio of GGBF slag to total cementitious materials shall be no greater than 40%; and the total of fly ash and GBBF slag shall be no greater than 50% of total cementitious materials.
3. Tolerance on entrained air content shall be as delivered.
4. Normal weight aggregate unless indicated lightweight (LW) concrete at 117 lb. / cu. ft.

4.2.3.5.a Mix designs incorporating superplasticizer must be accompanied by test results from cylinders made from trial batches or field test data in which the superplasticizer was added to a minimum 8 cu. yd. batch in a truck mixer.

4.3.1.1.a Site produced concrete is prohibited.

4.3.1.4 When a high-range water-reducer (superplasticizer) is added at the site it shall be premeasured and added in accordance with the manufacturer’s written instructions and specifications, using truck-mounted power injection equipment capable of rapidly and uniformly distributing the admixture to the concrete. The concrete shall be mixed for a minimum of six minutes after addition of the superplasticizer prior to discharge.

4.3.2.1.a Slump adjustment: When concrete arrives at the project with slump below that suitable for placing, and below the slump specified, water may be added only if
neither the maximum specified water-cementitious materials ratio nor the maximum slump is exceeded, provided that:

1. The approved mix design has allowed for on site addition of water.
2. The amount of water added at the site is accurately measured to plus or minus 1 gallon of the desired added amount.
3. The water addition is followed by 3 minutes of mixing at mixing speed prior to discharge.
4. Standard cylinder samples as required by these Specifications are taken after addition of water.
5. The person authorized to add water shall be mutually approved by Architect/Engineer, Contractor, Construction Manager and Ready-Mix Producer.

4.3.2.1.c The maximum water-cementitious materials ratio is defined as that of the mix design furnished by the ready-mix producer. (Not to exceed values noted in Table 4.2.2.8.b).

4.3.2.1.d Concrete arriving at the site above the maximum slump shall be rejected.

4.3.2.1.e Addition of cement, except as part of initial batching at the plant in accordance with an approved mix design, is prohibited.

4.3.2.2.a The concrete must be discharged from the ready-mix trucks within 1-1/2 hours after the introduction of mixing water to the cement and aggregates.
1. During hot weather or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required. When air temperature is between 85 °F (30 °C) and 90 °F (32 °C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 °F (32 °C) reduce mixing and delivery time to 60 minutes.

4.3.2.3 Furnish to the Project Superintendent 2 delivery tickets with each load of concrete. Tickets shall contain the following information.

a. Date.
b. Producer and plant.
c. Job.
d. Contractor.
e. Truck No. and time dispatched.
f. Concrete designation and cement type.
g. Admixtures description and content.
h. Time discharge started and completed.
i. Amount of concrete in load.
j. Amount of water in mix at plant.
k. Amount of any material added at the site and authorized signature.

Section 5 (ACI 301) - Handling, Placing and Constructing
5.1.2.1.e Notify the Architect/Engineer at least two working days prior to placing concrete.

5.1.2.1.e.1 No concrete shall be placed without Owner’s Testing Agency being present. Give due notice to the Architect/Engineer and all Contractors affected before placing concrete. Allow adequate time for installation of all necessary parts.

5.2.1.1.a Water used for curing exposed surfaces shall be free of substances that will stain or discolor concrete.

5.2.1.2 Curing Compounds:

a. Liquid Membrane-Forming Curing Compound for unformed surfaces that will not receive a coating or bonded floor covering shall conform to the requirements of ASTM C1315, Type I, Class A.

b. Liquid Membrane-Forming Curing Compound for formed surfaces and unformed surfaces that will receive a coating or bonded floor covering shall be a dissipating or removable curing compound that conforms to ASTM C309. Furthermore, the curing compound shall be approved in writing by the manufacturers of all coatings, floor coverings and surface treatments used on the project. Confirm types and locations of coatings, flooring, and surface treatments with Architect.

c. Curing compound(s) shall comply with all applicable environmental and clean air regulations for the community in which this Project is located.

5.2.1.3 Curing Sheets that conform to ASTM C171 shall be used for specified wet curing. Prior approved materials:


b. Polyethylene film, minimum 8 mils thickness.

c. BurLene curing blankets manufactured by the Max Katz Bag Company, Inc.

5.2.1.7 Related materials for concrete construction shall be as follows:

5.2.1.7.a Vapor retarder under interior slabs-on-grade: Minimum 10 mils plastic sheet material meeting ASTM E 1745, Class A requirements. Include manufacturer’s pressure sensitive tape and mastic.

5.2.1.7.b Non-slip Aggregate used as the abrasive aggregate for a non-slip floor finish shall be fused aluminum oxide grits, or crushed emery. Emery aggregate shall not contain less than 40% aluminum oxide nor less than 24% ferric oxide. Use material that is factory-graded, packaged, rustproof and non-glazing, and is unaffected by freezing, moisture and cleaning materials.

5.2.1.7.c A floor sealer shall be used where shown on the architectural contract documents. The compound shall be a V.O.C. compliant water-based, non-yellowing acrylic sealer. Apply according to manufacturer’s recommendations.

5.2.1.7.d Non-shrink grout shall have a minimum compression strength of 7000 psi at 28 days and be a non-shrink, non-metallic, non-staining, non-corrosive, premixed grout. Comply with Corps of Engineers CRD C621, “Specification for Non-
Shrink Grout”. In addition, the grout manufacturer shall furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95% bearing under a 4 ft. x 4 ft. base plate.

Prior approved grouts:
1. Dayton Superior Sure-Grip High Performance Grout
2. Euclid Hi Flow or NS Grout
3. Master Builders Masterflow 713 Plus or Materflow 928 grout

5.2.1.7.e Epoxy Bonding Agent: Epoxy bonding agent complying with ASTM C 881, Type V, Grade 2, with Class corresponding to temperature at time of pour.

5.2.1.7.f Latex Bonding Agent: Latex bonding agent complying with ASTM C 1059, Type II.

5.2.1.7.g Neoprene bearing pads shown on drawings shall be 100% virgin chloroprene (Neoprene) and shall meet AASHTO specifications. Shore "A" hardness shall be 60 unless otherwise noted. Submit certification and test reports for the actual production run of these pads as part of the shop drawing submittal procedures.

5.2.1.7.j Dovetail Anchor Slots: 22 gauge minimum, G60 galvanized. Provide where masonry is backed by concrete. Maximum horizontal slot spacing is 16 in. c/c. Refer to architectural drawings.

5.2.1.7.k Epoxy Adhesive:
1. Two-component, high modulus, high strength, structural epoxy adhesive for use in installing reinforcing steel dowels into hardened concrete.
2. ASTM C 881, Type IV, Grade 2 or 3 with class corresponding to temperature at time of placement.

5.3.1.7 Discharge of concrete from ready-mix trucks shall not begin until testing agency has made preliminary checks of slump (and air content - if required).

5.3.2.1.a.1 Adequate protection against rain, sleet or snow shall be defined as protection that prevents any and all adverse affects of the rain, sleet or snow on the appearance, strength or durability of the concrete.

5.3.2.1.b.1 Placement of concrete in cold weather shall also comply with paragraph 1.8 of this specification, titled Cold Weather Concreting.

5.3.2.1.c.1 Placement of concrete in hot weather shall also comply with paragraph 1.9 of this specification, titled Hot Weather Concreting.

5.3.2.1.d Evaporation Retarder - When low humidity and/or dry winds create conditions suitable for plastic cracking, evaporation retarder may be required to be applied by spray one or more times during the finishing operation. Evaporation retarder shall not be used as a finishing aid.

5.3.2.3.c.1 Pumping pipes and hoses shall be supported above in-place reinforcing on plywood or tires to cushion impacts, prevent abrasions of epoxy coatings and PT sheathing, and prevent displacement of reinforcement.
5.3.2.4.a Assume 1/2 in. average extra concrete will be required to account for deflection of metal deck.

5.3.2.4.b Concrete is not permitted to be placed in standing water or under water without approval of Architect/Engineer.

5.3.2.6.a Bond is required for vertical construction joints in horizontal members, except for slabs on grade.

5.3.2.7 Where not otherwise shown on Drawings, provide control joints in slabs on grade at column centerlines and at the following maximum spacing:
   a. Slabs less than 5 in. thick – 12 ft. c/c
   b. Slabs 5 in. to 8 in. thick – 16 ft. c/c
   c. Topping slabs – 8 ft. c/c
   d. Maximum panel width-to-length ratio: 1.5.

5.3.3.3.a Surface finish-1.0 (SF-1.0):
   - No formwork facing material is specified;
   - Patch voids larger than 1-1/2 in. wide or 1/2 in. deep;
   - Remove projections larger than 1/2 in.;
   - Tie holes need not be patched;
   - Surface tolerance Class C as specified in ACI 117; and
   - Mockup not required.

5.3.3.3.b Surface finish-2.0 (SF-2.0):
   - Patch voids larger than 3/4 in. wide or 1/2 in. deep;
   - Remove projections larger than 1/8 in.;
   - Patch tie holes unless indicated otherwise in Contract Documents;
   - Surface tolerance Class A as specified in ACI 117; and
   - Mockup not required.

5.3.3.3.c Surface finish-3.0 (SF-1.0):
   - Patch voids larger than 3/4 in. wide or 1/2 in. deep;
   - Remove projections larger than 1/8 in.;
   - Patch tie holes unless indicated otherwise in Contract Documents;
   - Surface tolerance Class A as specified in ACI 117; and
   - Provide mockup of concrete surface appearance and texture.

5.3.3.4.b.1 Where a grout-cleaned rubbed finish is indicated, grout color shall match color of concrete surface to which the grout is applied. When the color of the grout lightens due to drying, rub the surface and keep the surface damp for 36 hours afterward.

5.3.3.4.c.1 Where a cork-floated finish is specified, grout color shall match color of concrete surface to which the grout is applied.

5.3.3.7 Specified Finishes of Formed Surfaces:
   a. NON-EXPOSED SURFACES shall be SF-1.0 per 5.3.3.3.a. This includes all non-exposed flat surface and ribbed slabs. Metal pans shall be new or
factory reconditioned, with stiffeners to support concrete without sags and bulges in order to satisfy a Class D surface tolerance per ACI 117.

b. EXPOSED SURFACES shall be SF-2.0 per 5.3.3.3.b cast against Class 1 High Density, Overlaid plywood Ext-ADA true to line. This finish applies to all exposed to view formed surfaces that are not designated Architectural Concrete, both interior and exterior.
   1. Formwork shall be in 8-foot lengths and 4-foot widths unless otherwise noted.

c. ARCHITECTURALLY EXPOSED SURFACES shall be SF-3.0 per 5.3.3.3.c cast against Class 1 High Density, Overlaid plywood Ext-ADA true to line, unless specified otherwise in Section 6 (ACI 301). This finish applies to all formed surfaces exposed to view which are designated Architectural Concrete, both interior and exterior.
   1. Material and layout must be approved by Architect prior to placing concrete.
   2. Formwork shall be in 8-foot lengths and 4-foot widths unless otherwise noted.

5.3.3.8 In the case of disagreement regarding use of damaged or worn formwork impairing the concrete surface the Architect’s decision shall be final.

5.3.4.1.a Slabs shall be finished in accordance with 5.3.4.2.j ‘Nonspecified finish’ (as described in ACI 301), unless indicated otherwise on the architectural drawings or in 5.3.4.2.k.

5.3.4.2.k Specified Finishes of Unformed Surfaces:

Type A Exterior areas exposed to vehicular or pedestrian traffic to receive a floated or light broom finish per the Architect’s direction. Finish slabs to a manual straightedge ‘conventional’ tolerance per ACI 117 (1/2 in. in 10 feet) and provide positive drainage with no “ponds” greater than 6 in. in diameter. Do not “over finish” slabs.

Type B Building interior slabs-on-grade and supported decks and all other slabs not specifically indicated shall receive a steel trowel finish in accordance with 5.3.4.2.c. Finish slabs to a ‘flat’ tolerance (SOFₗ=35, MLFₗ=28, SOFₗ=25, MLFₗ=20) in accordance with ACI 117. Measure floor finish tolerance within 72 hours after floor finishing and before removal of supporting formwork or shoring. Levelness tolerance (SOFₗ) is not applicable to unshored suspended floors.

Type C Slabs to receive future waterproofing membrane or insulation with topping slabs shall have a floated finish in accordance with 5.3.4.2.b,

Type D Slabs to receive future topping slabs bonded to base slab shall be finished in accordance with 5.3.4.2.f.
Type E  Stair treads and landings, interior or exterior, shall receive a non-slip floated finish with a non-slip aggregate finished to a manual straightedge ‘flat’ tolerance per ACI 117 (1/4 in. in 10 feet).

5.3.4.2.k.1  Unformed surfaces which do not comply with the specified tolerances, and are deemed unacceptable by the Architect or installer of subsequent floor covering(s), shall be remedied by the Contractor in a manner acceptable to the Architect at no additional cost to the Owner.

5.3.6.3.a  When forms are removed prior to 7 days, apply one coat of liquid curing compound to all formed surfaces within an hour of formwork removal.

5.3.6.4.d.1  A thin layer of water shall be applied to the slab surface just prior to placement of the waterproof sheet. The sheet shall remain in place for a minimum of 7 days and shall be periodically sprinkled with water to ensure concrete surface remains moist.

All edges and laps of the waterproof sheet shall be weighted down and all tears in the sheet shall be immediately repaired so that no portion of the concrete surface remains uncovered.

5.3.6.4.e.1  Apply curing compound to flatwork in two coats at right angles to each other per manufacturer’s recommendations. Total application rate shall be in accordance with manufacturer’s recommendations, but not less than 1 gal./200 ft$^2$. For rough surfaces, such as broom or scratch finishes, increase application rate per manufacturer’s recommendations, but by not less than 50%.

a. Correct coverage shall be maintained by the applicator and determined through accurate measurement of the material and the number of square feet to which it is applied.

b. Curing compound shall also be applied to formed surfaces, including beam and slab soffits, per manufacturer’s recommendations when forms are removed sooner than 7 days after concrete is cast.

5.3.6.4.g  Unless otherwise noted, preservation of moisture in concrete shall be by application of a curing compound satisfying the requirements of 5.2.1.2. Apply the curing compound in accordance with 5.3.6.4.e.

5.3.6.4.h  Where curing compound will not be compatible with applied finishes, application of a waterproof sheet material per 5.3.6.4.d or a continuous wet cure is required. Wet cure all slabs to receive a bonded topping or waterproof membrane. Wet cure slabs shown on the architectural drawings as requiring a wet cure.

5.3.7.1.a  All voids, damaged places, fins, projections, and honeycomb areas shall be removed down to sound concrete and repaired immediately after form removal. Any concrete that is not formed as shown on the contract drawings, is out of alignment or level, or indicates a defective surface or unsoundness of any nature shall be removed and replaced to the limits required by the Architect/Engineer unless permission is granted to patch or otherwise correct the defective work. Permission to patch or attempt the correction shall not be construed as a waive of the Architect/Engineer’s right to require complete removal of the defective work.
should the patching or correction prove to be, in the opinion of the Architect/Engineer, unsatisfactory either as to structure or appearance.

5.3.7.2.a Grout tie holes with non-shrink grout in below-grade walls. Coat the applied area with the specified bonding agent per the manufacturer’s instructions. **Do not grout tie holes in exposed to view walls unless otherwise noted.**

5.3.7.5.a Repair materials other than site-mixed portland-cement mortar shall be submitted for approval.

5.3.7.7 All patching materials shall be proportioned to match color of surrounding material after patch material has cured. Prior to starting patching operation, test different techniques, grout mixes, and curing procedures on concealed areas to best match cast concrete. Obtain approval from the Architect/Engineer of patching material and methods prior to proceeding with patching.

Section 7 (ACI 301) - Lightweight Concrete

7.1.3.1 Sprinkle lightweight aggregate stockpiles continuously for a minimum of two weeks just prior to use in concrete. Lightweight aggregate must be saturated prior to use in concrete mixes.

7.2.1.1 Prior approved lightweight aggregate is Solite.

7.2.2.1.a Concrete shall have a minimum durability factor of 90% when tested in accordance with ASTM C 666.

7.2.3.3 Refer to table 4.2.2.8.b for the minimum compressive strength, minimum cement content, and maximum air dry unit weight of the lightweight concrete.

Section 9 (ACI 301) – Post-Tensioned Concrete

9.1.1 Delete this section of ACI 301.

Section 10 (ACI 301) – Shrinkage-Compensating Concrete

10.1.1 Delete this section of ACI 301.

Section 11 (ACI 301) – Industrial Floor Slabs

11.1.1 Delete this section of ACI 301.

Section 12 (ACI 301) – Tilt-Up Construction

12.1.1 Delete this section of ACI 301.

Section 13 (ACI 301) – Precast Structural Concrete

13.1.1 Delete this section of ACI 301. Where applicable, Precast Structural Concrete is specified in Specification Section 03 4100 – Precast Structural Concrete.

Section 14 (ACI 301) – Precast Architectural Concrete
14.1.1 Delete this section of ACI 301. Where applicable, Precast Architectural Concrete is specified in Specification Section 03 4500 – Precast Architectural Concrete.

END OF FOREGOING PARAGRAPH 1.7 ENTITLED “SUPPLEMENTAL REQUIREMENTS AND MODIFICATIONS TO ACI 301-10”.

1.8 COLD WEATHER CONCRETING

A. The provisions of ACI 306.1 shall be followed for all concrete placed or cured when the average daily temperature is below 40 °F. The methods of protection to be used for cold weather concrete, including preservation of moisture for curing of the concrete, shall be submitted in writing to the Architect/Engineer for review at least one week prior to cold weather placement.

B. Plan construction schedule and obtain needed materials and equipment on the job site in advance of cold weather.

C. All reinforcement, formwork and top 12 inches of the subgrade shall be clear of ice and snow and be not less than 40 °F at time of placement of concrete. The temperature of large embedded items, such as weld plate assemblies for structural steel framing, shall be no less than 35 °F at time of placement.

D. The concrete temperature as placed shall not be less than specified in column (2) of Table 3.2.1 in ACI 306.1, and shall not exceed these values by more than 20 °F. The temperature of the concrete being discharged shall be tested by the testing agency whenever cylinders are cast, and hourly by the Contractor. The Contractor shall maintain and submit same to the Architect/Engineer weekly.

E. Any covering, insulation or housing shall be extended to protect projecting reinforcement and embedments.

F. The Contractor shall install and read maximum/minimum thermometers twice daily during the construction and curing of all structural slabs in cold weather. Provide one thermometer for each 3000 square feet of slab. Place the thermometers near slab perimeter. The Contractor shall submit those temperature readings to the Architect/Engineer weekly.

G. Concrete shall be exposed to ambient temperature in a gradual manner after being cured. Refer to ACI 306.1, Table 3.2.1.

1.9 HOT WEATHER CONCRETING

A. The provisions of ACI 305.1 shall be followed for all concrete placed when the ambient air temperature is greater than 80 °F. Note: Concrete protection during windy conditions combined with heat or low humidity shall also conform to ACI 305.1. The methods of protection used for hot weather concreting shall be submitted in writing to the Architect/Engineer for review at least one week prior to hot weather placement.

B. Plan construction schedule and obtain needed materials and equipment on the job site in advance of hot weather.
C. The Contractor and ready-mix supplier shall review concrete mixes for use in hot weather with respect to placing requirements, strength and durability.

D. Concrete temperatures as discharged from the truck shall not exceed 95°F. Ice, if used, shall be considered part of the total mix water (50 lbs. ice = 6 gallons of water). (Retarders in low slump superplasticized mixes may be required to comply with this requirement.)

E. The temperature of the concrete being discharged shall be tested by the testing agency whenever cylinders are cast, and hourly by the Contractor. The Contractor shall maintain a written record of these temperatures and submit same to the Architect/Engineer weekly.

F. Cool and moisten formwork and subgrade by sprinkling with water prior to placing concrete.

G. Placement and Finishing:
   1. Concrete shall be discharged from the truck a maximum of one hour after the introduction of mix water to cement and aggregates.
   2. Do not add water to mix to increase slump. Use the approved superplasticizer to maintain a placeable concrete mix.
   3. Strike off and screed slabs immediately. Protect slab's surface against moisture loss prior to final finishing.
   4. Thoroughly vibrate through all wall and column lift lines and adjacent slab placements to prevent cold joints.
   5. Immediately apply liquid curing compound as specified in Section 5 (ACI 301) after final finishing. Follow with continuous wet curing as specified in paragraphs 5.3.6.4.a or 5.3.6.4.b (ACI 301) for a minimum of three days.

PART 2 PRODUCTS AND

PART 3 EXECUTION

3.1 PRODUCT AND EXECUTION REQUIREMENTS ARE INCLUDED IN PARAGRAPHS 1.7, 1.8 AND 1.9 ABOVE.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Section includes all labor, materials, equipment, special tools and services to complete Structural Steel and Other Steel work required for the Project, as herein specified, and as indicated on the Drawings, including but not limited to:

1. All Structural Steel indicated, including design of connections not shown on the Drawings.
2. All accessories, attachments, anchors and rough hardware for structural steel work. Accessories include anchor bolts, embed plates, deck support angles, etc.
3. Prime painting, galvanizing, and Architecturally Exposed Structural Steel where indicated on the Drawings.
4. Quality control and Inspection By Contractor specified to be performed by the Contractor.
5. Coordination with related and adjacent work shown on the Drawings.
6. The Contract Documents do not differentiate between fabrication and erection work. Should fabrication and erection be performed by separate contractors, the fabricator is responsible for the scope of work of erector and is responsible for resolution of any disputes that may arise.
7. Setting of items built into cast-in-place concrete or unit masonry and grouting of base plates is not included in this section.

B. Steel Joist and Metal Deck work is to be performed by the Contractor of this Section, including submittals, erection, quality control, and Inspection By Contractor specified herein. See the related sections for additional requirements specific to joists and deck.

C. Related Sections:

1. Section 03 3000 - Cast-In-Place Concrete.
2. Section 05 3000 - Metal Decking.
3. Section 05 4000 - Cold-Formed Metal Framing.

1.2 REFERENCES

A. Comply with the provisions of the following codes and standards. Modifications in this Specification, when in conflict with the referenced codes and standards, shall take precedence over the referenced codes and standards.

2. American Institute of Steel Construction (AISC) 303-10: "Code of Standard Practice for Steel Buildings and Bridges," April 14, 2010, as modified by the project Drawings and this Specification; and modifications herein at the end of this section.
6. AWS-C5.4-93: "Recommended Practices for Stud Welding".
9. Steel Structures Painting Council (SSPC) “SSPC Painting Manual”: “Systems and Specifications” and “Good Painting Practice”
10. American Galvanizer’s Association (AGA) Recommendations and Suggested Specifications for Hot-Dip Galvanizing.

1.3 SUBMITTALS

A. The structural engineer of record’s review of the Contractor’s submittals shall be for compliance with the strength and serviceability requirements of the Contract Documents only. Submittals are not reviewed for accuracy of dimensions, fit-up, construct-ability, or for coordination of shop drawings.

B. Submit for record evidence of Steel Fabricator’s and Erector’s qualifications.

C. Submit for record evidence of Steel Fabricator’s and Erector’s quality control programs, procedures and certifications showing conformance with Chapter 17 of the Building Code.

D. Prior to preparing shop drawings, submit for record calculations of connections designed by the fabricator, prepared, signed and sealed by a Professional Engineer registered in the state in which this project is located.

E. Submit detailed drawings, include:
   1. Complete details and schedules for fabrication and shop assembly of all members.
   2. Details, schedules, procedures and diagrams for field erection of the structural frame.
   3. Evidence that shop drawings (piece and erection drawings) have been reviewed by the Fabricator's Professional Engineer prior to submittal.
   4. Layout and installation drawings for all anchor bolts and other items to be embedded in concrete or masonry work by others. Drawings shall dimension the locations of all embedded items noting pertinent tolerances for the installation.

F. Prior to fabrication, submit for record two copies of producer's or manufacturer's specifications and installation instructions for the following items. Include laboratory test reports and other data for evidence as required to show compliance with these specifications (including specified standards). Indicate by transmittal form that copies of each applicable instruction have been distributed to fabricators, installers and erectors.
   1. Structural steel: Submit the mill report for each heat of steel used prior to the start of fabrication. Mill reports shall show chemical analysis to include C, Mn, Cr, Mo, V, Ni, Cu and full mechanical properties of the structural steel provided. For unsatisfactory mill test report, retest or reject steel.
2. High-strength bolts, including nuts and washers: Submit certification of inspection test report for each production lot indicating proof load, tensile strength and hardness of high strength bolts. For unsatisfactory test reports, retest or reject bolts.

3. Welding materials and procedures: Submit written welding procedures for all welding on the project, both shop and field. Procedures for complete penetration welds shall include test records to verify the heat-affected zone and show that parent metal for the test meets the grade specified for the project. Welding sequence and procedures are to minimize the effect of weld shrinkage, residual stresses, and to maintain erection tolerances.

4. Expansion bolts and adhesive anchors.

5. Primer paint and surface preparation procedures.

6. Hot-dip galvanizing and surface preparation procedures

G. During fabrication and construction, Contractor shall submit the following inspection and test reports immediately to the Owner's representative and inspector, with a copy to the structural engineer of record within one week.

1. Welder certification for shop and field welders.
2. Welding, fabrication and erection inspection reports.
3. Welding verification inspection and test reports for all shop and field welds.
4. Shear stud test reports.
5. Contractor’s weekly inspection report summary.

H. Submit record drawings of the erected steel members to the Owner’s representative.

I. Informational submittals, compliance reports and submittals for record will not be reviewed or returned.

1.4 CONTRACTOR DESIGNED CONNECTIONS

A. The Contractor shall be responsible for the structural design and detailing of all connections not shown on the Drawings, in addition to detailing those connections shown on the Drawings. The structural design and detailing of connections shall be in accordance with the following provisions and those identified on the drawings.

B. Design of all connections shall be under the direct supervision of a suitably qualified and experienced structural Professional Engineer, registered in the state in which this project is located, who shall sign and seal the shop drawings of the work for which he is responsible.

C. The Contractor shall design connections using the concepts, specific configuration details, and typical connection notes indicated on the Drawings as minimum requirements.

D. The Contractor shall prepare sketches of all connection details, with locations clearly marked on plans and elevations, and submit these in conjunction with pertinent design notes and calculations for review by the Owner’s structural engineer, prior to preparing and submitting related shop drawings.

E. All beam connections shall be simple beam connections unless indicated otherwise on the drawings. Simple beam connections shall be designed for the reaction noted on the Drawings, or
where no reaction is called out, for the reaction from the maximum uniform load capacity of the beam. Connections shall also meet the minimum requirements indicated on the Drawings.

F. All gusset, brace and truss member connections shall be designed for the member forces shown on the drawings, or full capacity of the members’ flanges if no forces are shown. Connections shall also meet the minimum requirements indicated on the Drawings.

G. Design of connections includes the analysis and design of connected material to determine requirements for stiffeners, doubler plates, etc. Even if doubler plates and stiffeners are not shown on the contract documents they may be required based on the Contractor’s connection design and shall be included in the work.

H. All member splices shall be designed to develop the full capacity of the smaller member.

I. Connections of members that are part of the Seismic Force Resisting System shall be designed to meet the AISC seismic provisions for the structure type noted on the drawings.

J. The Contractor may propose alternate connections to those shown on the Drawings by submitting sketches, design notes and calculations of all alternate connection details, with locations clearly marked on plans and elevations, at the beginning of the project. Approval is at the discretion and judgment of the Owner’s structural engineer. Shop drawings submitted by the Contractor showing either details or alternate connections not previously reviewed in accordance with these provisions shall be subject to rejection.

1.5 QUALITY ASSURANCE

A. Steel Fabricator:

1. 10 years experience in the fabrication of structural steel.
2. Completion of 10 projects of similar size and complexity within the last 5 years. Submit a list of projects and their locations. Each project listed is to have at least 70 percent of the steel quantity of the work being bid.
3. The steel fabricator must be certified under the AISC Quality Certification Program as Standard for Steel Building Structures, or Major Steel Bridge. Evidence of current auditing by an independent, approved inspection agency that the fabricator has established quality control procedures comparable to the AISC program may be considered in lieu of AISC certification.
4. Steel fabricator must have an established in-house quality control program for shop drawing production, material tracking, material inspection, welder certification, weld quality, and fabrication accuracy. Fabricator shall be registered and approved per Section 1704.2.5 of the Building Code, and submit required certificate of compliance. Failure to meet these qualifications will require additional inspections prescribed in Building Code Chapter 17 to be performed by the Owner’s inspection agency at the Contractor’s expense.

B. Steel Erector:

1. 5 years experience in the erection of structural steel.
2. Submit a list of 6 similar completed projects; include key personnel, and equipment.
3. The steel erector must be certified under the AISC Quality Certification Program as a Certified or Advanced Certified Steel Erector. Evidence by an independent, approved inspection
agency that the erector has established quality control procedures, including weld testing, comparable to the AISC program may be considered in lieu of AISC certification.

C. Qualify welding processes and welding operators in accordance with AWS “Standard Qualification Procedure”. All welding shall be performed by operators who are qualified for the types of welds used. Verify each operator’s qualifications with Owner’s inspector prior to using in production.

1. Welders shall retake qualification test if, as determined by the Owner’s representative, there is a reasonable doubt as to the proficiency of the welder. If the welder does not requalify he/she shall not perform welding on this Project.
2. The Contractor shall pay all costs associated with welder qualification.

D. Qualify mechanical fasteners and installation processes in accordance with manufacturer’s engineering reports and code recognized approval procedure. Use installers certified by the fastener manufacturer. Verify each installer’s qualifications with Owner’s inspector prior to using in production.

E. Contractor shall be responsible for quality control and Inspection By Contractor and for arranging inspections by the Owner’s inspection agency as required by the Contract Documents and referenced codes and standards.

F. Contractor shall reject, repair or replace work not in conformance with the requirements of this specification.

G. Source quality control: All steel shall be Identifiable. Unidentifiable steel shall be tested or rejected.

1. Materials delivered with certificate are classified as Identifiable; those without certificates are classified as Unidentifiable.
2. Test material not identifiable by heat number and mill test, or other acceptable manufacturer’s identification per ASTM A370-02. Testing to be performed by Contractor’s testing agency as follows:
   a. Shear Connectors: Each lot of 100 studs; tensile tests on 3 finished studs per AWS.
   b. Structural Shapes and Plates: From coupons taken from material; one tensile test and one bend test per 5 tons of each shape.
   c. High Strength Bolts: Each lot of 100 bolts; tensile tests on 2 bolts in full size and one tensile test on a ½” diameter machined specimen.
   d. Other Materials: Test as directed.

H. Structural inspections required by Chapter 17 of the Building Code shall be performed by an approved inspector retained by the Owner.

I. Contractor shall furnish Owner’s inspector with the following:

1. One complete set of fabrication and erection drawings.
2. Material bills and mill test reports.
3. Information regarding time, place of rolling and shipment of materials to shop.
4. If requested, representative sample pieces for testing.
5. Full and ample means and assistance for testing materials.
6. Complete set of welding procedures.
7. Welder qualifications.
8. AISC fabricator certification documents QA/QC manual and most recent AISC audit.
9. AISC erector certification documents QA/QC manual and most recent AISC audit.
10. Reports for quality control all tests and Inspection By Contractor.
11. Qualifications for Contractors independent testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Material Storage: Protect structural steel members and packaged materials from corrosion and deterioration. Store off ground and pitched to drain off water.

B. Do not store materials on the structure in a manner that might cause distortion or damage to the members or the supporting structures. Repair or replace damaged materials or structures as directed.

C. Deliver welding electrodes to job in unbroken packages bearing name of manufacturer. Special handling for electrodes is required per AWS. Provide and use an oven for electrodes requiring continuous drying prior to use.

PART 2 PRODUCTS

2.1 MATERIALS

A. Structural Steel:

2. Other rolled shapes, plates and bars: ASTM A36, U.N.O.
3. HSS tubular square, rectangular and round shapes: ASTM A500, Grade B, Fy = 46 ksi
4. Structural steel pipe: ASTM A53, Type E or S, Grade B (Spiral Pipe is not permitted).
5. All steel to be welded shall conform to chemical and metallurgical limitations specified in AWS D1.1 and D1.3.
6. Special care shall be used to select plate and rolled sections free from internal laminations. The Contractor shall assure compliance with provisions for lamination inspection.
7. All end plates and other plates and shapes exceeding 1” in thickness and intended to receive other material welded normal to them with complete penetration welds or fillet welds exceeding 5/16” in size, shall be fully killed and be capable of through-thickness tension test reduction of area values of 20 percent minimum.
8. Comply with AASHTO Fracture Toughness requirements for Bridge Steels ASTM A709 “Zone 2 Welded Fractures Critical” where noted on structural drawings or below. Provide Charpy V-Notch Impact testing with samples from the core of shapes and plates. Use frequency “P” for the Charpy testing. Steel shall be silicon killed, fine grained. Fracture critical steel includes:
   a. Steel noted on plans or details as “FC”.
   b. Top and bottom chords of trusses.
   c. Top flange and bottom flanges of plate girders, where flange thickness exceeds 1½”.
   d. Flanges of rolled or built-up columns where flange thickness exceeds 1½”.
e. Plates exceeding 1” in thickness with perpendicular attachments, such as base plates and end plates, by penetration welds or fillet welds exceeding 5/16” in size.

B. Threaded Fasteners:

1. Anchor rods: ASTM F1554, Fy 36ksi, minimum. Supply all anchor rods with two heavy-hex nuts, one nut to be used for base plate leveling, unless otherwise shown.

2. High strength anchor rods (where noted): Dywidag Thread bar (Grade 160) conforming to ASTM A722. Threads shall be deformed, not cut, conforming to ASTM A615. Couplers and nuts, including spherical washer and nuts, shall be supplied from a single manufacturer. Alternative supplier is Williams Form Anchor High Strength Anchor Bolts (Grade 150) only one size larger to give equal or greater strength than specified Dywidag. All material, whether Dywidag or William’s, shall be designed for cyclic loading, to temperature extremes of (-20) degrees F.

3. Structural bolts: ASTM A325 heavy-hex structural bolts, heavy-hex nuts and hardened washers, quenched and tempered type 1 medium-carbon steel. Use tension control assemblies conforming to ASTM F1852 wherever access permits. For all bolts unless noted otherwise.

4. Structural bolts noted A490: ASTM A490 heavy-hex structural bolts, heavy-hex nuts and hardened washers, quenched and tempered type 1 alloy steel. Use tension control assemblies conforming to ASTM F2280 where access permits. Use only where A490 bolts are noted on the drawings or acceptable to the engineer of record by written request.

5. Where access prevents the use of a tension control bolt, install bolt(s) with load indicator washer conforming to ASTM F959, in accordance with “Specification for Structural Joints Using High-Strength Bolts” (12-31-09), paragraph 8.2.4, and mark bolt(s) for inspection. Load indicator washers shall be self-indicating to allow visual observation, and provided with 1 or more additional flat washers, based on hole type, as required by the manufacturer.

C. Welding electrodes:

1. Use electrodes as required by AISC “Specification for Structural Steel Buildings” and the AWS Code. As minimum use E70 XX electrodes, low hydrogen.

2. For complete penetration welds of beams, columns and trusses, use E70TG-K2 electrodes or better.

3. Charpy V-Notch Impact requirements for welds for and/or to Fracture Critical Steel shall be in accordance with AASHTO/AWS Bridge Welding Code as required to match that specified for the parent material.

D. Steel stud shear connectors: ASTM A108, Grades 1010 through 1020, Type B, and AWS D1.1.

E. Expansion bolts: Wedge type with one piece wrap around expansion sleeve meeting the requirements of Federal Specification A-A-1923, type 4, zinc plated, galvanized or stainless steel. Embedment depth into concrete shall be as shown on the drawings, if not shown embed 8 x diameter, but never less than the manufacturer's recommended standard embedment.

F. Galvanizing: ASTM A123. Galvanize bolts and washers connecting galvanized members per ASTM A153, Class C. Touch up with galvanizing repair compound.

G. Galvanizing repair: Zinc rich galvanize repair compound containing 90% minimum zinc by weight in the dried film. Comply with DOD-P-21035 or The Society for Protective Coatings, Paint Specifications No. 20 (SSPC-PS 20).
2.2 FABRICATION

A. General:

1. Fabricate items of structural steel in accordance with this specification, the referenced codes and standards, the contract design drawings and the final reviewed shop drawings.

2. Detail and fabricate steel to allow for erection in compliance with OSHA regulations. Complete detailing for compliance, including modification of details shown on the contract drawings where required.

3. Provide camber in structural members as shown. Unless otherwise shown, fabricate beams with mill camber up.

4. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.

5. Where finishing is required, complete the assembly, including connections and welding of units, before start of finishing operations.

6. Furnish main steel members in one piece without splicing unless otherwise shown or approved.

7. All exterior hollow steel members shall be completely sealed air tight with welded plates.

8. Provide holes for drainage in any exterior members that will collect and hold water, either during construction or in final structure.

9. Mill all surfaces in contact bearing. Cut and fit bearing and column stiffeners and straighten base plates to provide full bearing over entire cross-section.

10. Seams in hollow structural shapes shall be oriented away from public view.

11. Plates that are subjected to axial tension shall be oriented with the roll direction as shown on the Drawings. Where not shown, orient the roll direction nominally parallel to the direction of primary tensile stress in the plate.

B. Connections:

1. Provide welded shop connections unless otherwise shown.

2. Provide bolted field connections unless otherwise shown.

3. Provide high-strength bolts for all bolted connections.

4. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

5. Comply with AWS D1.1 Code for procedures, preheat, appearance and quality of welds, including methods used in correcting welding work. Assemble and weld built-up sections by methods that will produce true alignment of axis without warp.

6. Consider toughness and notch sensitivity of steel in formation of the welding procedures to prevent brittle and premature fracture during fabrication and erection. Toughness requirements are to match those of the parent metal. Weld in a manner to minimize accumulation and concentration of through-thickness strains due to weld shrinkage. Sequence welds in a manner to reduce residual stresses caused by welding to a minimum value.

C. Provisions: Provide holes, weld nuts, welded studs, etc., required for securing other work to structural steel and for the passage of other work through steel framing members as required.
2.3 FINISHING

A. Galvanize structural steel where indicated on the Drawings, including all exterior plates and shapes, mechanical support frames, ledge angles, lintels, and lintel plates.
   1. Clean steel to be galvanized of foreign substances per ASTM A385. Power tool clean all welds and adjacent areas to remove flux and splatter before galvanizing.
   2. Provide 2.3-oz./sf zinc coating per ASTM A123.

B. Prime paint structural steel where indicated on the Drawings, do not paint at field weld locations or slip critical faying surfaces. Do not paint galvanized steel or steel which is to be fireproofed, U.N.O.
   1. Surface Preparation (after SSPC SP-1 Solvent Wipe):
      a. Where standard primer indicated - SSPC SP-3 “Power Tool Cleaning.”
      b. Where indicated “Architecturally Exposed” - SSPC SP-6 “Commercial Blast Cleaning.”
   2. Immediately after surface preparation, apply structural steel primer paint in accordance with the manufacturer’s instructions and at a rate to provide a uniform dry film thickness of 2.0 mils. Use painting methods that will result in full coverage of joints, corners, edges and all exposed surfaces. No sags or runs permitted on steel that will be exposed in the finished work.

PART 3 EXECUTION

3.1 EXAMINATION

A. Establish permanent benchmarks, in addition to those provided, as needed for accurate erection of structural steel.

B. Field survey and measure all existing conditions prior to preparation of shop drawings. Employ a licensed land surveyor for all steel erection work.

C. Check elevations of concrete bearing surfaces and locations of anchor bolts and similar devices before fabrication work and report dimensional discrepancies to the Owner’s representative. Do not proceed with fabrication until corrections have been made or until compensating adjustments to structural steel have been approved by the Owner’s structural engineer.

D. Furnish templates and detailed setting drawings as needed to ensure accurate positions of anchors.

E. Verify positions of anchor bolts before fabrication of steel. Report deviations from design locations and submit written recommendations for corrections.

F. Notify the Owner’s representative in writing of conditions that would hinder proper and timely installation, or impair performance of finished work.

3.2 INSPECTION BY CONTRACTOR

A. Fabrication and erection Inspection By Contractor shall conform to requirements of referenced codes and standards and the following:
1. Inspection By Contractor shall be at Contractor’s expense, by a testing agency or qualified inspector other than that employed by Owner, and shall be performed before Owner’s inspection of material involved.

2. Contractor shall submit weekly written inspection report summaries to the Owner’s representative, inspector, and structural engineer. In general, these reports shall:
   a. Verify that welders are certified.
   b. Inspect every weld for quality and conformance.
   c. Make systematic record of all welds, including:
      1) Location and type of weld.
      2) Weather conditions during welding.
      3) Identification marks of welders.
      4) List of defective welds.
      5) Manner of correction of defects.
   d. Confirm welding equipment is used per manufacturer’s recommendations; drying oven and preheating is properly used; fit-up; proper use of run-out plates; and verify structural steel compliance with the specified dimensional standard.

3. Acceptance criteria used for the inspection of welds shall be as specified in AWS D1.1.

B. Visually inspect all material for defects before and after cleaning. Material with visible defects shall be rejected.

C. Lamination inspection: All wide flange or plate material 1 inch or greater in thickness within 6 inches of complete penetration welds for flange or perpendicular plate connections shall be ultrasonically tested for laminations per ASTM A578, Level II. Perform such testing before fabrication and test flange and plate material adjacent to and behind welds again after welding. Inspect all material visually for lamellar tears.

   1. Material in which defects are found shall be rejected and replaced with satisfactory new material, or repaired by welding, subject to approval of the Owner’s structural engineer. Repaired material shall be re-tested at no additional cost to Owner.

D. Penetration welds: Inspect all (100%) complete and partial penetration welds visually. Inspect all (100%) complete penetration welds by ultrasonic or radiographic tests for entire length of weld. All inspections to occur a minimum of 24 hours after completion of welding.

   1. Material that fails testing shall be corrected and re-tested over entire length of weld until satisfactory results are achieved.
   2. Ultrasonic testing shall be performed by a specially trained, qualified technician to operate equipment, examine welds, and maintain a record of welds examined, defects found, and dispositions of defects.
   3. When ultrasonic indications arising from weld root can be interpreted as either a weld defect or backing strip, the backing strip shall be removed and the weld shall be re-tested.
   4. Ultrasonic instrumentation shall be calibrated by technician to evaluate the quality of welds per AWS D1.1.
   5. Other methods of inspection, for example, x-ray, gamma ray, magnetic particle, or dye penetrant, may be used on welds if acceptable to the Owner’s structural engineer.

E. Fillet welds: Inspect all (100%) shop and field fillet welds visually for proper size, quality of weld and placement per reviewed shop drawings. Inspect 5% of a mix of field and shop welds by magnetic particle method, ASTM 109.
F. Shear studs: Test and install as specified in AWS D1.1 requirements for stud welding.

G. High strength bolted connections: At beginning of bolting operations, verify bolt installation techniques and test bolts in field conditions for proper pretension per manufacturer’s requirements. Retest when changes in bolt lots, lubrication and weather exposure conditions occur. Inspect all bolted connections for bolt size, quantity, type, and tension.

H. Expansion and adhesive anchor bolts: Observe hole preparation and installation technique at all anchors and proof test all anchors to verify conformance with manufacturer’s recommendations.

3.3 INSPECTION BY OWNER

A. The Owner will engage an independent inspection agency to perform shop and field verification inspection services in accordance with referenced standards. The Contractor shall schedule and coordinate inspections.

1. The Owner will pay costs of initial inspection.
2. Material that fails inspection shall be corrected by Contractor and re-inspected until satisfactory results are achieved.
3. The Contractor shall pay costs incurred by Owner’s inspection agency, architect, and/or engineer for re-inspection of corrections made because of failed initial tests.
4. Inspection may be performed in shop or field.
5. Contractor shall perform all necessary preparatory work for inspection such as cleaning, marking and removal of back-up bars, if needed, without additional costs.
6. Acceptance criteria used for the inspection of welds shall be as specified in AWS D1.1.

B. Inspections do not relieve Contractor of responsibility for contract compliance. The Owner’s representative shall have the right to inspect or test work and reject faulty materials of workmanship at any time before final acceptance.

C. General:

1. Review Contractor's quality control program.
2. Review Contractor’s fabrication and erection inspection reports for compliance with the requirements of AWS D1.1 and Inspection By Contractor, above.
3. Verify welder's certifications.
4. Provide required verification inspections.
5. Record types and locations of all defects discovered, report such discoveries to Contractor, and record corrections performed. Reports will be made not less than weekly to the Owner’s representative.

D. Penetration welds: All (100%) complete and partial penetration welds shall be visually inspected. Twenty percent (20%) of complete penetration welds shall be inspected ultrasonically for the entire length of weld. Columns, beams and plate material perpendicular in connections with penetration welds will be checked for lamellar tears. Further inspection may be required if unacceptable welds or material are found. Contractor shall pay cost of such additional inspection. Rejection of any portion of a weld shall require re-inspection of 100% of that weld after repair.
E. Fillet welds: Twenty percent (20%) of the field-placed fillet welds shall be visually inspected. Five percent (5%) of shop-placed welds shall be visually inspected to verify fabrication quality control. Inspector is to verify placement of welds per reviewed show drawings, as well as proper size and quality of weld.

F. Shear studs: At start of shear stud installation, Owner’s inspector shall observe construction installation and the Contractor’s quality control, specified in AWS D1.1, (requirements for stud welding) and perform the following additional requirements:

1. 100% of the first 100 studs and 50% of the next 200 studs installed shall be bend tested to a 15-degree angle. If more than 4 studs fail, installation shall cease until installation procedures have been adjusted to achieve satisfactory results, and Contractor shall bend test all studs installed to date.
2. For balance of job, bend tests at least 10% of all field-applied shear studs. A failure rate of not more than 2% of studs tested will be acceptable.
3. Contractor shall correct failed stud installations.
4. Owner’s inspector shall check stud installation using the contract drawings and reviewed shop drawings to verify quantity and location of studs.
5. If operators or equipment are changed or the deck becomes wet, testing shall revert to that at the beginning of the project.

G. High strength bolted connections:

1. Observe Contractor’s testing and installation techniques meet manufacturer requirements.
2. Visually inspect all bolted connections for bolt size, quantity, type, and tension. Inspection shall also confirm that bolts’ threads are not in the shear plane where required.

H. Expansion and adhesive anchor bolts: Observe that all anchor bolts are proof tested after installation in conformance with manufacturer’s recommendation.

I. Remedies: Defective material shall be removed and replaced by the Contractor unless corrective procedures are permitted by the engineer. Corrections shall be tested at Contractor's expense until satisfactory results are achieved.

3.4 OXYGEN (FLAME) CUTTING

A. Manual oxygen cutting shall be done in the shop only and only with a mechanically guided torch. Alternatively, an unguided torch may be used provided the cut is not within 0.5 inches, of the finished dimension and the final removal is completed by chipping or grinding to produce a surface quality equal to that of the base metal at cut edges.

B. Control process to prevent excessive hardening of edges of steel where material is to be welded or is subject to axial tension.

C. Clean and repair all cut edges by welding and/or grinding to remove all gouges, cuts, burrs, and jags to meet the requirements of AWS D1.1.

D. Re-entrant cuts shall have as large a radius as possible without over cutting.
E. The use of oxygen-cut holes for bolted connections is not permitted under any circumstances. Violation will be cause for the rejection of any pieces in which oxygen cut bolt holes exist.

F. Oxygen cutting of structural steel in the field is not allowed except with the written consent and approval of the Owner’s structural engineer.

3.5 BASE PLATES AND ANCHORS

A. Furnish anchor rods, and other items built into cast-in-place concrete or unit masonry to appropriate installer, together with template and detailed setting drawings required to assure accurate positioning of the items.

B. Templates, furnished by the Contractor for all anchor rods, shall be used to set the anchors. Templates shall be fabricated from steel plate, minimum thickness 1/8”. The installer is to check carefully the setting of the bolts to the proper position prior to placement of concrete. Anchor bolts shall have nuts and washers. Damaged threads shall be repaired or re-cut to permit full tightening of nuts.

C. Anchors, embed plates and other items shall not be welded to reinforcing steel.

D. Base plates supported on concrete, whether shop attached or shipped loose, shall be furnished with and set upon leveling nuts. Base plates shall have holes for bleeding off air during grouting.

E. Setting base plates:
   1. Prior to setting, clean existing and new concrete surfaces and roughen with bush hammer to improve bond. Clean the bottom surface of the base plates. Chip out any areas required to set shear lugs, making sure that the reinforcing steel is not damaged.
   2. Tighten anchor bolts after the base plates have been positioned and leveled. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the base plate.

3.6 BOLTS

A. Assemble joint using drifts to obtain correct alignment.

B. Fit bolts. Use hardened washers under the turned part. Lubricate bolts to prevent nuts seizing on the bolts. Lubricate with a liquid high pressure lubricant and apply only to the outstanding threads after the bolts have been inserted through the steel work, taking care to prevent lubricant getting between the plies of the joint.

C. Tighten bolts sufficiently in an appropriate sequence to bring joint surfaces into uniformly close contact.

D. Pretension all high strength bolts to the appropriate levels using tension control bolts or load indicator washers.

E. Mark each bolted connection when all bolts in the connection are prestensioned. Do not touch-up paint or cover until bolts have been inspected. The inspector shall mark connections that have been inspected.
3.7 EXPANSION BOLTS AND ADHESIVE ANCHORS

A. Install in strict accordance with the manufacturer’s written instructions and recommendations. Holes must be properly sized, thoroughly cleaned and all dust removed.

B. Use washers on all bolts.

C. Use care and do not cut or damage concrete reinforcing bars.

D. When exposed to view in the final structure, bolts shall be of a length that will extend entirely through but not more than ¼-inch beyond the nuts unless otherwise shown on the drawings.

3.8 WELDING (APPLIES TO BOTH SHOP AND FIELD WELDS)

A. Weld using only qualified and approved AWS procedures. Use drying oven for electrodes and preheat steel per AWS requirements.

B. Weld in manner to prevent warping or distortion of finished product. Use jigs that will not restrain piece from moving during welding or cooling after welding. Sequence weld passes at a joint to prevent excessive heat build-up or cause shrinkage cracks to form. Adequately peen and brush joint after successive passes to prevent slag inclusions, open pockets, and inadequate fusion.

C. Provisions shall be made in detailing of lengths of members for dimensional changes as a result of shrinkage stresses so as to provide required finished dimension.

D. During assembling and welding, hold components with adequate clamps or other means to keep parts straight, accurately aligned and positioned, and in close contact. Plan sequence of field welding to minimize locked-in stresses and distortion.

E. Provide adequate screening from wind for field welding.

F. Cut out defective welds or parts of welds with a chisel or air arc, and re-weld.

G. Tack welds and temporary welds made in material that will be subject to tension or architecturally exposed shall be removed and ground smooth.

H. Fillet weld sizes shall comply with the minimum requirements of the AWS D1.1 Code regardless of smaller sizes being noted on the contract design drawings.

I. Remove run-off tabs and grind surfaces smooth where the tabs interfere with architectural treatment or are exposed to view in the final structure. Remove backup bars where exposed to public view in the completed structure.

J. All exposed to public view or to weather welds shall be continuous. In the event that an intermittent weld is specified, provide seal welds between.

K. Heavy sections and those weldments having a high degree of restraint must be welded in a sequence with the proper preheat such that no permanent distortion occurs. Submit a welding sequence for review for these types of connections.
3.9 ERECTION

A. Comply with this specification, the referenced codes and standards, the contract design drawings, and the final shop drawings. Comply with requirements of governing authorities, including requirements for work above public streets and sidewalks.

B. Provide all temporary shoring and bracing members as required, with connections of sufficient strength to bear imposed loads, including all construction loads and Building Code wind loads. Comply with FM bulletin I-7:

1. The structural steel framework is "non-self-supporting" and therefore requires temporary support bracing. Do not remove temporary support members and connections until the structure is complete and functioning as the designed unit. The unit is complete when all structural steel and metal deck is completed, and supporting concrete, including walls, floor diaphragms and slabs on metal deck are placed and cured.

C. Provide temporary planking and working platforms as needed for the work. Provide temporary guards on the steel frame at the perimeter of each floor and all floor and roof openings.

D. Field Assembly:

1. Set structural frames accurately to the lines and elevations indicated. Align and adjust the various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignments.

2. Level and plumb individual members of the structure within specified AISC tolerances, unless more restrictive tolerances are specified on the drawings.

3. Splice members only where shown or specified.

4. On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth.

5. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignments and the removal of paint on surfaces adjacent to field welds.

6. Do not enlarge unfair holes in members by burning or by use of drift pins except in secondary bracing members. Ream holes that must be enlarged to admit bolts. Where a hole is required to be enlarged by more than 3/32-inch ream to and use the next larger bolt size.

7. Do not use gas cutting torches in the field for correcting fabrication errors, except on secondary members that are not under stress. Finish gas-cut sections equal to a sheared appearance.

3.10 CLEANING

A. Following erection, clean all steel work of mud and dirt accumulated during erection. Thoroughly clean and remove dirt, debris, oil, water, and other foreign material from steel and leave ready for painting or fireproofing.

B. Field, coat all damaged and abraded areas of galvanized steel with galvanizing repair compound applied per manufacturer’s instructions.
3.11 MODIFICATIONS TO THE AISC CODE OF STANDARD PRACTICE

A. Modifications to the AISC Code of Standard Practice are described throughout the Contract Documents and within this Section. Requirements of the Contract Documents that modify or conflict with referenced standards shall take precedence over the standard. Where a numbered paragraph is noted below, the requirements of said paragraph in the AISC “Code of Standard Practice for Steel Buildings and Bridges”, April 14, 2010, and its Commentary are deleted and the requirements noted herein shall apply.

1.7.1 (a) Steel Contractor shall provide, install and remove any shoring necessary for the installation of new structural steel.

1.7.3 Fabricator shall survey and determine existing dimensions and elevations required for structural steel work or arrange for field verification through the GC or CM, with no additional cost to the Owner.

3.1 (h) Dimensions and elevations for structural steel may require coordination with architectural components, mechanical requirements, and existing conditions and may not be completely shown on the structural drawings.

3.1.2.1 Connections shall be as shown on the Design Drawings with detailing completed by the Fabricator. Should differing configurations be needed, Fabricator shall propose and submit details prior to shop drawing preparation. The submittal shall clearly define the location of all connections submitted for review. See Section 4.2.

3.1.2.2 If additional information or clarifications regarding connections is desired, the Fabricator shall contact the structural engineer of record.

3.2 Architectural Electrical and Mechanical Design Drawings and Specifications

Architectural, Electrical and Mechanical Drawings may be used as a supplement to the Structural Steel Drawings to define detail configurations and construction information, including dimensions and locations.

3.5 Revisions to Design Drawings and Specifications

Revisions are addressed in Section 9.3

3.6 Fast-Track Project Delivery

When it is required that a project be bid before the requirements of Section 3.1 can be met, the Owner may provide sufficient information in the form of scope, drawings, weights, outline specifications, and other descriptive data to enable the fabricator and erector to prepare a knowledgeable bid. Construction shall not commence until drawings are issued for construction, any adjustments to the bid is made and written notice to proceed is given by the Owner.

4.2.1 Legibility of Drawings

Drawings shall be clearly legible and drawn to an identifiable scale that is appropriate to clearly convey the information, but not less than 1/8” to the foot, unless a smaller scale is approved by the Owner’s representative.

4.4 Review of Shop Drawings
Shop drawings shall be made by the Contractor and be submitted for review. The architect and engineer will endeavor to complete their review of shop drawing submittals within 14 days of engineer's receipt of submittals for those shop drawings deemed critical; other shop drawings, 28 days. Shop drawings shall be returned noted: "No exceptions noted," or "Exceptions noted," or "Exceptions noted, revise and resubmit." Fabrication of material prior to the receipt of shop drawings for that material noted "No exceptions noted" or "Exceptions noted" shall be at the Contractor's risk.

4.4.1 Review of shop drawings does not relieve the Contractor of the responsibility for accuracy of detail dimensions; the general fit-up of parts to be assembled in the field; the ability to erect the material; the adequacy of any members or connections designed by the Contractor; or the Contractor's safety measures.

4.4.2 Any notations made on the shop drawings or answers to a Request For Information (RFI) do not authorize additional compensation for the Contractor without the issuance of a formal change order.

4.5 Shop and/or Erection Drawings Not Furnished by the Fabricator

Shop drawings shall be made by the Fabricator or his subcontractor and shall be the responsibility of the Fabricator.

9.3.1 Revisions to the structural steel requirements are made by issuance of new documents, reissuance of existing documents, answers to RFIs, or by annotation of shop or erection drawings.

9.3.2 A revision to the contract price is made by formal change order.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Metal Deck work shall be performed by or under the Contractor of Section 05 1200, Structural Steel, and as specified in Section 05 1200, with the additional requirements herein.

B. Section includes all labor, materials, equipment, special tools and services to complete Metal Deck Work required for the Project, as herein specified, and as indicated on the Drawings, including but not limited to:
   1. The extent of metal decking, including basic layout and type of deck units is indicated on the Drawings.
   2. Performance requirements.
   3. All roof decks.
   4. All fasteners and accessory items required to make a complete installation.
   5. Detailing of metal deck and accessories.
   6. Repair of deck finishes.

C. Metal deck serves other functions in addition to resisting directly applied loads. The manufacturer shall review the use, details and method of installation of his product as indicated and shall disclose to the Owner’s representative any and all deviations from his recommended use and method of installation and shall also make recommendations for the use and method of installation of his product to achieve the intended purpose and result. Such disclosures shall be made within the time stipulated for the submission of shop drawings.

D. Related Sections:
   1. Section 03 3000 – Cast-In-Place Concrete.
   2. Section 05 1200 – Structural Steel.
   3. Section 05 4400 – Cold-Formed Metal Roof Trusses.
   4. Roofing and Insulation.

1.2 REFERENCES

A. Comply with the provisions of the following codes and standards. Modifications in this specification, when in conflict with the referenced codes and standards, shall take precedence over the referenced codes and standards.

   3. American Society of Civil Engineers (ASCE), ASCE 3-91: “Standard for the Structural Design of Composite Slabs”.
16. OSHA Regulations, current.

1.3 SUBMITTALS

A. Submit for record evidence of deck manufacturer’s qualifications.

B. Submit for record evidence of deck manufacturer’s quality control programs, procedures and certifications showing conformance with Chapter 17 of the Building Code.

C. Submit detailed drawings, include:
   1. Unit dimensions, section properties and finish of all types of deck.
   2. Drawings to scale indicating layout and types of deck panels, supplementary framing, reinforcement, cut openings, accessories, and sequence of installation.
   3. Type and location of fasteners and anchorage details.
   4. Details of accessories, plates, and their attachment.
   5. Primer paint and color where painted, or surfaces treated for fireproofing, with extent shown on plan.

D. Submit for record two copies of manufacturer's product data, load and diaphragm capacities, specifications, and installation instructions for each type of decking, surface treatment, finish, fasteners and accessories showing compliance with all requirements of the specifications. Indicate by transmittal form that copies of all applicable instruction have been provided to steel fabricator and erector.

E. Submit for record galvanizing repair and touch up paint product data.

F. Upon request, submit samples for review and acceptance by the Owner’s representative. Samples may be used for bond tests of subsequent coatings.

G. Informational submittals, compliance reports and submittals for record will not be reviewed or returned.

1.4 QUALITY ASSURANCE

A. Deck manufacturer shall be a member of the Steel Deck Institute and shall have an established quality control program with current auditing by an approved inspection agency in conformance with Chapter 17 of the Building Code. Failure to meet these qualifications will require additional inspections prescribed in Building Code Chapter 17 to be performed by the Owner’s inspection agency at the Contractor’s expense.

B. Deck detailer and deck supplier shall be approved by the deck manufacturer.
C. Contractor shall be responsible for quality control, inspection and testing of metal deck and shall reject, repair or replace work not in conformance with the requirements of this specification.

D. Qualify welding processes and welding operators in accordance with AWS “Standard Qualification Procedure”. Verify each operator’s qualifications with special inspector prior to using in production.

E. Qualify mechanical fasteners and installation processes in accordance with manufacturer’s engineering reports and code recognized approval procedure. Use installers certified by the fastener manufacturer. Verify each installer’s qualifications with special inspector prior to using in production.

F. Decking in place is subject to inspection and testing. Expense of removing and replacing portions of decking for testing purposes will be borne by Owner if satisfactory; expense shall be paid by Contractor if unsatisfactory. Remove defective work and replace with new acceptable work.

1.5 DELIVERY, STORAGE AND HANDLING

A. Do not bend or mar deck. Protect deck and packaged materials from corrosion and deterioration. Store off ground and pitched to drain off water. Cover deck with waterproof covering and ventilate.

B. Do not handle or store deck bundles on the structure in a manner that might cause distortion or damage to the deck or the supporting structures. Repair or replace damaged materials or structures as directed. Bent and damaged deck will be rejected.

C. Deliver welding electrodes to job in unbroken packages bearing name of manufacturer. Special handling for electrodes is required per AWS. Provide and use an oven for electrodes requiring continuous drying prior to use.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Metal deck serves other functions in addition to resisting directly applied gravity loads. Metal decks are horizontal shear diaphragms that provide local bracing and transfer horizontal loads as part of the overall lateral force resisting system of the structure. The deck must be fastened at regular intervals to all supporting steel and be capable of these functions.

1. Roof metal deck is required to permanently brace the compression flanges of all supporting members, including miscellaneous framing, and act as a shear diaphragm as an essential part of the lateral force resisting system of the structure.

B. Compute properties of deck sections based on effective design width as limited by AISI Specifications. All data shall be derived from tests certified by an independent testing agency.

C. Provide decking tested and listed in the UL Fire Resistance Directory for specific UL designs indicated on the Architectural Documents.

D. Provide and fasten deck capable of supporting a diaphragm load as noted on the drawings, but not less than 250 pounds per linear foot, working stress load.
E. Form deck as roof deck: Design and fabricate deck capable of supporting total dead and live loads. Deflection shall not exceed 1/360 of the span under a live load of 25 psf. Anchor roof deck units to resist net uplift of 30 psf, working stress loads, FM Class I requirements, or as required by the contract documents, whichever is greater.

F. Accessories for a complete installation, including:
   1. Provide continuous sheet metal plates at all ridges, valleys, change of roof deck direction and areas where roof deck is not nested, lapped or interlocked.

2.2 MANUFACTURERS

A. Manufacturer of steel deck products shall be a current member of the Steel Deck Institute. Manufacturers may include:
   1. Canam Steel Corp.
   2. Consolidated Systems, Inc.
   3. Cordeck.
   4. DACS, Inc.
   5. Epic Metals Corp.
   6. Flexospan Steel Buildings, Inc.
   7. Marlyn Steel Decks, Inc.
   8. New Millennium Building Systems.
   10. Roof Deck Inc.
   11. Valley Joist, Inc.
   12. Wheeling Corrugating Co.

2.3 MATERIALS

A. Steel for metal deck units and accessories: ASTM A653, SQ33 or higher. Conform to AISI Specification for Design of Cold-Formed Steel Structural Members.

B. Shop finish: ASTM A 924, hot dip galvanizing.

C. Galvanizing repair: Zinc rich galvanize repair compound containing 90% minimum zinc by weight in the dried film. Comply with DOD-P-21035 or The Society for Protective Coatings, Paint Specifications No. 20 (SSPC-PS 20).

D. Welding materials: comply with AWS D1.1 and D1.3.

E. Deck fasteners, subject to compliance with all requirements of the drawings, specifications, and manufacturer:
   1. All deck shall be fastened to the supporting steel by screw fasteners. All fasteners must be recognized by the Steel Deck Institute, the ICC-ES International Code Council Evaluation Service, Factory Mutual and Underwriters Laboratory.
   2. Fastener spacing indicated on the drawings or in this specification is based on screws to cold-formed metal framing supports. Where manufactured fasteners are used, fastener spacing may need to be reduced and is to be designed by the Contractor’s engineer and submitted for review.
   3. The following manufacturers supply products that generally comply with these requirements:
      a. PNEUTEK®, Inc., 17 Friars Drive, Hudson, NH, 03051.
      b. HILTI® Corporation, PO Box 21148, Tulsa, OK, 74121.
2.4 FABRICATION
A. Provide all deck of each type from a single manufacturer.
B. Supply deck units in lengths for 3 or more spans on 4 or more supports, where possible, with interlocking or nested side laps.
C. Minimum thickness of material as fabricated shall be within 5% of the design thickness.
D. Deck gage noted is minimum and may have to be increased based on design considering design loads, steel strength, concrete slab thickness, and span variations. Each deck sheet shall be clearly marked as to location if deck gage or strength varies on the structure.
E. Form deck as roof deck: ribbed G-60 galvanized units with depth and minimum thickness as shown on the drawings and as required by design, but at least 9/16” deep and not less than 24 gage.
F. Sheet metal plate: closures, not less than 14 gage.

PART 3 EXECUTION

3.1 EXAMINATION
A. Installer shall examine the area and conditions under which metal decking is to be installed.
B. Notify Owner’s representative in writing of conditions detrimental to proper and timely completion of the work.
C. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION, FORM DECK AS ROOF DECK
A. Provide complete, continuous coverage of entire floor and roof areas without gaps or voids other than specifically indicated openings.
   1. Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking.
   2. Provide neat, square and trim cuts.
   3. Cut openings in deck true to dimensions using metal saws, drills, or cutting torch.
   4. Do not use cutting torch where decking is to be permanently exposed to view.
B. Avoid concentrated loads and impact loads during erection and construction. Plank the deck in all traffic areas to prevent damage to units.
C. Install deck units and accessories in accordance with manufacturer’s recommendations and final shop drawings, referenced standards and as specified herein.
   1. Place deck units in straight alignment, flat and square without warp or excessive deflection, and adjust to final position with proper end bearing on supports before permanently fastening.
   2. Place deck units in lengths for 3 or more spans, on 4 or more supports, wherever possible.
   3. Do not stretch or contract side lap interlocks.
4. Fasten as work progresses, do not leave material unsecured.
5. Coordinate with the manufacturer and structural steel erector in sizing and locating decking bundles to prevent overloading structural members.
6. Do not use deck units for storage or working platforms until permanently secured. Do not overload deck in any case.

D. Provide a minimum of 2” bearing and lap ends not less than 2”. Do not extend bottom sheet past the support.

E. Minimum attachment.
   1. Fasten roof deck units to steel supporting members with fasteners spaced 6” o.c. at ends, end laps, and all perimeter supports. Space fasteners at maximum 12” o.c. at all intermediate supports. Secure deck to each supporting member in ribs in which side laps occur.
   2. Mechanically fasten side laps between adjacent deck units with #10 screws. Do not exceed 24” o.c. spacing.
   3. Fasteners may need to be larger and/or spaced closer for F.M. and U.L. ratings, diaphragm loading specified, or other requirements of the contract documents and shall be indicated by the manufacturer on installation drawings.
   4. Fasten accessories to cold-formed metal framing supports with screws at 12” o.c. and to deck with screws at 6” o.c.

F. Reinforce deck at openings.
   1. Cold-formed metal roof truss contractor to frame openings with cold-formed members connected to the roof trusses.
   2. Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work shown.

G. Provide continuous sheet metal plates at all ridges, valleys, change of roof deck direction and areas where roof deck is not nested, lapped or interlocked. Attach directly to the steel deck at 6” o.c. each side as a finished surface for the application of insulation and roofing.

H. Metal deck to receive spray-on finish, insulation, or fireproofing (see architectural contract documents) shall be cleaned of all grease, mill oil, paraffin, dirt, salt and other contaminants which would impair adhesion. All required cleaning shall be done prior to metal deck installation using a cleaning method that is compatible with finish application.

3.3 INSPECTION

A. Contractor’s inspector shall inspect all metal deck work, fasteners and welds as part of the required quality control. Inspect as work proceeds and areas are completed, but ahead of concrete or roof placement. Confirm in reports:
   1. Proper material is installed properly, including gage of material and, if gage varies, at correct locations on the structure.
   2. Welding qualifications and fastener certifications for deck installers.
   3. All (100%) deck welds and mechanical fasteners are installed and inspected, including layout, spacing, size and quality, per the Structural Drawings and project requirements.
   4. Galvanized finish is repaired.

B. Owner’s inspector shall review Contractor’s inspections and verify the installed deck work.
3.4 FINISH REPAIR AND CLEANING

A. Repair galvanized finish on all galvanized steel roof deck, and any deck with exterior exposure, by field coating all damaged and abraded areas with galvanizing repair compound. After decking installation and ahead of roofing, wire brush, clean and paint scarred areas, welds and rust spots on top and bottom surfaces of decking units and supporting steel members. Touch-up surfaces with galvanizing repair paint applied in accordance with manufacturer’s instructions.

B. Following erection, clean all steel deck of mud and dirt accumulated during erection. Thoroughly clean and remove dirt, debris, oil, water, and other foreign material from deck surfaces. Clean composite deck with detergent to remove oil and slick spots that would prevent concrete from bonding. Leave ready for concrete fill, roofing, painting or fireproofing.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, tools and equipment to install cold-formed metal wall framing as shown on the drawings and specified herein, including but not limited to:

1. Exterior load-bearing steel stud walls.
2. Interior load-bearing steel stud walls.
3. Exterior steel stud curtain walls.
4. Bridging, bracing, clips and other accessories.

B. Related Sections

1. Section 05 1200 – Structural Steel
2. Section 05 3000 – Metal Decking

1.2 REFERENCES

A. Comply with the provisions of the following codes and standards. Modifications in this specification, when in conflict with the referenced codes and standards, shall take precedence over the referenced codes and standards.

3. ASTM A 1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
4. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
5. ASTM C 955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
6. ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
8. AISI - Standard for Cold-Formed Steel Framing General Provisions.
9. AISI - North American Specification (NASPEC) for the Design of Cold-Formed Steel Structural Members - 2007, including 2010 Supplement.
11. AWS D1.3 "Structural Welding Code - Sheet Steel."

1.3 SUBMITTALS

A. Submit manufacturer’s product data and installation instructions for each type of cold-formed steel framing and accessory required.

B. Submit manufacturer’s certification of product compliance with codes and standards.
C. Submit shop drawings showing:
   1. Locations of framing members, wall framing sections and opening elevations.
   2. Sizes and spacing of framing members.
   3. Methods of fastening framing members to each other and to supporting systems.
   4. Details of vertical deflection connections to structures.
   5. Locations and spacing of lateral bracing and structural bracing systems.
   6. Accessory products required for complete installation.

1.4 QUALITY ASSURANCE

A. Contractor shall provide effective, full time quality control over all fabrication and erection complying with the pertinent codes and regulations of government agencies having jurisdiction.

B. Conduct pre-installation meeting to verify project requirements, substrate conditions, and manufacturer's installation instructions.

C. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code-Steel" and AWS D1.3 "Structural Welding Code-Sheet Steel."

D. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer’s unopened containers or bundles, fully identified by name, brand, type and grade. Exercise care to avoid damage during unloading, storing and installation.

B. Store materials protected from exposure to rain, snow or other harmful weather conditions, at temperature and humidity conditions per the recommendations of ASTM C955.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Clark Western Building Systems.
   2. Dietrich Metal Framing.
   3. Steel Stud Manufacturers Association (SSMA) member manufacturer approved by Architect.

2.2 COMPONENTS

A. Structural Framing: Cold-formed galvanized steel stud sections (type S), sizes per drawings. Provide minimum 1-5/8 inch stiffened flange, depths as indicated on drawings, and material thickness not less than 18 ga. Minimum yield strength 50 ksi for 16 ga. and heavier material.

B. Non-load Bearing Studs – Provide minimum 1-1/4 inch stiffened flange, depths as indicated on drawings, and material thickness not less than 25 gage.

C. Structural Track: Cold-formed galvanized steel runner tracks with minimum 1 ¼ inch flange. Thickness per drawings, but not less than 18 ga.

D. Deflection Track: Cold-formed deep leg runner slip track per drawings, not less than 18 ga.

E. Deflection Clips: Manufacturer’s standard clips, minimum 14 ga.
F. Clip Angles: Per drawing, not less than 16 ga.

G. Fasteners: Self-drilling, self-tapping screws; complying with ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.


2.3 MATERIALS

A. Steel: Galvanized steel meeting or exceeding the requirements of ASTM A 1003.
   1. Coating: Galvanized G60 coating minimum, complying with ASTM C 955.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine structure, substrates and installation conditions. Do not proceed with cold-formed steel metal framing until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.2 PREPARATION

A. Prepare attachment surfaces so that they are plumb, level, and in proper alignment for accepting the cold-formed metal framing.

3.3 FABRICATION

A. Framing components may be preassembled into panels prior to erecting. Prefabricate panels so they are square, with components attached in a manner which prevents racking and minimizes distortion during lifting and transport.

B. Cut all framing components square for attachment to perpendicular members or as required for an angular fit against abutting members.

C. Plumb, align and securely attach studs to flanges of both upper and lower runners.

D. In all doubled jamb studs and doubled headers not accessible to insulation contractors, provide insulation equal to that specified elsewhere.

E. Splices in members other than top and bottom runner track are not permitted.

F. Provide temporary bracing where required, until erection is complete.

3.4 INSTALLATION

A. Runners shall be securely anchored to the supporting structure. Provide complete, uniform and level bearing support at the bottom runner.

B. Abutting lengths of runner shall each be securely anchored to a common structural element, butt-welded or spliced.
C. Install studs plumbed, aligned and tightly nested in both upper and lower runners with secure attachment to the flanges of each runner.

D. Jack studs or cripples shall be installed below window sills, above window and door heads, at free standing stair rails and elsewhere to furnish support, and securely attached to supporting members.

E. Provide temporary bracing, where required until erection is completed.

F. Splices in axially loaded studs are not permitted.

G. Fasten components by self-drilling screws or welding. Touch-up all welds with galvanized spray paint.

H. Wall stud bridging –Where bridging is not specified on the drawings, minimum bridging shall be one row near mid-height for wall heights up to 9'-0". Bridging rows not to exceed 4'-0" on center where wall height exceeds 9'-0", but first row of bridging may be up to 5'-6" from the top and bottom of the wall. Bridging shall be attached in a manner to prevent stud rotation and braced to prevent lateral buckling.

I. Provisions for structure vertical movement shall be provided for non-load-bearing studs at each elevated floor level and roof.

J. Handling and lifting of prefabricated panels shall be done in a manner so as not to cause distortion in any member.

K. Cutting: All cutting shall be done with a power-driven saw with appropriate abrasive blade. No hand cutting will be permitted. All cuts shall be clean, accurate and true to line.

L. Align wall framing in accordance with project design details.

3.4 TOLERANCES

A. Framing members: ¼ inch maximum from true position.

B. Walls: 1/16 inch per foot maximum from plumb - ¼ inch maximum.

END OF SECTION
SECTION 05 4400

PRE-ENGINEERED, PRE-FABRICATED COLD-FORMED STEEL ROOF TRUSSES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes pre-engineered, pre-fabricated cold-formed steel framing elements. Work includes:

1. Cold-Formed steel roof trusses.
2. Anchorage, bracing and bridging.

B. Related Sections

1. Section 05 1200 – Structural Steel
2. Section 05 3000 – Metal Decking
3. Section 05 4000 – Cold-Formed Steel Framing

1.2 REFERENCES

A. Comply with the provisions of the following codes and standards. Modifications in this specification, when in conflict with the referenced codes and standards, shall take precedence over the referenced codes and standards.

5. ASTM A 500-03a - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
6. ASTM A 653-08 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
9. AWS D1.3: Structural Welding Code – Sheet Steel
10. LGSEA - Field Installation Guide for Cold-Formed Steel Roof Trusses; Light Gauge Steel Engineers Association; October 1999.
11. LGSEA Technical Note 551d - Design Guide for Construction Bracing of Cold-Formed Steel Trusses; Light Gauge Steel Engineers Association; February 1997.
1.3 PERFORMANCE REQUIREMENTS

A. Calculate structural characteristics of cold-formed steel truss members according to AISI “North American Specification for the Design of Cold-Formed Steel Structural Members”.

B. Structural Performance: Design, fabricate and erect cold-formed steel trusses to withstand specified design loads within limits and under conditions required.
   1. Design Loads: As indicated on the Drawings.
   2. Deflections: Dead and live load deflection meeting the following (unless otherwise specified):
      a. Roof Trusses: Vertical deflection less than or equal to the lesser of Length/360 and 1/2”.
   3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 120 deg F.

1.4 SUBMITTALS

A. Submit Manufacturer’s product data and installation instructions for each type of cold-formed steel framing and accessory required.

B. Submit detailed roof truss layouts indicating placement of trusses.

C. Submit individual truss drawings, sealed and signed by the Truss Engineer, a qualified Professional Engineer registered in the state in which this project is being constructed.
   Include:
   1. Description of design criteria.
   2. Engineering analysis depicting member stresses and truss deflection.
   3. Truss member sizes and thicknesses and connections at truss joints.
   4. Truss support reactions.
   5. Top chord, bottom chord and web bracing requirements.

D. Submit final plan drawings, sealed and signed by a qualified Professional Engineer registered in the state in which this project is being constructed, depicting final installed truss assembly.
   Include:
   1. All truss to truss connections.
   2. All truss to structure connections.
   3. Plan and details for the location of all temporary and permanent lateral and diagonal bracing and blocking required in the top chord, web, and bottom chord planes.

E. Submit evidence of roof truss Fabricator and Erector qualifications.
1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Fabrication shall be performed in a quality controlled manufacturing environment by a cold-formed steel truss Fabricator with experience fabricating cold-formed steel trusses equal in material, design, and scope to the trusses required for this Project.

   1. Installation of cold-formed steel roof truss assemblies shall be performed by an Erector with experience installing cold-formed steel trusses equal in material, design and scope to the trusses required for this Project.

B. Welding Standards: Comply with applicable provisions of AWS D1.1 and AWS D1.3.

   1. Qualify welding processes and welding operators in accordance with AWS “Standard Qualification Procedure.”

C. Special Inspections required by IBC chapter 17 shall be performed by an Approved Testing Agency retained by the Owner.

D. Pre-Installation Meeting: A pre-installation meeting shall be held at the job site before the scheduled beginning of installation of the roof trusses. Attendees shall review potential interface conflicts and coordinate layout and support provisions. Attendance is required by representatives of the following:

   1. Truss Fabricator.
   2. Truss Erector.
   3. Construction Manager or General Contractor.
   4. Other Contractors directly affecting, or affected by, construction activities of this Section, including but not limited to:
      a. Installers of truss support framing.
      b. Installers of metal roof deck and wood sheathing.
      c. Installers of mechanical, electrical and plumbing systems.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer’s unopened containers or bundles, fully identified by name, brand, type and grade. Exercise care to avoid damage during unloading, storing and erection.

B. Store trusses on blocking, pallets, platforms or other supports off the ground and in an upright position sufficiently braced to avoid damage from excessive bending.

C. Protect trusses and accessories from corrosion, deformation, damage and deterioration when stored at job site. Keep trusses free of dirt and other foreign matter.

1.7 PROJECT CONDITIONS

A. During construction, adequately distribute all loads applied to trusses so as not to exceed the carrying capacity of any one truss.
PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer:
   1. Ultra-Span
   2. TrusSteel

2.2 COMPONENTS

A. System components: All components to be compatible with and approved by the roof truss Manufacturer.

B. Provide Manufacturer’s standard steel truss members, bracing, bridging, blocking, reinforcements, fasteners and accessories as needed to provide a complete cold-formed steel roof truss assembly.

2.3 MATERIALS

A. Materials:
   1. Chord members: Components shall be fabricated of structural quality steel sheet per ASTM A653 with a minimum yield strength of 50,000 psi. Minimum uncoated steel thickness shall be 20 ga.
   2. Web members: Components shall be fabricated of structural quality steel sheet per ASTM A653 with a minimum yield strength of 50,000 psi, or cold-formed ASTM A500 steel structural tubing with a minimum yield strength of 45,000 psi. Minimum uncoated steel thickness shall be 20 ga.
   3. Bracing, bridging and blocking members: Components shall be fabricated of commercial quality steel sheet per ASTM A653 with a minimum yield strength of 33,000 psi.

B. Finish: Except where noted otherwise, provide components with protective zinc coating complying with ASTM A653, minimum G60 coating.

C. Fastenings:
   1. Manufacturer recommended and approved self-drilling screws with corrosion-resistant plated finish. Fasteners shall be of sufficient size and number to ensure the strength of the connection.
   2. Welding: Comply with AWS D1.1 when applicable and AWS D1.3 for welding base metals less than 1/8” thick.
   3. Other fasteners as recommended and approved in writing by truss Manufacturer.

2.4 FABRICATION

A. Factory fabricate cold-formed steel trusses plumb, square, true to line, and with connections securely fastened, according to Manufacturer’s recommendations and the requirements of this Section.
   1. Fabricate truss assemblies in jig templates.
   2. Cut truss members by sawing or shearing or plasma cutting.
3. Fasten cold-formed steel truss members by screw fastening, or other methods as standard with the Fabricator.
   a. Locate mechanical fasteners and install according to cold-formed steel truss component Manufacturer’s instructions with screw penetrating joined members by not less than 3 exposed screw threads.

B. Care shall be taken during handling, delivery and erection. Brace, block, or reinforce trusses as necessary to minimize member and connection stresses. Refer to LGSEA “Field Installation Guide for Cold-Formed Steel Roof Trusses.”

C. Fabrication Tolerances: Fabricate trusses to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet (1:960) and as follows:
   1. Spacing: Space individual trusses no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
   2. Squareness: Fabricate each cold-formed steel truss to a maximum out-of-square tolerance of 1/8 inch.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine structure, substrates and installation conditions. Do not proceed with cold-formed steel truss installation until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.2 INSTALLATION

A. Install trusses in accordance with the truss Manufacturer’s instructions and the truss Fabricator’s final plan drawings.

B. Install all erection bracing and permanent bracing and bridging before application of any loads. Follow recommendations of LGSEA “Field Installation Guide for Cold-Formed Steel Roof Trusses”.
   1. Provide erection bracing that holds trusses straight and plumb and in safe condition until decking and permanent truss bracing has been fastened to form a structurally sound and stable framing system.

C. Erect trusses with plane of truss webs vertical and parallel to each other, accurately located at design spacing indicated.

D. Provide proper lifting equipment, including spreader bar, suited to sizes and types of trusses required, applied at lift points prescribed by truss Fabricator. Exercise care to avoid damage to truss members during erection and to keep horizontal bending of the trusses to a minimum.
E. Provide framing anchors as indicated on individual truss drawings and final plan drawings. Anchor trusses securely at bearing points.

F. Install trusses plumb, square, true to line, and with connections securely fastened, according to the Manufacturer’s instructions.
   1. Do not alter or cut truss members without prior approval of the Truss Engineer.
   2. Fasten cold-formed steel trusses by screw fastening, welding or other methods, as standard with Fabricator.
      a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to cold-formed truss Manufacturer’s instructions with screws penetrating joined members by not less than 3 exposed screw threads.
   3. Install trusses in one-piece lengths, unless splice connections are indicated.
   4. Provide erection bracing and leave in place until trusses are permanently stabilized.

G. Erection Tolerances: Install trusses to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet (1:960) and as follows:
   1. Space individual trusses no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
   2. Limit out-of-plane bow and plumb per LGSEA “Field Installation Guide for Cold-Formed Steel Roof Trusses”.

H. Repair or replace damaged chords, webs, bracing and complete trusses as directed and approved in writing in advance by the truss Manufacturer.

3.3 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanizing repair paint according to ASTM A780 and the Manufacturer’s instructions.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Decorative metal fabrications including, but not limited to:
      a. Any other steel non-structural items indicated on Drawings.
   2. Metal non-structural items including, but not limited to, stairs, steel railings and any other steel
      non-structural items indicated on Drawings.

1.2 REFERENCES
A. Referenced Standards:
   1. AISC "Code of Standard Practice for Steel Buildings".
   2. AWS D1.1 "Structural Welding Code - Steel".
   3. Steel Structures Painting Council (SSPC) for shop painting.
   4. AHDGA "Design of Products To Be Hot Dip Galvanized After Fabrication".
   5. AISC "Code of Standard Practice For Steel Buildings and Bridges".
   6. ASTM A6 "General Requirements For Delivery of Rolled Steel Plates, Shapes, Sheet Piling
      and Bars For Structural Use."
   7. NOMMA "Voluntary Guideline for Joint Finishes".

1.3 SUBMITTALS
A. Submit Items Indicated below for Review by Architect:
   1. Shop drawings: Detail fabrication and installation of decorative metal fabrications. Include
      plans, elevations, sections, and details of components and their connections indicating
      fabrication assembly and erection details, sizes of members, fastenings, supports and anchors,
      hardware, patterns, clearances, and necessary connections to work of other trades. Show
      anchorage and accessory items.
   2. Submit setting drawings, templates, and directions for installation of anchorage items.
   3. Submit manufacturer's product data for proprietary products specified herein.
   4. Samples for Verification: For each type of exposed finish required, prepared on 6-inch square
      samples of metal of same thickness and material indicated for the Work.
   5. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products
      furnished comply with requirements.

1.4 QUALITY ASSURANCE
A. Fabricator Qualifications: A firm experienced in producing ornamental formed metal similar to
   that indicated for this Project and with a record of successful in-service performance, as well as
   sufficient production capacity to produce required units.
   1. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering
      analysis by a qualified professional engineer.
2. Installer Qualifications: Arrange for installation of ornamental formed metal specified in this Section by the same firm that fabricated it.

B. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code - Steel."
   2. AWS D1.3, "Structural Welding Code - Sheet Steel."
   3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.5 DELIVERY, STORAGE AND HANDLING

A. Protect metal from injury at shops, in transit to job, until erected in place, completed, inspected and accepted.

B. Deliver anchorage items and templates for anchorage items embedded in cast-in-place concrete or masonry construction to site for timely installation in concrete and masonry construction.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, beams, and other construction contiguous with ornamental formed metal by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION

A. Coordinate installation of anchorages for decorative formed-metal items. 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.

B. Coordinate installation of decorative formed metal with adjacent construction to ensure that wall assemblies, flashings, trim, and joint sealants, are protected against damage from the effects of weather, age, corrosion, and other causes.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Metals: Free from defects impairing strength, durability, appearance; best commercial quality for purposes specified and made with structural properties to withstand safely, strains, stresses to which they will be normally subjected.

B. Steel Members:
   1. Steel shapes, bars and plates: FY 36,000 psi steel; ASTM A992. Tubing: ASTM A500, Grade B.
   2. Pipe: ASTM A501 or ASTM A53, Types E or S, Grade B.
   3. Bolts, nuts, screws: Same material as metal with which used.

C. Prime Paint: Tnemec, Series 10-99, Sherwin-Williams "Kromik Metal Primer E41 N1", or equivalent as approved by Architect.
D. Filler Metal and Electrodes: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded or brazed and as necessary for strength, corrosion resistance, and compatibility in fabricated items.
   1. Use filler metals that will match the color of metal being joined and will not cause discoloration.

E. Fasteners: Use fasteners fabricated from same basic metal and alloy as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
   1. Provide concealed fasteners for interconnecting ornamental formed-metal items and for attaching them to other work, unless exposed fasteners are unavoidable.
   2. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

F. Structural Anchors: Provide torque-controlled expansion anchors fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

G. Nonstructural Anchors: Provide powder-actuated fasteners, metal expansion sleeve anchors, or metal impact expansion anchors of type, size, and material necessary for type of load and installation indicated, as recommended by manufacturer, unless otherwise indicated. Use nonferrous-metal or hot-dip galvanized anchors as needed for corrosion resistance.

H. Steel Pipe Railing:
   1. ASTM A53 steel pipe, galvanized at exterior locations, 2-1/2 inch nominal diameter (2.88 inch O.D.) unless otherwise specified herein or indicated on Drawings. Extra strong for vertical supports; standard weight for other components.
   2. Unless otherwise indicated on Drawings, form railing as follows:
      a. Form parallel horizontal members that support the vertical members spaced not more than 4 inches apart, and vertical supports at ends and at intermediate spacing sufficient to resist loading required by referenced code, but not more than 6'-0" apart.
      b. For guard rail at landings wider than 12 inches and at other locations indicated on Drawings or required by referenced code, make height to top of railing not less than 42 inches above adjacent walking surface.
      c. For sloping rail along stair risers, make height to top of railing not less than 42 inches above stair nosing and provide a handrail at 34" above stair nosing. Unless otherwise indicated on Drawings, extend rails beyond top and bottom risers as required by building code referenced in Section 01010. Return wall rail ends to walls and cap.
      d. Use flush type fittings with full welded connections for elbows, wall returns, caps. Cope ends of pipe to fit contour of pipe to which pipe is joined for joints at tees and crosses and weld. Joint finish shall be NOMMA Finish #2; completely sanded joint with some undercutting and pinholes allowed.
   3. Materials for railing anchorage, unless otherwise specified herein or indicated on Drawings:
      a. At stair walkways, ramps and stairs, maintain base connection to concrete structural roof deck.
         1) Secure pipe handrails at stairs adjacent to masonry or concrete walls with wall brackets and expansion or toggle bolts not to exceed 5'-0" on center.
         2) At other wall types anchor with wall brackets and appropriate anchors for the type of wall, anchored to studs in stud walls, not to exceed 5'-0" on center.
   4. At Contractor's option, railing system above may be provided by R & B Wagner, Inc.
Northern Kentucky University
Astronomical Observatory

I. Stair Nosings:
   1. Manufacturers: Products specified are those of Wooster Products, Inc. Comparable products by American Safety Tread, Inc. or Amstep Products shall also be acceptable.
   2. Description: Aluminum safety groove tread full width of stair tread.
   3. Color of abrasive inserts: As selected by Architect from manufacturer's full range of standard colors.
   4. Types:
      a. At concrete-filled steel stairs: Wooster Type 231BF cast-in-place.
      b. At cast-in-place concrete stairs: Wooster Type 231.

J. Prefabricated stairs:
   1. Pre-fabricate stair, railing and handrail system. Refer to Design Requirements specified in Part 1 herein.
   2. Manufacturers: Systems specified herein are those of American Stair Corporation. Equivalent products, meeting requirements specified herein, by Worthington Metal Fabricators, or Alfab, Inc., shall also be acceptable.
   3. Stairs:
      a. Manufacturer's standard flush welded system comprised of minimum 14 ga. plain risers, minimum 14 ga. pour-in-place concrete treads and landings, minimum MC 12 X 10.6. 2-inches by 12-inches HSS tube stringers, and support beams appropriate for design.

2.2 FABRICATION

A. General:
   1. Coordinate dimensions and attachment methods of ornamental formed-metal items with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned, unless otherwise indicated.

B. Fabrication: True to detail, with clean, straight, sharply defined profiles; smooth finished surfaces except where otherwise specified.

C. Joints: Strong, rigid, as adjoining sections.
   1. Welded joints: Cope components at connections to provide close fit, or use fittings designed for this purpose.
      a. Use welding and brazing procedures that will blend with and not cause discoloration of metal being joined.
      b. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
   2. Exposed joints, close fitting; make jointing where least conspicuous; no jointing of plain surfaces, moldings.
   3. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.

D. Connections, accessories: Adequate to safely sustain, withstand stresses, strains to which they will be normally subjected. Bolts, nuts, screws, for steel or iron for exterior work: A153 hot-dipped, centrifugal galvanized, or stainless steel.

E. Cutting, drilling: As required for attachment of other work coming in contact with miscellaneous metal work or where directions for same are given prior to or with approval of shop drawings.
Execute carefully necessary cutting, drilling, tapping, fitting, required for installation of miscellaneous metal work. When required, fit work at job before finishing.

F. Riveting, bolting, screwing: Unless otherwise indicated on Drawings, rivet, bolt, screw heads: Flat, countersunk in exposed faces of work of finish character, elsewhere as required. Cut off bolts, screws, etc., where exposed, flush with nuts or other adjacent metal. Except as otherwise required, weld or rivet shop assembled connections; rivets, bolts or machine screws may be used for field connections. Exposed fastenings: Same material, color, finish as metal to which they apply, unless otherwise required. Make up threaded connections tightly so that threads will be entirely concealed by fitting.

G. Fabricate stair and railing assemblies to meet requirements of codes referenced in Division 1.

H. Corrosion Control: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

I. Galvanizing:
   1. ASTM A123 for hot-dipped galvanizing rolled, pressed and forged steel shapes, plates, bars and strip 1/8 inch thick and heavier.
   2. ASTM A153 for hot-dipped, centrifugal galvanizing of iron and steel hardware.
   3. ASTM A385 and A386 for galvanizing assembled steel products.
   4. Surface preparation: Prepare ferrous metal surfaces prior to galvanizing to comply with minimum requirements of SSPC. Ensure that metal is thoroughly clean.
   5. To the maximum practicable extent, galvanize assemblies after fabrication.
   6. Fabricate to permit venting and drainage during galvanizing, per referenced AHDGA standard.
   7. Remove slag and weld spatters; grind, wire brush and clean welds before galvanizing.
   8. After fabrication touch up portions up to a maximum of one inch wide with zinc-rich touch-up meeting all requirements of ASTM A780 to ensure continuity of galvanized surfaces.
   9. Where welding is required after galvanizing, provide adequate ventilation and protection of personnel. Comply with OSHA and other regulations of other regulatory agencies, and recommendations of AHDGA.
  10. For galvanized items that will be painted under other section of Specifications, comply with requirements of AHDGA standard referenced in Part 1 herein so as not to inhibit bond of primer applied therein.
  11. For galvanized steel to be field painted, prepare steel surface and apply steel fabricators's recommended and Architect's approved "paint-grip" primer paint for field painting. Ensure that prime painted surfaces are free from substances that will inhibit adherence of field paint. Comply with referenced AHDGA "Painting Galvanized Structural Steel" and coordinate with Section 099100.
  12. Galvanize the following:
       a. Items exposed to exterior temperatures.
       b. Items exposed to interior wet conditions.
       c. Items specified herein to be galvanized.
       d. Items indicated on Drawings to be galvanized.

J. Shop prime painting of non-galvanized ferrous metal except metal:
   1. General: Paint non-galvanized ferrous metal work before delivery or exposure to weather with protective paint.
a. Comply with preparation and painting guidelines of SSPC SP-3 “Power Tool Cleaning” preceded by SSPC SP-1 “Solvent Wipe”. Use methods specified therein required to achieve surface that meets surface condition requirements of paint manufacturer.

2. Apply paint; work into joints and corners.
3. Coat pins, planed, threaded, other machine finished surfaces.
4. Dip bolts which are to remain permanently in work in paint to cover entire bolt.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine adjoining work on which this work is in any way dependent for perfect workmanship and fit. Do not start work until unsatisfactory conditions are corrected. Take field measurements prior to preparation of shop drawings and fabrication.

3.2 ERECTION SAFETY

A. Erect and brace work specified herein as required to maintain stability until complete and functioning as designed unit in compliance with referenced standards and any other requirements of the Contract Documents.

B. Erection equipment for work specified herein shall be suitable and safe for workmen and shall be maintained in a safe and stable condition until items specified herein are fully self supporting.

C. Where welding of galvanized metal is required, provide adequate ventilation and protection of personnel. Comply with OSHA and other regulations of other regulatory agencies, and recommendations of AHDGA.

3.3 INSTALLATION OF NON-STRUCTURAL ITEMS

A. Install work in conformance with approved shop drawings and manufacturer's recommendations.

B. Grind coating prior to field welding galvanizing materials.

C. Supports: Install supporting members, fastenings, hangers, bracing, brackets, straps, bolts, angles and other required accessories to set, connect work rigidly, properly to structural metal, concrete, masonry or other construction. Except where otherwise specified for particular items or for built in work, secure to masonry with expansion or toggle bolts.

D. Railings:
   1. Install posts in grout specified herein.
   2. Install railing assemblies to meet requirements of codes referenced in Division 1.
   3. Where rails are anchored with grout in concrete or in sleeves in concrete, wrap embedded end with specified foam wrap for top 1/4 inch of embedment. Remove foam for caulking under Section 07900.

E. Protect surrounding finish surfaces from damage due to work specified herein.

3.4 ADJUSTMENT AND CLEANING

A. After completing installation, including work by other trades, lubricate, test, and adjust sliding doors to operate easily, free from warp, twist, or distortion. Ensure smooth operation and locking;
B.  Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

C.  Clean exposed metal thoroughly and leave in complete, finished condition acceptable to Architect.

D.  Repair or replace any work damaged by work specified herein as acceptable to Architect at no cost to Owner.

END OF SECTION
SECTION 06 1050
MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Wood Blocking, cants and nailers
   2. Preservative and fire-retardant treatment
   3. Connection hardware and accessories.

B. Products supplied but not installed under this Section:
   1. Division 09 Section - Non-Structural Metal Framing: Installation of wood blocking in stud partitions for wall mounted items.

1.2 REFERENCES
A. Work specified herein shall conform to applicable portions of the following referenced standards:
   2. APA panel blocking shall meet requirements of latest edition of U.S. Product Standard PS 1 or one of APA's Performance Standards.

1.3 SUBMITTALS
A. Product data for installed wood covered by requirements of this Section:
   1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
   2. For interior fire retardant treated lumber: Test results after being tested in accordance with ASTM D3201 "Standard Test Method for Hygroscopic Properties of Fire-Retardant Wood and Wood-Based Products".

B. For preservative treated lumber
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 DELIVERY, STORAGE AND HANDLING
A. Store materials in a safe area and shored up off ground surface
   1. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.
B. Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.

C. Keep material clearly identified with identification marks legible

D. Do not allow installation of damaged or otherwise non-complying material

E. Deliver, store and handle fire retardant treated (FRT) material to prevent moisture from rewetting the FRT material
   1. Dry fire retardant treated material exposed to moisture during delivery, storage or handling, and prior to installation, as recommended by manufacturer and treater of FRT material
   2. Keep dry until permanently protected

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide composite materials with recycled content and containing no formaldehyde.

B. Lumber: Standard Grade Southern Pine or Douglas Fir.

C. APA panels:
   1. Type: APA C-D Plugged Plywood, Exposure 1, square edge.
   2. Provide treatment grade for pressure treated panels.

D. Preservative treatment material: Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
   2. Interior lumber not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX). Do not use inorganic boron (SBX) for sill plates.
   3. The chemical retention level shall be coordinated by the Contractor to correspond with the end use of the material.
   4. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
   5. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
   6. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
   7. Location: Wood blocking in exterior walls and exterior locations.
E. Fire Retardant Treatment
   1. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
   2. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
      a. Use treatment that does not promote corrosion of metal fasteners.
   3. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
   4. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction indicating the following:
      a. Grade mark of an independent agency approved by the manufacturer and the Ohio Building Code.
      b. Name of manufacturer of fire retardant treatment.
      c. Name of treatment plant.
      d. U.L. flame spread mark.
      e. Flame spread rating or FR-S designation.
      f. The notation "Monitored by TP, Standard 2200P".
      g. Structural properties that occur following fire-retardant treatment process
   5. Location: Interior blocking.

2.2 ROOFING LUMBER
   A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
      1. Roof Blocking.
      2. Roof Nailers.
      3. Rooftop equipment bases and support curbs.
   B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 15% maximum moisture content and the following species:
      1. Douglas-fir larch; WCLIB or WWPA.
   C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.3 FASTENERS
   A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.
D. Wood Screws: ASME B18.6.1.
E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.


2.4 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing to Concrete: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

C. Steel hardware: ASTM A7 or A36 (ASTM A153 hot-dipped, centrifugal galvanized at exterior locations).

D. Framing Connectors: Simpson, or equal approved by Architect; H.U.D. UM-25 Manual, or type meeting the Kentucky Building Code

1. Connectors in contact with preservative treated lumber shall be galvanized to Simpson’s “Zmax”, G185, or stainless steel.

E. Glue for exterior work: Water resistant casein or other moisture resistant type. Glue for interior work: Grade best suited for purpose.

F. APA panel and plywood fasteners, adhesive and clips: Type recommended by APA.

G. All fasteners for preservative treated lumber shall be hot-dipped galvanized or stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Consult Drawings for requirements and location of blocking and other miscellaneous carpentry work necessary for support and/or attachment of work specified in other sections.

2. Interior wood blocking for Owner-furnished items: Coordinate with Architect and Owner to determine necessary blocking for Owner-furnished items. Install blocking as required to support Owner-furnished items.

3. Carefully select members: Select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing or making proper connections.

4. If fire retardant treated lumber or plywood is exposed to moisture during delivery, storage or handling, and prior to installation, dry as recommended by manufacturer and treater of FRT material, and keep dry until permanently protected by building enclosure.

B. Blocking and Grounds:

1. Consult Drawings for requirements and location of blocking and other miscellaneous carpentry work necessary for support and/or attachment of work specified in other sections.

2. Provide blocking in stud partitions where indicated and for wall mounted items not specified or indicated as metal blocking specified in Division 09 Section – Nonstructural Metal Framing.

3. Anchor blocking firmly in place with anchors appropriate for installation, spaced not more than 32 inches o.c.; stagger bolts where placed in two rows.

4. Set grounds rigidly; use toggle bolts, expansion shield in masonry. Set in perfect alignment; true up with long straight edge.

C. Anchors: Furnish to other trades anchors, bolts, plates required for wood anchorage built into work provided by those trades.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 ADJUSTMENT

A. In the event of damage, repair or replace with new as acceptable to Architect.

B. Keep premises in a neat, safe, and orderly condition at all times during execution of this portion of the Work, free from accumulation of sawdust, cut-ends, and debris

3.4 PROTECTION

A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION
SECTION 06400
ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Architectural woodwork items herein specified and as shown on Drawings including but not limited to:
   1. Custom fabricated plastic laminate casework.

B. Products installed but not supplied under this Section:
   1. Division 06 Section - Miscellaneous Rough Carpentry: Wood blocking for work specified herein unless otherwise specified or indicated on Drawings.

C. Related Sections:
   1. Division 07 Section - Joint Sealants: Calking.

1.2 REFERENCES

A. American Woodwork Institute (AWI):

1.3 SUBMITTALS

A. Submit items indicated below to Construction Manager for review by Architect:
   1. Submit shop drawings for work specified herein.
      a. Indicate material and species, matching of panels, molding profiles and thicknesses, size of parts, construction, fastenings, blocking, clearances, intersections with adjacent surfaces and materials, assembly and erection details, applied finishes, built-in hardware, and necessary connections to work of other trades.
      b. Indicate millwork manufacturer's selections for various components where AWI standards permit millwork manufacturer's options, unless otherwise specified herein.
      c. Shop Drawings: Submit shop drawings for showing plans, elevations, ends, cross-sections, service run spaces, location, and type of service fixtures. Show details and location of anchorages and fitting to floors, walls, and base. Include layout of units with relation to surrounding walls, doors, windows, and other building components.
         1) Coordinate shop drawings with other work involved.
   2. Samples:
      a. Samples: Submit manufacturer's standard samples of specified finishes, including top material. Samples will be reviewed by Architect for color, texture, and pattern only. Compliance with other specified requirements is exclusive responsibility of Contractor.
      b. Manufacturer's full range of standard and custom colors and designs of items requiring Architect's selection of colors or designs.
   3. Submit certification that plastic laminate is high pressure plastic laminate.
   4. Submit manufacturer's product data for factory manufactured items.
1.4 QUALITY ASSURANCE

A. Humidity and temperature conditions.
   1. AWI "Architectural Woodwork Standards", Section 2.

1.5 DELIVERY, STORAGE AND HANDLING

A. Protect architectural woodwork before, during, and after installation and protect installed work and materials of other trades. Comply with AWS Section 2 for humidity and temperature conditions.

PART 2 - PRODUCTS

2.1 DEFINITIONS

A. Exposed Parts- Surfaces visible when:
   1. Drawer fronts and doors are closed;
   2. Cabinets and shelving are open-type or behind clear glass doors;
   3. Bottoms of cabinets are seen 48-inches or more above finished floor;
   4. Tops of cabinets are seen below 72-inches above finished floor, or are visible from an upper floor or staircase after installation;
   5. Portions of cabinets are visible after fixed appliances are installed;
   6. Front edges of cabinet body members are visible or seen through a gap of greater than 1/8-inch with doors and drawers closed.
      a. Note: for the purpose of factory finishing, both sides of cabinet doors shall be considered Exposed

B. Semi-Exposed Parts- Surfaces visible when:
   1. Drawers/doors are in the open position;
   2. Bottoms of cabinets are between 30” and up to 48” above finish floor;
   3. All front edges of shelving behind doors.

C. Concealed Surfaces-Surfaces are concealed when:
   1. Surfaces are not visible after installation;
   2. Bottoms of cabinets are less than 30-inches above finish floor;
   3. Tops of cabinets are 72-inches or more above finished floor and are not visible from an upper level;
   4. Stretchers, blocking and/or components are concealed by drawers.
   5. Corners are created by tall, wall, or base cabinets, and shall be non-accessible

2.2 MATERIALS

A. General: Provide materials that comply with requirements of AWI quality standard for each type of woodwork and quality grade indicated and, where the following products are part of interior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated.

B. Wood Products:
   1. Hardboard: AHA A135.4
3. Particle Board: ANSI A208.1, Grade M-2-Exterior Glue.
5. Hard Plywood and Face Veneers: HPVA HP-1
   a. Countertops with sinks and similar wet areas: APA A-B Exterior.

C. High-Pressure Decorative Plastic Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
   1. Mastic for applying plastic laminate to substrate: Type recommended by plastic laminate manufacturer.

D. All other materials not specifically described but required for a complete and proper installation as indicated on Drawings shall be new, suitable for intended use and subject to Architect's approval.

2.3 CABINET HARDWARE AND ACCESSORY MATERIALS

A. Casework hardware: Furnished and installed by casework manufacturer.
   1. Manufacturers: Products of one manufacturer are specified for quality and appearance standard. Products by the following manufacturers shall be acceptable if they are available and can meet the specified standard, and are acceptable to Construction Manager and Architect: Knape & Vogt; Grant; Stanley; Julius Blum; Grass America, Inc.
   2. Hinges: Heavy Duty, five knuckle 2-3/4 inch institutional type hinge, "overlay" design. Mill ground, hospital tip, tight pin feature with all edges eased. Hinge to be full wrap around type of tempered steel .088" thick. Hinges shall be surface applied. Each hinge to have minimum nine screws #8, 5/8" F.H.S.M. to assure positive door action and alignment. One pair per door to 48 inch height. One and one-half pair over 48 inches in height. Hinge to accommodate 13/16 inch thick laminated door, and allow 270 degree swing. Satin chrome finish.
      a. Stanley #HT1592, 26D – 5 knuckle
   3. Pulls: Stainless steel wire pulls; #4 finish.
   4. Catches if required to hold door closed: Amerock.
      a. Magnetic catch for tall cabinets : Two per door. Minimum 6 lb. pull per catch
   5. Grommets and slots: 2-inch diameter plastic grommets with retractable cover:
      a. Doug Mockett & Co.; ABS metal, satin or brushed silver metal to be selected by architect from manufacturer’s full line of standard metals.
      b. Unless indicated on Drawings, provide one, grommet at each workstation and at areas with electrical/data connection below
   6. Provide resilient bumper pads for all doors.
      a. Grass Series No. BP-C or equal.
   7. Provide oval profile, Phillips head, wood screws with finish washers at all exposed fasteners.
      a. Ives No. 1B14 series finishing washers or equal.

B. All other materials not specifically described but required for a complete and proper installation as indicated on Drawings shall be new, suitable for intended use and subject to Architect's approval.
2.4 FABRICATION REQUIREMENTS, GENERAL

A. Fabricate in compliance with Drawings and AWI standards referenced within this section except where more stringent requirements are specified herein. Refer to Quality Assurance in Part 1 herein.
   1. All casework to be balanced construction.
   2. All countertops with sinks to have moisture resistant MDF substrate.
   3. 4-inch back- and end splash typical U.N.O..
   4. All exposed corners of countertops to have 1-inch radius.
   5. At cutouts and “L” shaped countertops, all inside corners to be smoothly rounded with a minimum 3/4” corner radius.
   6. Install grommets in countertops at 3’-0” o.c.
   7. Mount wall and base cabinets to 18 gage metal plate behind gypsum board with 3/8 inch hex head bolt with toggle

B. Take field measurements to ensure accurate fit. Where field measurements are not possible due to scheduling, coordinate with trades responsible for work into which work specified herein is to be installed to ensure that required dimensions and tolerances are provided.

C. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.

D. Fabricate woodwork to dimensions, profiles, and details indicated.

E. Complete fabrication, including assembly, finishing, and hardware application, before shipment to Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Trial fit assemblies at the fabrication shop that cannot be shipped completely assembled. Insert dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on approved shop drawings before disassembling for shipment.

F. Shop-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating. Coordinate with other sections for provision for items provided therein, such as:
   1. Openings for electrical and communications work.
   2. Other required items or items as specified herein or indicated on Drawings.

G. Install hardware specified herein.

H. Countertops:
   1. Top Sizes: Furnish tops in maximum practicable lengths.
   2. Top Thickness: Maintain nominal 1½ inch thickness as indicated on drawings with tolerance not exceeding plus or minus 1/32 inch. Provide front and end overhang over base cabinets, as shown on drawings.
I. Install plastic laminate and quartz surfacing to substrate using methods recommended by manufacturer of same.

2.5 COUNTERTOPS

A. Quality Standard: Premium Grade.
   1. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
   2. Assemble casings in plant except where limitations of access to place of installation require field assembly.
   3. Match specie and cut indicated for other types of transparent-finished architectural woodwork located in same area of building, unless otherwise indicated.

2.6 PLASTIC LAMINATE FACED CASEWORK

A. Quality Standard: AWS Section 10 – Custom Grade for Plastic laminate faced casework.
   1. Casework design standard: Reveal overlay, with 32 mm bore adjustable shelf system.
   2. Sight-exposed surfaces: Plastic laminate as specified herein.
      a. Edges of cabinets adjacent to exterior windows but not exposed within room shall be deemed “Sight-Exposed Surfaces”.
   3. Semi-exposed surfaces: As governed by AWI quality grade; provide white thermoplastic liner throughout interiors of cabinets with doors.
   4. Shelves: Core of plywood or particleboard with 3/4 inch thick lumber edging; veneer of plastic laminate as specified herein on top surfaces and edges; thermoplastic liner on bottom surfaces; white in cabinets with doors.
   5. Edges:
      a. At doors and drawers: 3 mm thick PVC.
      b. Other edges: Same plastic laminate as face, pressure glued, per AWI standard.

2.7 INTERIOR WALL PANELS – MDO

A. All interior walls shall be comprised of Medium Density Overlay boards – ½”.
   1. Attach panels to metal stud walls with screws – countersink screws and cap flush with wood plugs, sand and prep for paint. Screws/fasteners shall be clean, with a consistent location/placement between all boards. Joints between panels shall be tight and straight.
   2. Divide each length of the wall equally with the MDO boards– all equal MDO panel widths with the two outside panels being the same width.
   3. All exposed edges shall be smooth, sanded and edges eased.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine installed work of other trades and verify that such work is complete to point where this portion of work may properly commence.

B. Use a moisture meter to ensure that moisture content of substrate is within limits recommended by AWS Section 2.
C. Do not start work until unsatisfactory conditions are corrected.

### 3.2 PREPARATION

A. Field measurements: Take necessary measurements in field to ensure proper dimensions for cabinets, countertops and other work specified herein.

### 3.3 INSTALLATION

A. Install in compliance with Drawings and AWS Premium Grade except where more stringent requirements are specified herein. Refer to Quality Assurance in Part 1 herein.

B. Install work true, square, plumb, level and firmly anchored; where blocking or backing is required, coordinate as necessary with other trades to ensure placement of required backing and blocking in a timely manner.
   1. Install blocking; coordinate as necessary with other trades.

C. Joints: Use judgment in locating joints to render them inconspicuous as possible in finished work. Allow for expansion and contraction.

D. Fastening:
   1. Fastenings: As far as possible conceal fastenings; where not possible, locate them in inconspicuous places. Where nailing is permitted through woodwork face, countersink fastener heads on exposed carpentry work and fill holes.
      a. Drill pilot holes in hardwood before fastening to prevent splitting.
      b. Fasten to prevent movement or warping.
   2. Nail trim with finish nails of proper dimension to hold member firmly in place without splitting the wood.
   3. Screw, do not drive, wood screws except that screws may be started by driving and then screwed home.
   4. Provide oval profile, Phillips head, wood screws with finish washers at all exposed fasteners.

E. Attach wall-mounted items to in-wall solid wood blocking at stud partitions.

F. Coordinate with other sections for provision for items provided therein, such as:
   1. Openings for electrical and communications work.
   2. Other required items or items as specified herein or indicated on Drawings.

G. Countertops: Install as recommended by fabricator and indicated on approved shop drawings.
   1. Install countertops with no more than 1/8-inch sag or bow or other variation from a straight line.

H. Protect adjacent finishes from damages due to installation of work specified herein.

### 3.4 CLEANING AND ADJUSTMENT

A. Remove and replace with new any material soiled or damaged by work specified herein.
   1. Repair or remove and replace with new, defective work as directed upon completion of installation.

B. Adjust doors, drawers and other operable hardware for proper operation.
C. Cleaning:
   1. Clean factory finished exposed and semi-exposed surfaces to new condition.
   2. Clean surfaces to be field-finished to a finishable condition.
   3. Remove and refinish damaged or soiled areas.

END OF SECTION
SECTION 07 0150
PREPARATION FOR RE-ROOFING

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. Roof tear-off.
   2. Partial roof tear-off.
   3. Temporary roofing membrane.
B. Related Sections:
   1. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for re-roofing preparation.

1.3 MATERIALS OWNERSHIP
A. Except for items or materials indicated to be reused, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.4 DEFINITIONS
A. Roofing Terminology: Refer to ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.
B. Existing Membrane Roofing System: Built-up asphalt roofing membrane, roof insulation, surfacing, and components and accessories between deck and roofing membrane.
C. Roof Tear-Off: Removal of existing membrane roofing system from deck.
D. Partial Roof Tear-Off: Removal of a portion of existing membrane roofing system from deck or removal of selected components and accessories from existing membrane roofing system.
E. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and reinstalled.
F. Existing to Remain: Existing items of construction that are not indicated to be removed.

1.5 SUBMITTALS
A. Product Data: For each type of product indicated.
B. Temporary Roofing: Include Product Data and description of temporary roofing system. If temporary roof will remain in place, submit surface preparation requirements needed to receive permanent roof, and submit a letter from roofing membrane manufacturer stating acceptance of
the temporary membrane and that its inclusion will not adversely affect the roofing system's resistance to fire and wind or its FM Global rating.

C. Fastener pull-out test report.

D. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, that might be misconstrued as having been damaged by reroofing operations. Submit before Work begins.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installer of new membrane roofing system, licensed to perform demolition work related to non-friable Asbestos-Containing Materials (ACM) Category I asbestos materials in the State or jurisdiction where Project is located.


C. Reroofing Conference: Conduct conference at Project site.

1. Meet with Owner; Architect; Owner's insurer if applicable; testing and inspecting agency representative; roofing system manufacturer's representative; roofing Installer including project manager, superintendent, and foreman; and installers whose work interfaces with or affects reroofing including installers of roof accessories and roof-mounted equipment.

2. Review methods and procedures related to roofing system tear-off and replacement including, but not limited to, the following:

   a. Reroofing preparation, including membrane roofing system manufacturer's written instructions.

   b. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

   c. Structural loading limitations of deck during reroofing.

   d. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that will affect reroofing.

   e. Governing regulations and requirements for insurance and certificates if applicable.

   f. Existing conditions that may require notification of Architect before proceeding.

1.7 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately below reroofing area. Conduct reroofing so Owner's operations will not be disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.

1. Coordinate work activities daily with Owner so Owner can place protective dust or water leakage covers over sensitive equipment or furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below the work area.

B. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.

C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
D. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.
   1. Construction Drawings and Project Manual for existing roofing system are available for Contractor's reference. Contractor is responsible for conclusions derived from existing documents.

E. Limit construction loads on roof for rooftop equipment wheel loads and for uniformly distributed loads.

F. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.

PART 2 - PRODUCTS

2.1 INFILL MATERIALS
   A. Use infill materials matching existing membrane roofing system materials unless otherwise indicated.

2.2 TEMPORARY ROOFING MATERIALS
   A. Glass-Fiber Felts: ASTM D 2178, Type IV, asphalt-impregnated, glass-fiber felt.
   B. Asphalt Primer: ASTM D 41.
   C. Roofing Asphalt: ASTM D 312, Type III or IV.

2.3 AUXILIARY REROOFING MATERIALS
   A. General: Auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of existing and new membrane roofing system.
   B. Base Sheet Fasteners: Capped head, factory-coated steel fasteners, listed in FM Approval's "Approval Guide."
   C. Metal Flashing Sheet: Metal flashing sheet is specified in Division 07 Section "Sheet Metal Flashing and Trim."

PART 3 - EXECUTION

3.1 PREPARATION
   A. Protect existing membrane roofing system that is indicated not to be reroofed.
   B. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.
   C. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
   D. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs
specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

1. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing membrane roofing system components that are to remain.

E. Verify that rooftop utilities and service piping have been shut off before beginning the Work.

3.2 ROOF TEAR-OFF

A. Roof Tear-Off: Remove existing roofing membrane and other membrane roofing system components down to the deck or to the level required for new work and rework.

1. Remove cover boards, roof insulation, and substrate boards as required.

3.3 DECK PREPARATION

A. Inspect deck after tear-off of membrane roofing system.

B. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263 or by pouring 1 pint (0.5 L) of hot roofing asphalt on deck at start of each day's work and at start of each roof area or plane. Do not proceed with roofing work if moisture condenses under the plastic sheet or if asphalt test sample foams or can be easily and cleanly stripped after cooling.

C. If deck surface is not suitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect. Do not proceed with installation until directed by Architect.

3.4 INFILL MATERIALS INSTALLATION

A. Immediately after removal of selected portions of existing membrane roofing system, and inspection and repair, if needed, of deck, fill in the tear-off areas to match existing membrane roofing system construction.

1. Install new roofing membrane patch over roof infill area.

3.5 TEMPORARY ROOFING MEMBRANE

A. Install temporary roofing membrane over area to be reroofed. Install two glass-fiber felts, lapping each sheet 19 inches (483 mm) over preceding sheet. Embed glass-fiber felt in a solid mopping of hot roofing asphalt applied within equiviscous temperature range. Glaze-coat completed surface with hot roofing asphalt.

B. Prepare the temporary roof to receive new roofing membrane by patching and repairing temporary roofing membrane. Restore temporary roofing membrane to watertight condition. Obtain approval for temporary roof substrate from roofing membrane manufacturer before installing new roof.
3.6 EXISTING BASE FLASHINGS

A. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings specified in Division 07 Section “Sheet Metal Flashing and Trim.”

3.7 DISPOSAL

A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

1. Storage or sale of demolished items or materials on-site is not permitted.

B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION
SECTION 07 2726

FLUID-APPLIED MEMBRANE AIR BARRIERS

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 materials and installation of fluid applied waterproof air barrier and vapor barrier membrane over vertical above grade wall sheathing and metal roof deck.

B. Related Requirements:
   1. Section 07: Sheet Metal Flashing, Sealants

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.
   1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
   2. Include details of interfaces with other materials that form part of air barrier.
   3. Provide samples of product
1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by the Installer, who work on Project.

B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.

C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
   1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

B. Mock-ups
   1. Build stand-alone site mock up or sample wall area on as-built construction to incorporate back-up wall construction, typical details covering substrate joints, cracks, flashing transitions, penetrations, corners, terminations, tie-ins with adjoining construction, and interfaces with separate materials that form part of the air barrier assembly

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on field mockups.

B. Mockup Testing: Air-barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.
   1. Conduct assembly air leakage testing in accordance with ASTM E 783.
   2. Conduct adhesion testing to substrates in accordance with ASTM D 4541.
   3. Conduct wet sealant compatibility testing in accordance with sealant manufacturer’s field quality control test procedure.
   4. Notify design professional minimum 7 days prior to testing

1.9 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.
   1. Protect substrates from environmental conditions that affect air-barrier performance.
   2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist. – maintain ambient and surface temperatures above 40 degrees F during application and drying period, minimum 24 hours after application of product.
1.11 WARRANTY

A. Provide manufacturer’s standard warranty

PART 2 - PRODUCTS

2.1 MATERIALS

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 WATERPROOF AIR AND VAPOR BARRIER MEMBRANE

A. Fluid-Applied, Vapor-Retarding Membrane Air Barrier:
   1. Approved Manufacturers: Subject to compliance with requirements:
      a. Sto Corp – Sto Guard (basis of design)
      b. Carlisle Coatings & Waterproofing Inc.
      c. Henry Company
      d. Tremco Incorporated
      e. Meadows, W.R. Inc

2.3 PRIMARY AIR BARRIER MATERIAL (BASIS OF DESIGN)

A. StoGuard VaporSeal - ready-mixed flexible spray or roller applied waterproof air barrier and vapor barrier membrane material

B. Accessory Materials
   1. Joint and Rough Opening Treatments
      a. Sto Gold Fill® with StoGuard Mesh: ready mixed flexible trowel or spray applied air barrier material.
      b. StoGuard Rapid Seal™ with StoGuard Mesh: moisture cure elastomeric waterproof air barrier material (mesh not required at rough openings).
      c. Sto VaporSeal with StoGuard Fabric: flexible waterproof air barrier and vapor barrier membrane material
      d. StoGuard Tape: self adhering rubberized asphalt tape with polyester fabric facing (for rough openings only).
   2. Joint Reinforcements
      a. StoGuard Mesh: nominal 4.2 oz/yd² (142 g/m²) self-adhesive, flexible, symmetrical, interlaced glass fiber reinforcing mesh, with alkaline resistant coating for compatibility with Sto materials.
      b. StoGuard Fabric: non-woven integrally reinforced cloth reinforcement.
      c. StoGuard RediCorner™: non-woven integrally reinforced pre-formed cloth.
   3. Transition Membrane
      a. StoGuard Transition Membrane - flexible air barrier membrane for continuity at transitions: sheathing to foundation, dissimilar materials (CMU to frame wall), wall to balcony floor slab or ceiling, flashing shingle lap transitions, floor line deflection joints, masonry control joints, and through wall joints in masonry or frame construction.
4. Sealant
   a. StoGuard RapidSeal – one component rapid drying waterproof air barrier material for sealing fish mouths, wrinkles, seams, gaps, holes, or other voids in StoGuard air barrier materials.

5. Primers
   a. StoGuard Primer: rubber resin emulsion primer for use with StoGuard Tape to enhance adhesion and allow installation down to 35 degrees F (1.7 degrees C).

C. Auxiliary Materials (provide as required):
   1. Wet sealant: Dow Corning 758, 790, 791, and 795 sealants
   2. Pre-cured sealant tape: Dow 123
   3. Spray adhesive: 3M Super 77 Spray Adhesive
   4. Spray foam: Dow Great Stuff for Gaps and Cracks

2.4 PERFORMANCE REQUIREMENTS

A. Water penetration resistance: joint treatment and primary air barrier and vapor barrier material, comply with ICC ES AC 212, par 4.8.3, no water penetration after 5 hours hydrostatic pressure

B. Nail sealability: ASTM D 1970, 7.9.1, primary air barrier and vapor barrier passes

C. Material air leakage: ASTM D 2178, primary air barrier and vapor barrier and joint treatment ≤ 0.004 cfm/ft² at 1.57 psf (0.02 L/s·m² at 75 Pa)

D. Elongation: ASTM D 412, primary air barrier and vapor barrier material, > 500% at 7 days

E. Adhesion: joint treatment and primary air barrier and vapor barrier material, ASTM D 4541, ≥ 30 psi (207 kPa), or exceeds strength of glass mat facing on glass mat gypsum substrates

F. Surface burning: ASTM E 84, joint treatment and primary air barrier and vapor barrier material flame spread ≤ 25, smoke developed ≤ 450, Class A building material

G. Water vapor permeance: ASTM E 96 Method A, < 0.1 perms (5.7 ng/Pa·s·m²)

H. Field adhesion testing: ASTM D 4541, ≥ 30 psi (207 kPa) or exceeds strength of glass mat facing on glass mat gypsum substrates

I. Volatile Organic Compounds: SCAQMD Rule 1113, joint treatment and primary air barrier and vapor barrier material < 100 g/L

2.5 DESIGN CRITERIA

A. Moisture Control
   1. Prevent the accumulation of water in the wall assembly and behind the exterior wall cladding:
      a. Minimize condensation within the assembly.
      b. Drain water directly to the exterior where it is likely to penetrate components in the wall assembly (windows and doors, for example).
      c. Provide corrosion resistant flashing to direct water to the exterior in accordance with code requirements, including: above window and door heads, beneath window and door sills, at roof/wall intersections, floor lines, decks, intersections of lower walls with higher walls, and at the base of the wall.
B. Air Barrier Continuity: provide continuous air barrier assembly of compatible air barrier components.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
   1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
   2. Inspect sheathing application for compliance with applicable requirements

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.

E. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

F. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

G. Concrete
   1. Remove surface contamination and weak surface conditions. Use chemical cleaners such as TSP (trisodium phosphate) detergent to remove oil and grease and rinse with potable water. Use chemical cleaners to remove efflorescence or other surface contamination in accordance with manufacturer’s written instructions. Use mechanical methods such as waterblasting, sandblasting, and wire brushing to remove weak surface conditions.
   2. Repair cracks up to 1/8 inch (3 mm) wide by raking with a sharp tool to remove loose, friable material and blow clean with oil-free compressed air. Apply joint treatment material over crack, embed reinforcement (where applicable), and smooth joint treatment material with a trowel, drywall or putty knife to cover the reinforcement.
   3. Remove projecting fins, ridges, and mortar by mechanical means. Remove excess mortar from masonry ties, lintels and shelf angles.
   4. Fill honeycombs, aggregate pockets, holes and other voids with patching material.

H. Sheathing
   1. Remove and replace damaged sheathing.
2. Spot surface defects such as over-driven fasteners, knot holes, or other voids in sheathing with knife grade joint treatment material.
3. Spot fasteners with knife grade or coating joint treatment material.

3.3 FLUID AIR/MOISTURE BARRIER MEMBRANE INSTALLATION

A. General: Apply fluid air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions. Apply fluid air-barrier material within manufacturer's recommended application temperature ranges.

B. Coordinate work with other trades to ensure air barrier continuity with connections at foundation, floor lines, flashings, lintels and shelf angles, openings and penetrations such as pipes, vents, windows and doors, masonry anchors, rafters or beams, joints in construction, projections such as decks and balconies, and roof line.

C. Transition Membrane Detailing: detail transition areas with StoGuard Transition Membrane to achieve air barrier continuity. For illustrations of installation, including complex geometries such as inside and outside corners, refer to Sto Guide Details (www.stocorp.com).

D. Floor line deflection joints up to 1 inch (25 mm) wide, static joints and transitions – sheathing to foundation, dissimilar materials (CMU to frame wall), flashing shingle lap transitions, wall to balcony floor slab or ceiling:
   1. Apply waterproof coating (Sto Gold Coat) liberally to properly prepared surfaces with brush, roller, or spray.
   2. Place pre-cut lengths of StoGuard Transition Membrane centered over the transition in the wet coating. At changes in plane crease the membrane and similarly place the membrane material in the wet coating.
   3. Immediately top coat the membrane with additional coating and apply pressure with brush or roller to fully embed the membrane in the coating and achieve a smooth and wrinkle-free surface without gaps or voids.
   4. Apply coating liberally along all top horizontal edges on walls and along all edges on balcony floor slabs to fully seal the edges.
   5. Overlap minimum 2 inches (51 mm) at ends and adhere lap seams together with coating. Shingle lap vertical seams and vertical to horizontal intersections with minimum 2 inch (51 mm) overlap.

E. Movement joints up to 1 inch (25 mm) wide and up to ± 50% movement: masonry control joints, through wall joints in masonry or frame construction
   1. Insert backer rod sized to friction fit in the joint (diameter 25% greater than joint width).
   2. Recess the backer rod uniformly from the face of the joint ¼ inch (6 mm) for joints with + 25% movement, 3/8 inch (9 mm) for joints with +37.5% movement, or ½ inch (13 mm) for joints with + 50% movement.
   3. Apply the waterproof coating liberally to properly prepared surfaces with brush, roller, or spray along each side of the joint.
   4. Immediately place the membrane by looping it into the joint against the backer rod surface to provide slack.
   5. Embed the membrane in the wet coating along the sides of the joint by top coating with additional coating material and applying pressure with a brush or roller.

F. After the membrane installation is complete and the waterproof coating is dry:
1. Apply a final liberal coat of the waterproof coating to all top horizontal edges on walls to ensure waterproofing integrity. Similarly apply coating at all edges on balcony floor slabs.
2. Inspect the installed membrane for fish mouths, wrinkles, gaps, holes or other deficiencies. Correct fish mouths or wrinkles by cutting, then embedding the area with additional coating applied under and over the membrane.
3. Seal gaps, holes, and complex geometries at three dimensional corners with StoGuardRapidSeal.

G. Rough opening protection:
   1. Install rough opening protection into and around rough opening. Refer to Sto detail series 20.20x or 21.20x and applicable Sto product bulletins.

H. Sheathing joints
   1. Install joint treatment material with applicable reinforcement over sheathing joints. Refer to Sto details and applicable Sto product bulletins.

I. Waterproof air barrier membrane
   1. Concrete and Sheathing
      a. Airless spray application – Apply StoGuard VaporSeal to the prepared substrate using spray equipment such as Sto's M-8 Spray Pump or Graco 1095 airless spray equipment that can support a minimum 1.2 Gallon per minute (GPM). Suggested settings: 525 tip at 2700 psi. Adjust settings as needed to accommodate site and substrate conditions. Spray a minimum of 46 wet mils (25 dry mils). Apply a first pass in a vertical up and down motion, then a second pass in a side-to-side motion to build up film thickness and to achieve A VOID AND PINHOLE FREE SURFACE.
      b. Roller application – Apply a minimum of 2 uniform coats with a ¾ inch (19 mm) nap roller to achieve a minimum 25 dry mils and a VOID AND PINHOLE FREE SURFACE. Additional coats may be required to achieve mil thickness depending on substrate, application technique, and temperature and humidity conditions.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements.
   1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
   2. Continuous structural support of air-barrier system has been provided.
   3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
   4. Site conditions for application temperature and dryness of substrates have been maintained.
   5. Maximum exposure time of materials to UV deterioration has not been exceeded.
   6. Surfaces have been primed, if applicable.
   7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
   8. Termination mastic has been applied on cut edges.
9. Strips and transition strips have been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

C. Tests: As determined by Owner's testing agency from among the following tests:
1. Qualitative Air-Leakage Testing
2. Quantitative Air-Leakage Testing
3. Adhesion Testing

D. Air barriers will be considered defective if they do not pass tests and inspections.
1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

3.5 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than 30 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION
SECTION 07 4000
METAL ROOFING, WALL AND FASCIA/SOFFIT PANELS

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes:
   1. Preformed, prefinished metal roofing, metal wall panels, metal facias/soffits
   2. Fastening devices.
   3. Related flashing, closures, drip flashing and accessories.
   5. Underlayment.
B. Related Sections:
   1. Division 05 Section – Metal Deck: Roof decking under metal roofing and Cold Formed Metal Framing: Framing at Eaves/soffits
   2. Division 06 Section – Rough Carpentry
   3. Division 07 – Fluid Applied Membrane, Flashing and Sealants

1.2 ASSEMBLY DESCRIPTION
A. Roofing: A. The roofing assembly includes preformed sheet metal panels, related accessories, ridges, eaves, corners, rakes, miscellaneous flashing and attaching devices.
B. Wall Panels: The wall assembly includes preformed sheet metal panels, related accessories, corners, trim, miscellaneous flashing, sealants and attaching devices
C. Fascias/Soffits: The assembly includes preformed sheet metal panels, related accessories, corners, miscellaneous flashing and attaching devices.

1.3 SUBMITTALS
A. Submit items indicated below to Architect for review:
   1. Shop drawings indicating dimensions, panel layout, construction details, method of anchorage, method and sequence of installation and perimeter flashing details. Indicate spacing of snow guards.
   2. Manufacturer's product literature indicating compliance with requirements specified herein.
   3. Samples of manufacturer's full range of standard and custom colors.
   4. Submit detailed drawings showing layout of panels, anchoring details, joint details, trim, flashing, and accessories. Show details of weatherproofing, terminations, and penetrations of metal work.
   5. Submit a sample of each type of panel, complete with factory finish.
B. Submit results indicating compliance with minimum requirements of the following performance tests:
1. Air Infiltration ASTM E-1680-95
2. Water Infiltration ASTM E-1646-95
3. Wind Uplift - U.L.90

C. Submit calculations with registered engineer seal, verifying roof panel and attachment method resists wind pressures imposed on it pursuant to applicable building codes.

1.4 QUALITY ASSURANCE

A. Manufacturer: Company specializing in Architectural Sheet Metal Products with ten (10) years minimum experience.

B. Installation shall be performed only by manufacturer's approved installers.

C. Pre-roofing conference: Prior to commencement of roofing work of this section, convene a meeting at site with Contractor, installing subcontractor, a representative of manufacturer, Architect and Owner's Representative to review Specifications, scope of work, and other requirements, to ensure complete compliance with Specifications and understanding of job conditions.

D. During-roofing inspection: Periodically request inspection by an authorized representative of roofing manufacturer to ensure compliance with roofing manufacturer's requirements for procedures involved in roofing operation.

E. Post-roofing inspection: Immediately upon completion of roofing work of this section, convene a meeting at site with Contractor, installing subcontractor, a representative of manufacturer, Architect and Owner's Representative to review entire roof installation to ensure complete compliance with Specifications and manufacturer's conditions for warranty.

1.5 DELIVERY, STORAGE AND HANDLING

A. Upon receipt of panels and other materials, installer shall examine the shipment for damage and completeness.

B. Panels should be stored in a clean, dry place. One end should be elevated to allow moisture to run off.

C. Panels with strippable film must not be stored in the open, exposed to the sun.

D. Stack all materials to prevent damage and to allow for adequate ventilation.

1.6 WARRANTY

A. Paint finish shall have a twenty year guarantee against cracking, peeling and fade (not to exceed 5 N.B.S. units).

B. Applicator shall furnish guarantee covering watertightness of the roofing system for the period of two (2) years from the date of substantial completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS AND SYSTEMS

A. The following manufacturers and systems shall be acceptable in specified gage and finish:
1. Berridge Manufacturing Co. (basis of design)
2. Centria Architectural Systems
3. Carlisle Engineered Metals

2.2 BASIS OF DESIGN

A. Metal Wall Panels (MTL-1):
   1. Straight S-Deck by Berridge Manufacturing.

B. Metal Roof (MTL-2):
   1. Zee-Lock Standing Seam Roof with Batton Cap (to match existing NKU metal roof system) by Berridge Manufacturing.

C. Metal Fascia/Soffit Panels (MTL-3):
   1. Vee-Panel by Berridge Manufacturing.

2.3 SHEET MATERIALS

A. Prefinished metal shall be Aluminum-Zinc Alloy Coated (AZ-55 Galvalume®) Steel Sheet, 24-Gauge or 22-Gauge, ASTM 792-08, Grade 40, yield strength 40 ksi min.

B. Finish shall be full strength Kynar 500® or Hylar 5000™ fluoropolymer coating applied by the manufacturer on a continuous coil coating line, with a top side dry film thickness of 0.75 ± 0.05 mil over 0.20 ± 0.05 mil prime coat, to provide a total top side dry film thickness of 0.95 ± 0.10 mil. Bottom side shall be coated with a primer and beige urethane coating with a total dry film thickness of 0.35 ± 0.05 mil. Finish shall conform to all tests for adhesion, flexibility, and longevity as specified by the Kynar 500® or Hylar 5000™ finish supplier.

C. Color shall be selected by the Architect from the Manufacturer’s standard colors. Roof, wall and fascia panels may be different colors.

D. Strippable film shall be applied to the top side of all prefinished metal to protect the finish during fabrication, shipping and field handling. This strippable film MUST be removed immediately before installation.

E. Unpainted metal shall be Aluminum-Zinc Alloy Coated (AZ-55 Acrylic Coated Galvalume®) Steel Sheet, 24-Gauge or 22-Gauge, ASTM 792-08, Grade 40, yield strength 40 ksi min., with clear acrylic coating on both sides of material.

F. Field protection must be provided by the contractor at the job site so stacked or coiled material is not exposed to weather and moisture.

G. Flashing maybe factory fabricated or field fabricated. Unless otherwise specified all exposed adjacent flashing shall be of the same material and finish as panel system.

2.4 MATERIALS

A. Roofing underlayment: fluid applied membrane per Section 07 2726 to be applied to the metal roof deck.

B. Fasteners for underlayment: Aluminum or ASTM A153 hot-dipped, centrifugal galvanized sheet metal screws.
2.5 ACCESSORY MATERIALS

A. Straight S-Deck
   1. Fasteners: Exposed & Concealed Galvanized Steel with washers where required.
   2. Sealant: As specified in Section 07

B. Zee-Lock with Batton Cap
   1. Fasteners: Galvanized Steel with washers where required.
   2. Sealant: As specified in Section 07
   3. Vinyl Weatherseal Insert.
   4. Metal Batton Cap to match NKU existing conditions.

C. Vee-Panel
   1. Fasteners: Galvanized Steel with washers where required.

2.6 FABRICATION

A. Comply with dimensions, profile limitations, gages and fabrication details shown and, if not shown, provide manufacturer's standard product fabrication.

B. Fabricate components of system in factory, ready for field assembly.

C. All exposed adjacent flashing shall be of the same material and finish as the roof panels.

D. Hem all exposed edges of flashing on underside, 1/2 inch.

2.7 BERRIDGE STRAIGHT S-DECK PANEL

A. Nominal coverage width to be 32”

B. Panels shall be factory formed to 40’ max. As an option, panels may be factory curved to a minimum radius of 5’-0” (32” panel only).

C. 7/8” Corrugations to be spaced 2-½” on center.

D. Panel-to-panel and panel-to-purlin connections to be with No. 12-14 self-drilling fasteners, 1” min. for panel-to-purlin connections, 3/4” minimum for panel-to-panel connections.

2.8 BERRIDGE ZEE-LOCK STANDING SEAM PANEL WITH BATTON CAP

A. 2" high vertical legs shall be spaced at 16" on-center.

B. Panels shall be site-formed with the Berridge Model SP-21 Portable Roll Former in continuous lengths from ridge to eave or factory-formed to 40’ max.

C. Continuous Zee Rib shall be 1-3/8” wide and 2-1/8” in height. Rib shall be connected to purlin with two #12-14 x 1” self-drilling/tapping fasteners [Zee Clips spaced at 3’-0”].

D. Optional Vinyl Weatherseal (U.S. Patent 5134825) to be factory-installed over Continuous Zee Rib.

E. Sidelap to be mechanically seamed with a powered seamer.
F. When required, panel assembly to bear Underwriters Laboratories Label UL90, pursuant to Construction Number 312 for open framing conditions, either uninsulated or with blanket insulation; 335 or 335 (mod.) with rigid board insulation or 403 over solid substrate and applicable Fire Ratings.

G. Certification shall be submitted, based on independent testing laboratory, indicating no measurable water penetration or air leakage through the system when tested in accordance with ASTM E-1680-95 and ASTM E-1646-95.

2.9 BERRIDGE VEE-PANEL

A. Panels shall have 12-3/4" exposure, two 3/8" deep vee grooves at 4-1/4" on center, with concealed fasteners and interlocking sidelap.

B. Panels shall be have a smooth surface texture.

C. Panels shall be factory formed to 40' max.

D. Attachment to metal supports with #8 x 12" TEKS screws at maximum spacing of 2'-0" on center or per local code, whichever is greater.

E. Provide Vented Vee-Panel to have a Net Free Vent Area (NFVA) of 6.46 square inches per lineal foot of panel, 6.08 square inches per square foot of panel.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to which material specified herein will be attached prior to installation and do not proceed until defects are corrected.

3.2 COORDINATION

A. Coordinate work of this section closely with associated work specified in Section 07600.

3.3 INSTALLATION: STRAIGHT S-DECK

A. Comply with manufacturers standard instructions and conform to standards set forth in the Architectural Sheet Metal Manual published by SMACNA, in order to achieve a watertight installation.

A. Verify that the fluid applied membrane per Section 07 2726 has been applied to the exterior wall sheathing.

B. Install panels in such a manner that horizontal lines are true and level and vertical lines are plumb.

C. Install starter and edge trim before installing wall panels.

D. Remove protective strippable film prior to installation of wall panels.

E. Attach panels using manufacturer's standard clips and fasteners, spaced in accordance with approved shop drawings.

F. Install sealants for preformed wall panels as approved on shop drawings.
G. Do not allow panels or trim to come into contact with dissimilar materials.

H. Protect installed wall panels and trim from damage caused by adjacent construction until completion of installation.

I. Remove and replace any panels or components which are damaged beyond successful repair.

3.4 INSTALLATION: ZEE-LOCK WITH BATTON CAP

A. Substrate:
   1. Examine metal deck to ensure proper attachment to framing.
   2. Inspect roof deck to verify deck is clean and smooth, free of depressions, waves or projections, level to +/- 1/4" in 20', and properly sloped to eaves.
   3. Verify deck is dry and free of snow or ice. Flutes in steel deck to be clean and dry.

B. Underlayment:
   1. Verify the fluid applied membrane per Section 07 2726 has been applied to the metal roof deck.

C. Installation
   2. Install panels in such a manner that horizontal lines are true and level and vertical lines are plumb.
   3. Install starter and edge trim before installing roof panels.
   4. Remove protective strippable film prior to installation of roof panels.
   5. Attach panels using manufacturer's standard clips and fasteners, spaced in accordance with approved shop drawings.
   6. Install sealants for preformed roofing panels as approved on shop drawings.
   7. Do not allow panels or trim to come into contact with dissimilar materials.
   8. Do not allow traffic on completed roof. If required, provide cushioned walk boards.
   9. Protect installed roof panels and trim from damage caused by adjacent construction until completion of installation.
  10. Remove and replace any panels or components which are damaged beyond successful repair.

3.5 INSTALLATION: VEE-PANEL

A. Comply with manufacturers standard instructions and conform to standards set forth in the Architectural Sheet Metal Manual published by SMACNA, in order to achieve a watertight installation.

B. Install panels in such a manner that horizontal lines are true and level and vertical lines are plumb.

C. Install starter and edge trim before installing wall or soffit panels.

D. Remove protective strippable film prior to installation of wall panels.
E. Attach panels using manufacturer's standard clips and fasteners, spaced in accordance with approved shop drawings.

F. Do not allow panels or trim to come into contact with dissimilar materials.

G. Protect installed panels and trim from damage caused by adjacent construction until completion of installation.

H. Remove and replace any panels or components which are damaged beyond successful repair.

3.6 INSTALLATION - GENERAL

A. Attach metal roofing to metal deck substrate; attach soffit/fascia through to steel framing. Ensure that joints are watertight and free to move in both directions; form expansion joints where required or indicated. Use exposed fasteners only where required by manufacturer.

B. Install trim, closures and flashings.

C. Completed system shall be free from overbending, deforming, stretching, distortion, waves, and buckles.

3.7 POST-ROOFING INSPECTION

A. Refer to Quality Assurance in Part 1 herein for post-roofing inspection.

3.8 TESTING

A. At completion of roofing installation test entire roof specified herein. Using a hose, simulate a hard rainfall for 30 minutes. Examine entire roof specified herein and if leakage is found, adjust as necessary using factory approved methods only, and retest for 30 minutes. Repeat this procedure as necessary until roof is approved as watertight.

3.9 CLEANING AND ADJUSTMENT

A. Clean surfaces of work specified herein and adjacent finish surfaces using materials and methods recommended by manufacturers of same.

B. Replace any finish materials damaged by work specified herein.

END OF SECTION
SECTION 075216

STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS MEMBRANE ROOFING

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. Styrene-butadiene-styrene (SBS) modified bituminous membrane roofing.
      2. Vapor retarder.
      3. Roof insulation.
   B. Related Sections:
      1. Division 07 Section "Preparation for Re-Roofing."
      2. Division 07 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 DEFINITIONS
   A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.
   B. Hot Roofing Asphalt: Roofing asphalt heated to its equiviscous temperature, the temperature at which its viscosity is 125 centipoise for mop-applied roofing asphalt and 75 centipoise for mechanical spreader-applied roofing asphalt, within a range of plus or minus 25 deg F (14 deg C), measured at the mop cart or mechanical spreader immediately before application.

1.4 PERFORMANCE REQUIREMENTS
   A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
   B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
   C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to withstand design loads within limits and under conditions indicated.
      1. Corner Uplift Pressure: As calculated per the 2007 Kentucky Building Code, but not less than that required to comply with the FMG equivalency indicated.
      2. Perimeter Uplift Pressure: As calculated per the 2007 Kentucky Building Code, but not less than that required to comply with the FMG equivalency indicated.
      3. Field-of-Roof Uplift Pressure: As calculated per the 2007 Kentucky Building Code, but not less than that required to comply with the FMG equivalency indicated.
D. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class I or noncombustible construction, as applicable. Identify materials with FM Approvals markings.
   1. Fire/Windstorm Classification: Class 1A-90.
   2. Hail Resistance Rating: MH.

1.5 SUBMITTALS

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

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
   1. Base flashings and membrane terminations.
   2. Tapered insulation, including slopes.
   3. Crickets, saddles, and tapered edge strips, including slopes.
   4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Qualification Data: For qualified Installer, manufacturer, and testing agency.

D. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
   1. Submit evidence of complying with performance requirements.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

F. Maintenance Data: For roofing system to include in maintenance manuals.

G. Warranties: Sample of special warranties.

H. Inspection Reports: Copy of roofing system manufacturer’s progress inspection reports and final inspection report of completed roofing installation.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed and FM Approvals approved for membrane roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty, and with a minimum of five years previous experience installing membrane roofing systems identical to that used for this Project with a record of successful performance.
   1. Provide project names, addresses, contact names, and phone numbers for at least five (5) projects of similar scope completed by the Installer.

C. Source Limitations: Obtain components including roof insulation and fasteners for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.

D. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.
E. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

F. Preinstallation Roofing Conference: Conduct conference at Project site.
   1. Coordinate with re-roof conference.
   2. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
   4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   5. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
   6. Review structural loading limitations of roof deck during and after roofing.
   7. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
   8. Review governing regulations and requirements for insurance and certificates if applicable.
   9. Review temporary protection requirements for roofing system during and after installation.
  10. Review roof observation and repair procedures after roofing installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

B. Installation Limitations: Installation of all plies of final roofing membrane to occur in succession without exposure of insulation materials and base ply to weather and other sources of moisture prior to installation of the final ply. Roofing system installation may not be “phased”.

C. Permits: Proceed with roofing work only after obtaining all permits required by local agencies of jurisdiction, and after paying all fees which may be required for performance of the work.
D. Safety: Proceed with roofing work only in accordance with all fire and safety regulations recommended or required by OSHA, NRCA, and other industry and local governmental groups.

1.9 WARRANTY

A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Manufacturer’s Warranty: Written Manufacturer's warranty, without monetary limitation (“No Dollar Limit”) and including a flashing endorsement, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.
   1. Special warranty includes the total roofing system, including roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, protection boards, and other components of membrane roofing system.
   2. Warranty Period: Twenty (20) years from date of Substantial Completion.

C. Special Installer’s Warranty: Written roofing Installer's warranty, without monetary limitation and including a flashing endorsement, signed by Installer, covering Work of this Section.
   1. Special warranty includes the total roofing system, including roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, protection boards, and other components of roofing system.
   2. Warranty Period: Two (2) years from date of Substantial Completion.

The contractor will ensure that NKU receives the remainder of the existing 20 year roof warranty. The existing roof warranty started November 19, 2009. The contractor shall contact Siplast to provide a representative to inspect and verify the installation conditions and a written guarantee that the warranty is valid. See Existing Warranty at the end of this section.

PART 2 - PRODUCTS

2.1 SBS-MODIFIED ASPHALT-SHEET MATERIALS

A. SBS-Modified Bituminous Membrane Roofing:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      b. Siplast, Inc.
      c. Tremco Incorporated.
   2. Regional Certified SiPlast Roofing Installers: the list below is not intended to be a comprehensive list. Other approved/certified SiPlast contractors not listed here can be used if desired.
      a. Dalton Roofing Co.
      b. Imbus Roofing Co.
      c. Kelly & Carpenter Roofing & Sheet Metal Inc.
      d. Kramer & Son, Inc.

B. Roofing Membrane Sheet: ASTM D 6163, Grade S, Type I or II, SBS-modified asphalt sheet (reinforced with glass fibers); smooth surfaced; suitable for application method specified.
C. Granule-Surface Roofing Membrane Cap Sheet: ASTM D 6163, Grade G, Type I or II, SBS-modified asphalt sheet (reinforced with glass fibers); granular surfaced; suitable for application method specified, and as follows:

2.2 AUXILIARY ROOFING MEMBRANE MATERIALS
A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.
   1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
B. Asphalt Primer: ASTM D 41.
C. Roofing Asphalt: ASTM D 312, Type III or IV as recommended by roofing system manufacturer for application.
D. Cold-Applied Adhesive: Roofing system manufacturer's standard asphalt-based, one- or two-part, asbestos-free, cold-applied adhesive specially formulated for compatibility and use with roofing membrane and base flashings.
E. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application.
F. Mastic Sealant: Polyisobutylene, plain or modified bitumen; nonhardening, nonmigrating, nonskinning, and nondrying.
G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing membrane components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.
H. Metal Flashing Sheet: As specified in Division 07 Section "Sheet Metal Flashing and Trim."
I. Roofing Granules: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 (2.36-mm) sieve and 98 percent of mass retained on No. 40 (0.425-mm) sieve, color to match roofing membrane.
J. Miscellaneous Accessories: Provide those recommended by roofing system manufacturer.
K. Lighting Suppression Mounting Pads: Sections of roofing membrane cap sheet or walkway cap sheet strips at Contractor’s option.

2.3 VAPOR RETARDER
A. Polyethylene Film Over Metal Deck: ASTM D 4397, 6 mils (0.15 mm) thick, minimum, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).
   1. Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
   2. Adhesive: Manufacturer's standard lap adhesive, FM Approvals approved for vapor-retarder application.
B. Glass-Fiber Felt Over Concrete Deck: ASTM D 2178, Type IV, asphalt impregnated.
2.4 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Approvals-approved roof insulation.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
   1. Available Manufacturers:
      a. Apache Products Company.
      c. Celotex Corporation.
      d. GAF Materials Corporation.
      e. Honeywell Commercial Roofing Systems.
      f. Hunter Panels, LLC.
      g. Johns Manville International, Inc.
      h. Koppers Industries.
      i. RMAX.

C. Perlite Board Insulation: ASTM C 728, rigid, mineral-aggregate thermal insulation board composed of expanded perlite, cellulosic fibers, binders, and waterproofing agents with top surface seal coated.

D. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) and 1/8 inch per 12 inches (1:96) unless otherwise indicated.

E. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.5 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

C. Insulation Cant Strips: ASTM C 728, perlite insulation board.

D. Tapered Edge Strips: ASTM C 728, perlite insulation board.

E. Cover Board: ASTM C 728, rigid, mineral-aggregate thermal insulation board composed of expanded perlite, cellulosic fibers, binders, and waterproofing agents with top surface seal coated.

2.6 WALKWAYS

A. Walkway Cap Sheet Strips: ASTM D 6163, Grade G, Type I or II, SBS-modified asphalt sheet (reinforced with glass fibers); granular surfaced; suitable for application method specified, and as follows:
   1. Granule Color: Bright yellow and white as indicated on Drawings.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
   a. Test for moisture by pouring 1 pint (0.5 L) of hot roofing asphalt on deck at start of each day's work and at start of each roof area or plane. Do not proceed with roofing work if test sample foams or can be easily and cleanly stripped after cooling.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Prime surface of concrete deck with asphalt primer at a rate of 3/4 gal./100 sq. ft. (0.3 L/sq. m) and allow primer to dry.

3.3 VAPOR-RETARDER INSTALLATION

A. Polyethylene Film Over Metal Deck: Loosely lay polyethylene-film vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches (50 mm) and 6 inches (150 mm), respectively.
   1. Continuously seal side and end laps with tape or adhesive.

B. Built-up Vapor Retarder Over Concrete Deck: Install two glass-fiber felt plies lapping each felt 19 inches (483 mm) over preceding felt. Embed each felt in a solid mopping of hot roofing asphalt. Glaze-coat completed surface with hot roofing asphalt. Apply hot roofing asphalt within plus or minus 25 deg F (14 deg C) of equiviscous temperature.

C. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

3.4 INSULATION INSTALLATION

A. Comply with roofing system manufacturer's written instructions for installing roof insulation.

B. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing membrane system with vertical surfaces or angle changes more than 45 degrees.

C. Install tapered insulation under area of roofing to conform to slopes indicated.
D. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
   1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

E. Install insulation under new Observation floor slab to the thickness as indicated on the drawings.

F. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (68 mm) or more, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

G. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

H. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

I. Adhered Insulation Over Concrete Deck: Install each layer of insulation and adhere to substrate as follows:
   1. Prime surface of concrete deck with asphalt primer at rate of 3/4 gal./100 sq. ft. (0.3 L/sq. m) and allow primer to dry.
   2. Set each layer of insulation in a solid mopping of hot roofing asphalt applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.

J. Mechanically Fastened and Adhered Insulation Over Metal Deck: Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
   1. Fasten first layer of insulation according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
   2. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
   3. Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.

K. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints a minimum of 6 inches (150 mm) in each direction from joints of insulation below. Loosely butt cover boards together. Tape joints if required by roofing system manufacturer.
   1. Apply hot roofing asphalt to underside, and immediately bond cover board to substrate.

3.5 ROOFING MEMBRANE INSTALLATION, GENERAL

A. Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing" and as follows:
   1. Deck Type: I (insulated).
   2. Adhering Method: M (mopped) base ply, and L (cold-applied adhesive) for cap sheet.
   3. Number of SBS-Modified Asphalt Sheets: One base ply and one cap sheet.

B. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.

C. Cooperate with testing agencies engaged or required to perform services for installing roofing system.
D. Coordinate installation of roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
   1. At end of each day's work, provide tie-offs to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt, with joints and edges sealed.
   2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
   3. Remove and discard temporary seals before beginning work on adjoining roofing.

E. Asphalt Heating: Do not raise roofing asphalt temperature above equiviscous temperature range more than one hour before time of application. Do not exceed roofing asphalt manufacturer's recommended temperature limits during roofing asphalt heating. Do not heat roofing asphalt within 25 deg F (14 deg C) of flash point. Discard roofing asphalt maintained at a temperature exceeding finished blowing temperature for more than four hours.

F. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.6 SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

A. Install modified bituminous roofing membrane sheet and cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:
   1. Adhere roof membrane base sheet to substrate in a solid mopping of hot roofing asphalt applied at not less than 425 deg F (218 deg C).
   2. Adhere cap sheet to base sheet in cold-applied adhesive.
   3. Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.

B. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.
   1. Repair tears and voids in laps and lapped seams not completely sealed.
   2. Apply roofing granules to cover exuded bead at laps while bead is hot.

C. Install roofing membrane sheets so side and end laps shed water.

3.7 FLASHING AND STRIPPING INSTALLATION

A. Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof; secure to substrates according to roofing system manufacturer's written instructions, and as follows:
   1. Prime substrates with asphalt primer if required by roofing system manufacturer.
   2. Flashing Sheet Application: Adhere flashing base sheet to substrate in a solid mopping of hot roofing asphalt applied at not less than 425 deg F (218 deg C). Apply hot roofing asphalt to back of flashing sheet if recommended by roofing system manufacturer.
   3. Flashing Sheet Application: Adhere flashing cap sheet to substrate in cold-applied adhesive at rate required by roofing system manufacturer.

B. Extend base flashing up walls or parapets a minimum of 8 inches (200 mm) above roofing membrane and 4 inches (100 mm) onto field of roofing membrane.

C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
D. Install roofing membrane cap-sheet stripping where metal flanges and edgings are set on membrane roofing according to roofing system manufacturer's written instructions.

3.8 WALKWAY INSTALLATION

A. Walkway Cap Sheet Strips and Lightning Suppression Mounting Pads: Install walkway cap sheet strips over roofing membrane using same application method as used for roofing membrane cap sheet.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and to prepare test reports.

B. Test Cuts: Test specimens will be removed to evaluate problems observed during quality-assurance inspections of roofing membrane as follows:
   1. Approximate quantities of components within roofing membrane will be determined according to ASTM D 3617.
   2. Test specimens will be examined for interply voids according to ASTM D 3617 and to comply with criteria established in Appendix 3 in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
   3. Repair areas where test cuts were made according to roofing system manufacturer's written instructions.

C. Roof Progress Inspections: Roofing manufacturer’s technical personnel shall be present a minimum of two (2) hours per forty (40) hour work week, or ten percent of the installation time, to monitor roofing installation and verify compliance with Contract Documents, roofing manufacturer’s written guidelines, reviewed shop drawings and details, and warranty requirements.
   1. Progress inspections shall be conducted at regular intervals throughout roofing installation.
   2. Written reports from each progress inspection shall be submitted directly to Architect.

D. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.

E. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
   1. Notify Architect and Owner 48 hours in advance of date and time of inspection.

F. Roofing system will be considered defective if it does not pass tests and inspections.
   1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.10 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.
END OF SECTION
ROOF MEMBRANE/SYSTEM GUARANTEE

Guarantee No.: 38023
Guarantee Date: November 19, 2009

SIPLAST, INC. has sold materials which have been used in applying a Roof Membrane/System (comprised solely of the SIPLAST, Inc. Roof Membrane, Rigid Roof Insulation designated as Paratherm Polysycyanurate and/or SIPLAST Wood Fiberboard and/or DensDeck, DensDeck Prime or DensDeck DuraGuard, and Parafast Fasteners and/or Para-Stik Insulation Adhesive) to a building owned and described as follows:

OWNER: Northern Kentucky University
ADDRESS OF OWNER: 100 Nunn Drive
                      Highland Heights, KY 41099
JOB NAME & AREA: Northern Kentucky University - Founder's Hall
ADDRESS OF BUILDING: Kenton Drive
                      Newport, KY 41099
USE OF BUILDING: College/University

SIPLAST HEREBY GUARANTEES TO THE ABOVE OWNER, subject to the terms, conditions and limitations stated herein, that the Roof Membrane/System (comprised solely of the SIPLAST Roof Membrane, Paratherm and/or Wood Fiberboard and/or DensDeck, DensDeck Prime or DensDeck DuraGuard, Parafast Fasteners and/or Para-Stik Insulation Adhesive) at the above building will remain in a watertight condition for a period of 20 years, commencing with the date hereof, or SIPLAST, will repair the Roof Membrane/System at its own expense.

A. TERMS AND CONDITIONS
   This Guarantee shall be subject to the following additional terms and conditions.
   1. SIPLAST shall be liable under this Guarantee only if:
      a. The Roof Membrane is installed according to SIPLAST specifications;
      b. The Rigid Roof Insulation is installed according to SIPLAST specifications;
      c. The installation of the Roof Membrane and Roof Insulation is by a roofing contractor approved in advance by SIPLAST;
      d. The use of SIPLAST materials has been approved in advance by SIPLAST.
   2. NOTICE OF CLAIM
      Any claim hereunder shall be deemed waived unless the Owner shall have given SIPLAST written notice thereof within thirty (30) days after a leak is discovered or should by reasonable diligence have been discovered.
   3. EXCLUSIONS FROM COVERAGE
      This Guarantee does not cover leaks or failure of the Roof Membrane/System to perform as guaranteed herein resulting from occurrences beyond the control of SIPLAST including but not limited to:
      1. Damage to the Roof Membrane/System caused by lightning, windstorm, hail, earthquake, tornado, hurricane, flood, malicious mischief, vandalism, chemical or organic deposits or other unusual occurrences.
      2. Damage to the Roof Membrane/System caused by abuse or abnormal use of the roof or Roof Membrane/System or any deliberate or negligent act in maintaining the roof.
      3. Damage to the Roof Membrane/System caused by unauthorized repairs, alterations or modifications, or subsequent work on or through the roof done without prior written approval by SIPLAST of the methods and materials to be used.
      4. Damage to the Roof Membrane/System caused by structural defects or failures (including, but not limited to, settling or shifting of the building, and cracking or movement of grinders, beams, partitions or foundations) or defects or failure of any substrate component, including defects in application of any substrate component to which the Membrane/System is installed.
      5. Damage to the Roof Membrane/System caused by falling objects.
      6. Damage to the Roof Membrane/System caused by movement of metal work used in conjunction with the Roof Membrane/System.
      7. Damage to the Roof Membrane/System caused by installation of a sprinkler system, water or air conditioning equipment, radio or television antenna, framework for signs, water tower or other installation on the roof after the installation of the Roof Membrane without a prior written inspection by SIPLAST of the methods and materials to be used.
      8. Damage to the Roof Membrane/System resulting from other than occasional traffic across its surface or from its use as a storage area or recreational surface or for any other similar purposes.
      9. Damage to the Roof Membrane/System caused by a change in use of the building without prior written approval of SIPLAST.
      10. Damage to the Roof Membrane caused by ponding of water or other conditions resulting from improper drainage.
   D. LIMITATION OF LIABILITY
      SIPLAST shall be liable only for the cost of repair of such existing Roof Membrane/System by a SIPLAST approved contractor and will not be liable for damages to other components of the roof assembly or the building or the contents or for consequential damages. The expense of removing and replacing traffic surfaces built over the roof shall be borne by the Owner. It shall be a condition to the liability of SIPLAST, hereunder that SIPLAST have access to the roof during business hours throughout the term of the Guarantee. This Guarantee will be subject to all costs of installation being paid, including those of the roofing contractor.

THIS GUARANTEE, AND THE STATEMENTS, OBLIGATIONS AND REPRESENTATIONS HEREBIN CONTAINED, SHALL BE IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. SIPLAST SHALL NOT BE LIABLE FOR ANY DAMAGE TO THE BUILDING OR CONTENTS THEREOF, OR FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL OR PUNITIVE DAMAGES. SIPLAST AGENTS HAVE NO AUTHORITY TO GIVE GUARANTEES BEYOND THOSE PROVIDED IN THIS GUARANTEE.

SIPLAST, INC.

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An Icopal Group Company
SECTION 076200

SHEET METAL FLASHING AND TRIM

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. Formed Products:
      a. Formed roof drainage sheet metal fabrications.
      b. Formed low-slope roof sheet metal fabrications.

B. Related Sections:
   1. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
   2. Division 07 Section "Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing" for installing sheet metal flashing and trim integral with membrane roofing.

1.3 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Fabricate and install roof edge flashing and copings capable of resisting the following forces:
   1. Corner Uplift Pressure: As calculated per the 2007 Kentucky Building Code, but not less than that required to comply with the FMG equivalency indicated.
   2. Perimeter Uplift Pressure: As calculated per the 2007 Kentucky Building Code, but not less than that required to comply with the FMG equivalency indicated.
   3. Field-of-Roof Uplift Pressure: As calculated per the 2007 Kentucky Building Code, but not less than that required to comply with the FMG equivalency indicated.

C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:

1. Identification of material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
4. Details of termination points and assemblies, including fixed points.
5. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
6. Details of special conditions.
7. Details of connections to adjoining work.
8. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Joint Intersections, and Miscellaneous Fabrications: 12 inches (300 mm) long and in required profile. Include fasteners and other exposed accessories.
3. Accessories and Miscellaneous Materials: Full-size Sample.

E. Qualification Data: For qualified fabricator.

F. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

G. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Sheet Metal flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

C. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, and roof-mounted equipment.
2. Review methods and procedures related to sheet metal flashing and trim.
3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING
A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.7 WARRANTY
A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS
A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
B. Lead Sheet: ASTM B 749, Type L5112, copper-bearing lead sheet.
C. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
1. Exposed Coil-Coated Finishes:
   a. Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Color: Match Existing Colors and as selected by Architect from manufacturer's full range, excluding metallics.
D. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.
1. Finish: 4 (polished directional satin).
2. Surface: Smooth, flat.
2.2 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
   1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
      a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
      b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
   2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
   3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.


2.3 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
   1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
   2. Obtain field measurements for accurate fit before shop fabrication.
   3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
   4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

H. Do not use graphite pencils to mark metal surfaces.

2.4 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof-Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 10-foot- (3-m-) long, sections. Furnish with 6-inch- (150-mm-) wide, joint cover plates.

1. Joint Style: Butt, with 12-inch- (300-mm-) wide, concealed backup plate and 6-inch- (150-mm-) wide, exposed cover plates.

2. Fabricate with scuppers spaced 10 feet (3 m) apart, of dimensions required with 4-inch- (100-mm-) wide flanges and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.

3. Fabricate from the following materials:
   a. Aluminum: 0.050 inch (1.27 mm) thick.
   b. Stainless Steel: 0.019 inch (0.48 mm) thick.

B. Copings: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 10-foot- (3-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners and seal watertight.

1. Coping Profile: As shown on Drawings.

2. Joint Style: Butt, with 12-inch- (300-mm-) wide, concealed backup plate and 6-inch- (150-mm-) wide, exposed cover plates.

3. Fabricate from the following materials:
   a. Aluminum: 0.050 inch (1.27 mm) thick where installing at new roof decks.
   b. Stainless Steel: 0.025 inch (0.64 mm) thick where tying into existing copings.

C. Counterflashing: Fabricate from the following materials:

1. Stainless Steel: 0.019 inch (0.48 mm) thick.

D. Flashing Receivers: Fabricate from the following materials:

1. Stainless Steel: 0.016 inch (0.40 mm) thick.

E. Roof-Penetration Flashing: Fabricate from the following materials:
1. Lead: 4.0 lb./sq. ft., hard tempered.

F. Roof-Drain Flashing: Fabricate from the following materials:
   1. Lead: 4.0 lb./sq. ft., hard tempered.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
   2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
   3. Space cleats not more than 12 inches (300 mm) apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
   4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
   5. Install sealant tape where indicated.
   6. Torch cutting of sheet metal flashing and trim is not permitted.
   7. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
   1. Coat back side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not
be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.

D. Fastener Sizes: Use fasteners of sizes that will penetrate wood blocking not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.

E. Seal joints as shown and as required for watertight construction.
   1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
   2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

3.3 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at 16-inch (400-mm) centers.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.
   1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16-inch (400-mm) centers.
   2. Anchor interior leg of coping with screw fasteners and washers at 20-inch (500-mm) centers.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with sealant. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof.
   1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
   2. Seal with sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.
3.4 WALL FLASHING INSTALLATION
A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.5 MISCELLANEOUS FLASHING INSTALLATION
A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.6 ERECTION TOLERANCES
A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.7 CLEANING AND PROTECTION
A. Clean off excess sealants.
B. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
C. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION
SECTION 07 7200
ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Non-Penetrating Portable Rooftop Supports and Walkways

1.2 REFERENCES


D. MSS SP-58 - Pipe Hangers and Supports -- Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry.

E. MSS SP-69 - Pipe Hangers and Supports -- Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry.

1.3 SYSTEM DESCRIPTION

A. Support elevated walkway/ramp systems routed across the roof with an engineered prefabricated - Walkway System designed for installation without roof penetrations, flashing or damage to the roofing material. The system shall consist of bases, made of high density polypropylene plastics with UV Protection, a galvanized structural steel frame and ADA walkway planking. Nuts, threaded rods and washers shall be HDG, spring nuts and bolts for spring nuts will be electro-plated. System shall be custom designed to fit the load requirements that will be required, but not to exceed 2.5 psi per at each base. Edge Protection in the form of a 4” curb shall be provided for the ramps.

1.4 SUBMITTALS

A. Submit items indicated below for review by Architect:
   1. Submit shop drawings showing sizes, gages, location, method of attachment and hardware.
   2. Submit manufacturer's product data indicating compliance with requirements specified herein, and meeting requirements of the Kentucky Building Code.
   4. Shop Drawings: show installation layout, sizes of units and details of installation
   5. Submit warranty as described herein.
1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing walkway/ramp systems, with a minimum of eight years of documented experience.

B. Installer Qualifications: Company approved by manufacturer and with not less than five years of experience in installation of systems.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver all materials to project site in manufacturer's original packaging, marked with manufacturer's name, product model names and catalog numbers, identification numbers, and other related information.

B. Store materials under cover until needed for installation

1.7 WARRANTY

A. Provide manufacturer's standard 5 year warranty.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Portable Pipe Hangers; 5534 Harvey Wilson Drive, Houston, Texas 77020. ASD. Tel: (713) 672-5088. Fax: (713) 672-1170. www.portablepipehangers.com. email:info@portablepipehangers.com or approved manufacturer.

2.2 APPLICATION

A. Attachment of Base to Roof Surface when required for Seismic and High Wind Application:
   1. No attachment to roof surface.
   2. Adhesive attachment to roof surface.
   3. Mechanically fastened to roof deck.

2.3 MATERIALS

A. Portable Support System: Engineered, portable system specifically designed for installation without the need for roof penetrations or flashings, and without causing damage to the roofing membrane.
   1. Design system using high density / high impact polypropylene bases with carbon black, anti-oxidants for UV protection, and steel framing for support is 1-5/8 inch (41 mm) B22TH or 1-7/8 inch (48 mm) BTS22TH
   2. Custom design system to fit piping, conduits, equipment, or walkways to be installed and actual conditions of service and loading.
   3. Walkways and Platforms: Provide ADA galvanized metal grating, in configurations as indicated.

B. Bases: Injection molded high density / high impact polypropylene with UV-inhibitors and anti-oxidants, conforming to the following:
   1. Moisture Content: Negligible.
2. Shrinkage/Swelling Due to Moisture: Negligible.
3. Density: 55.8 lb/cu ft (894 kg/cu m).
4. Insect Resistance: No known insect damage potential.
5. Chemical Resistance (oil, brake fluid, gasoline, diesel, antifreeze, battery acid, and sulfuric acid) No visual or physical change apparent.
6. Flammability: No ignition after 10 minutes, 25 kW/m, when tested in accordance with ASTM D 1929.
7. Sized as required by loading conditions and as indicated on the drawings.
8. Shop fabricated with inserts for square tubing or threaded rods as required.
9. Color: Integral black color as molded.
10. Bases for Mechanical Attachment: Sealant chamber around penetration point, with injection port for sealing after fastening; beveled lip for sealant bead around entire diameter.

11. Edge Protection in the form of a 4” curb shall be provided for the ramps.

C. Steel Framing:
   1. Channel Types: 1-5/8 inch (41.3 mm) B22TH or 1-7/8 inch (47.6 mm) BTS22H, as required for loading conditions.
   2. Thickness: 12 gage (2.7 mm).
   3. Form: Roll-formed 3-sided or tubular channel, perforated with 9/16 inch (14.3 mm) holes at 1-7/8 inch (47.6 mm) centers on three sides.
   4. Finish: Hot dip galvanize in accordance with ASTM A 123 after fabrication, free of roughness, whiskers, unsightly spangles, icicles, runs, barbs, sags, droplets, and other surface blemishes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that roofing system is complete and that roof surfaces are smooth, flat and ready to receive work of this section.

B. Verify that roof surface temperature is at minimum 60 degrees F for proper adhesive performance.

3.2 PREPARATION

A. Clean surfaces of roof in areas to receive portable support bases.
   1. Sweep loose gravel from gravel surfaced roofs.
   2. Remove dirt, dust, oils, and other foreign materials.

B. Use care in handling portable support system components during installation, to avoid damage to roofing, flashing, equipment, or related materials.

3.3 INSTALLATION

A. Walkway/ramp and Crossover:
   1. Install substructures at spacing as required, but not greater than 5 feet (1.5 m) on center.
2. Locate bases and support framing as required and as specified herein. Provide complete and adequate support of all structures.

3. Accurately locate and align bases.
   a. Consult manufacturer of existing or new roofing system as to the type of isolation pads required between the roof and base
   b. Set isolation pads in adhesive if required by manufacturer's instructions.
   c. Place bases on isolation pads.
   d. Adhere or mechanically attach if required by code.
   e. Where applicable, replace gravel around bases.

4. Set legs of substructures into bases as indicated.

5. Use galvanized fasteners for galvanized framing and stainless steel fasteners for stainless steel framing.

6. Layout and fasten planking to substructures.

3.4 ADJUSTMENT AND CLEANING

A. Remove all packaging, unused fasteners, adhesive, and other installation materials from the project site.

B. Remove adhesive from exposed surfaces of supports and bases, and leave the work in clean condition.

C. Provide protection as required to leave the work area in undamaged condition at the time of completion of work.

END OF SECTION
SECTION 07 9200
JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Joint preparation, backing, and sealant.

1.2 SYSTEM DESCRIPTION

A. General locations of sealants:
   1. Location A: Joints in floors and where else horizontal surfaces are subject to pedestrian traffic.
   2. Location B: Interior vertical expansion and control joints and other interior vertical joints subject to movement, and horizontal joints not requiring Class A sealant.
   3. Location C: Silicone sealant for joints at plumbing fixtures and pipes, and countertops and backsplashes at walls, wall protection panels.
   4. Location D: Acoustical sealant in openings and at perimeter of partitions with acoustical insulation.
   5. Location E: Non-moving interior vertical joints not requiring any of the above.

B. Definitions:
   1. Horizontal joints: Joints on horizontal surfaces.
   2. Vertical joints: Joints on non-horizontal surfaces.

1.3 SUBMITTALS

A. Submit items indicated below for review by Architect:
   1. Samples: Submit in triplicate samples of each class of sealant indicating full range of manufacturer's standard colors.
   2. Product data: Submit product data for each sealant indicating compliance with specification requirements and manufacturer's recommended installation procedures.

1.4 QUALITY ASSURANCE

A. Use only installers who are thoroughly trained and experienced in skills required, who are completely familiar with materials involved and manufacturer's recommended methods of installation, and who are thoroughly familiar with requirements of this work.

B. Use only materials that are compatible with the joint-forming materials and with sealants integral with the joint-forming systems as approved by manufacturers of joint forming systems.

C. Submit upon request by Architect a statement from manufacturer indicating manufacturer's acceptance of installer's past performance using manufacturer's products.
1.5  DELIVERY, STORAGE AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6  PROJECT CONDITIONS

A. Environmental requirements:
   1. For one-part sealants, which depend on atmospheric curing, ensure that atmospheric conditions are within manufacturer's recommended limits at the time of installation and throughout curing period.

B. Protect work and adjacent surfaces during and after installation. Replace damaged work with new.

1.7  WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from natural causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1  PRODUCT REQUIREMENTS

A. Acceptable manufacturers of non-silicone sealants, except where specified otherwise:
   1. Pecora Corp.
   2. Sonneborn Building Products, Div., ChemRex, Inc.
   4. Sika Corp.

B. Acceptable manufacturers of silicone sealant:
   1. Dow Corning Corp.
   2. GE Plastics, Silicones.
   3. Pecora Corp.
   4. Tremco, Inc.
C. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

D. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Architectural Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.

E. Colors: Colors will be selected by Architect from samples submitted under Part 1 herein.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. BASF Building Systems; Omniseal 50.
      b. Dow Corning Corporation; 795.
      c. Pecora Corporation; 895.
      d. Tremco Incorporated; Spectrem 2.

2.3 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.4 MATERIALS

A. Location A Sealant: Self-leveling type, multi-component, ASTM C920, Type M, Grade P, Class 50.

B. Location B sealant:
   1. Silicone: Non-sag type, single component type, ASTM C920, Type S, Grade NS, Class 50.
   2. Stain-Test-Response Characteristics: Provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Location C sealant: Silicone sanitary sealant, ASTM C920, Type S, Grade NS, Class 25.
D. Location D sealant: Synthetic rubber - Tremco Acoustical Sealant, Pecora BA-98 Acoustical Sealant, United States Gypsum Company Acoustical Sealant, or W.W. Henry #413 Acoustical Sealant where exposed and painted or #313 Sound Control Sealant where concealed and not painted.

E. Location E sealant: Paintable acrylic latex complying with ASTM C834.

F. Backing:
   1. For Location A joints: Round rod of solid neoprene or butyl rubber with Shore A hardness of 70 approximately.
   2. For other joints: Closed cell "Sof Rod" by Nomaco, Inc., Zebulon, N.C., or other manufacturer approved by Architect and sealant manufacturer; provide open cell type only if required by sealant manufacturer and approved by Architect.

G. Primer: Type as recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

H. Bond breaker tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint.

I. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints and other surfaces to receive sealant for defects that will adversely affect execution and quality of work.
   1. Do not start work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      a. Concrete.
      b. Masonry.
      c. Hollow metal frames.

B. Clean metal surfaces of protected metal with xylol or methyl ethyl ketone solvent unless incompatible with finish on metal. Use only clean white cloths.
C. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, and based on preconstruction joint-sealant-substrate tests. Apply primer to comply with joint-sealant manufacturer's written instructions.
   1. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
   2. Do not apply primer in thicknesses greater than recommended by sealant or primer manufacturer.

D. Install bond breaker tape smoothly at back of joints where joint backing is not required or cannot be installed. Install to prevent adhesion of sealant to any portion of back of joint.

E. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION

A. Backing installation:
   1. Use installation tool with minimum 100 degree "wing span".
   2. Select size of backing to allow a minimum of 30 percent compression.
   3. For closed cell type, do not use sharp tools that will puncture and do not force backing so as to cause puncture; if punctured, replace same to prevent outgassing.
   4. Do not "pack" joints with backing.
   5. Joint depth:
      a. Joints 1/4 inch to 1/2 inch wide: Backing rod 1/4 inch from surface.
      b. Joints wider than 1/2 inch: Set backing to provide sealant joint size of 2:1 (width to depth) ratio to a maximum depth of 1/2 inch.
      c. Maintain uniform depth and profile to ensure sealant manufacturer's recommended shape of sealed joint for full length of joint.

B. Sealant installation:
   1. Pour self-leveling sealants per manufacturer's recommendations; on sloping horizontal surfaces follow manufacturer's recommendations for pre-curing, damming, etc.
   2. Gun apply non-sag sealants through a nozzle opening of a diameter so that full bead of sealant is gunned into joint; fill joint completely.
   3. Tool concave immediately after installation to form smooth, uniform beads of configuration indicated and ensure firm full contact with inner faces of joint. Strike off excess material with tooling stick or knife.
      a. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
      b. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
   4. Neatly point beads, free of wrinkles, uniformly smooth.
   5. Do not use tooling agents unless recommended by sealant manufacturer.
   6. Do not install sealant flashing weeps or other openings designed to drain water.

C. Acoustic sealant installation:
1. Gun apply 4 beads of sealant at floor and top of sound walls as indicated on partition manufacturer's standard details. Seal openings around wall outlets and butter back of electrical boxes in these walls with sealant.
2. Apply in strict accordance with manufacturer's directions.

3.4 FIELD QUALITY CONTROL

A. Inspection during installation: Contractor and sealant subcontractor shall periodically request inspection by an authorized representative of sealant manufacturer to ensure compliance with sealant manufacturer's requirements for installation of materials specified herein.

B. Inspection after installation: Immediately upon completion of work of this section, schedule a meeting at site with Contractor, this sealant subcontractor, a representative of sealant manufacturer and Owner's Representative to review entire sealant installation to ensure complete compliance with specifications and manufacturer's requirements.

3.5 ADJUSTMENT AND CLEANING

A. Repair, replace work that exhibits leakage, alligatoring, hardening, cracking, crumbling, shrinking, sagging, or staining of adjacent work. Ensure that sealant is removed from weeps and other openings designed to drain water.

B. If joint sealant requires adjustment or re-installation as directed by Architect, do not apply sealant over material already in place. Remove in-place material, thoroughly clean and prepare surfaces, and reinstall sealant using procedures specified herein.

C. Cleaning: Immediately following installation remove excess sealant and smears adjacent to joint with xylol or toluol as work progresses. Use only clean white cloths.

D. Remove excess sealants with commercial solvents of type recommended by sealant manufacturer. Exercise care not to damage sealant in joints.

3.6 SEALANT SCHEDULE

A. Seal locations which normally require sealing to prevent infiltration of light, air, water, and insects. Coordinate with System Description in Part 1 herein. Sealant locations include, but are not necessarily limited to, the following:
   1. Control joints and expansion joints in interior walls and ceilings.
   2. Exposed joints between and at perimeter of steel frames, aluminum frames, windows, louvers, grilles.
   3. Construction and isolation joints in exposed interior concrete slabs.
   4. Plumbing fixtures and piping to wall or floor joints.
   5. Countertop and countertop backsplash to wall joints.
   6. Endsplash and backsplash joints to countertop.
   7. Casework to wall joints.
   8. Acoustical sealant at perimeter of partitions with acoustical insulation.
   10. Where door or window frames are 1/2 inch or less from intersecting wall.
   11. Between metal surface and casing trim on edge of gypsum board and at insulating tape where gypsum board abuts exterior frame.
12. Mechanical and electrical penetrations of insulated walls and ceilings.
13. Window stools at window jambs and at windows, and under window stools unless otherwise detailed.
14. Other locations indicated on Drawings.

END OF SECTION
SECTION 08 1100
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Standard hollow metal door and frames.
B. Products Installed but not supplied under this section: Division 8 Section “Door Hardware”: Hardware for metal doors.

1.2 REFERENCES
A. American National Standards Institute, Inc (ANSI) and Steel Door Institute (SDI)
   1. A250.4 "Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors, and Hardware Reinforcing”.
   2. A250.8 "Recommended Specifications for Standard Steel Doors and Frames ".
   3. A250.10 “Test procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames”
B. Hardware Locations: Unless in conflict with Regulatory Requirements specified herein, locate hardware in accordance with DHI "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames", and approved by Architect during shop drawing submittal.

1.3 REGULATORY REQUIREMENTS
A. Requirements for persons with disabilities: Comply with Kentucky Building Code and with ADA standards.

1.4 SUBMITTALS
A. Submit items indicated below for review by Architect:
   1. Qualification Data: For Installer.
   2. Product Data: Submit manufacturer’s technical products data substantiating that products comply with requirements.
      a. Product Test Reports: Based on evaluation of comprehensive fire tests performed by a qualified testing agency, for each type of standard steel door and frame.
   3. Shop Drawings: Submit for fabrication and installation of steel doors and frames.
      a. Elevations of each door design.
      b. Details of doors, including vertical and horizontal edge details.
      c. Frame details for each frame type, including dimensioned profiles.
      d. Details and locations of reinforcement and preparations for hardware.
      e. Details of each different wall opening condition.
      f. Details of anchorages, accessories, joints, and connections.
      g. Details of conduit and preparations for electrified door hardware and controls.
4. Schedule: Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.

5. Coordination Drawings: Drawings of each opening, including door and frame, drawn to scale and coordinating door hardware. Show elevations of each door design type, showing dimensions, locations of door hardware, and preparations for power, signal, and electrified control systems.

1.5 QUALITY ASSURANCE

A. S.D.I. standards shall apply unless more stringent requirements are specified herein.

B. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

C. Qualifications of Installer: Use only personnel thoroughly trained and experienced in installation of hollow metal doors, frames and finish hardware.

1.6 DELIVERY, STORAGE AND HANDLING

A. Store doors and frames to prevent rust; store upright, in a protected, dry area, at least one inch off ground and with at least 1/4 inch air space between individual pieces; protect prefinished and hardware surfaces as required. Do not install rusted doors or frames.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

B. Do not install rusted doors or frames.

1.8 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers:
   1. Ceco Door Products.
   2. Curries Company.
   3. Steelcraft.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.
B. Frame Anchors: ASTM A 591, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.
   1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008 or ASTM A 1011, hot-dip galvanized according to ASTM A 153, Class B.

C. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153.

D. Shop Primer: Manufacturer's standard rust-inhibitive primer suitable as base, without further field preparation, for either acrylic-based or alkyd-based field-applied paint.

E. Silencers: Frame manufacturer's standard; 3 per single door; 2 per pair of doors.

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI A250.8.
   1. Design: 1-3/4 inches thick flush panel or as indicated on Drawings.
      a. Welded seams shall be filled and ground smooth.
   2. Core Construction: Manufacturer's polystyrene, polyurethane, mineral-board, or vertical steel-stiffener core that produces doors complying with ANSI A250.8.
   4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch-thick end closures or channels of same material as face sheets. If inverted channel provide flush top cap.

B. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
   1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless) with 0.053-inch thick faces, (16 gage).

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior door requirements.

D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Interior Frames: Fabricated from cold-rolled steel sheet.
   1. Fabricate frames with mitered or coped corners.
   2. Fabricate frames as knocked down unless otherwise indicated.
   3. Frames: 0.053-inch thick steel sheet.

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.
2.5 FRAME ANCHORS

A. Jamb Anchors:
   1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
   2. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:
   1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
   2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

C. Accessories:
   1. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

2.6 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow Metal Doors:
   1. Hollow metal doors shall be properly prepared and reinforced with a minimum of 16 gauge material for either mortised or cylindrical locks as specified. Provide 14 gage reinforcement for hollow metal doors receiving closers. Where 14 gage reinforcement is not provided, the use of sex bolts is mandatory.

D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
   1. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
   2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
   3. Floor Anchors: Weld anchors to bottom of jambs and Mullions with at least four spot welds per anchor.
   4. Jamb Anchors: Provide number and spacing of anchors as follows:
      a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
         1) Three anchors per jamb up to 60 inches high.
         2) Four anchors per jamb from 60 to 90 inches high.
         3) Five anchors per jamb from 90 to 96 inches high.
4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.

5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.

b. Compression Type: Not less than two anchors in each jamb.

5. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.

2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.

3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

a. Hollow metal frames shall be prepared for ANSI strike plates per A115.1-2 (4-7/8 inches high)

4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 16 Sections.

G. Hardware Reinforcement in Doors and Frames: Fabricate reinforcement plates from same material as door face sheets to comply with the following minimum sizes:

1. Hinges: Minimum 0.134 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.

2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.

3. Lock Face, Closers, and Concealed Holders: Minimum 0.075 inch thick.

4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.

2.7 STEEL FINISHES

A. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

B. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work
   1. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation
   2. Proceed with installation only after unsatisfactory conditions have been corrected
   3. Start of work indicates an acceptance of conditions as found

B. For the record, prepare written report listing conditions detrimental to performance of the Work.

3.2 PREPARATION

A. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

B. Before hardware installation, verify that all doors and frames are properly prepared to receive the specified hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place in accordance with ANSI A250.11.
   1. Comply with Drawings, shop drawings, and manufacturer's written instructions.
   2. Install fire rated doors and frames in accordance with NFPA 80.

B. Frames:
   1. After-Set Frames: Attach jambs to studs and head to jambs as recommended by manufacturer using specified compression and sill anchors. Ensure tight fit of frame to faces of gypsum board; anchor securely. Ensure that frames are square, plumb, and have the exact required opening width.
   2. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set.
      a. Weld anchors to studs. (Refer to Part 1 herein for critical nature of frame anchorage for heavy duty door frames.)
   3. At completion of wall construction, remove temporary braces and spreaders; grind smooth and touch up with prime paint areas left rough after removal of temporary braces.
   4. Install hardware in frames per hardware manufacturer's instructions and recommendations.
   5. Door silencers: Install silencers after painting of frames is completed. Coordinate with Section 099100.

C. Doors:
   1. Allow door bottoms to be painted under Section 09900 prior to hanging.
   2. Hang doors plumb, true and to accurate fit with clearances as specified.
   3. Install hardware in doors in accordance with hardware manufacturer's instructions and recommendations.
3.4 ADJUSTMENT AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
   1. Adjust or replace frames as necessary, and as approved by Architect, if not suitable for proper fit of doors.
   2. Adjust doors to proper fit and swing; leave in proper, noise-free operating condition acceptable to Architect.
   3. Adjust hardware for doors for proper, noise-free operation and function; leave in proper, noise-free operating condition acceptable to Architect.

B. Cleaning:
   1. Remove grout and other bonding material from hollow metal work immediately after installation.
   2. Clean exposed door and frame surfaces to paintable condition acceptable to Architect.
      a. Sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer
   3. Clean hardware surfaces to new condition.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION
SECTION 08 7100
DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes, but not limited to the following items:
   1. Hinges.
   2. Lock cylinders and keys.
   3. Locks and latch sets.
   4. Exit devices.
   5. Push/pull units.
   6. Closers.
   7. Protection plates.
   8. Weatherstripping.

B. Related Sections:
   1. Division 05 Section “Decorative Metals”.
   2. Division 08 Section “Metal Doors and Frames”.

C. Coordination:
   1. Coordinate all hardware with hollow metal door suppliers. Provide approved hardware
      schedules and template drawings to door and frame suppliers as soon as possible so as to
      facilitate delivery of these items. Confirm suitability of hardware for door types and styles
      specified.

1.2 REFERENCES

A. Work specified herein shall conform to applicable portions of the following referenced standards:
   2. ANSI A117.1 Specification for Making Buildings and Facilities Accessible To and Usable By
      Physically Handicapped People.
   3. ADA Accessibility Guidelines for Buildings and Facilities.
   4. ANSI/BHMA – A156.13 Mortise Locks and Latches.
   6. UL – Underwriters Laboratories.
   7. ANSI A250.6 Application of Hardware.
   8. AWS, Section 9, Installation of Hardware.
   9. ANSI/BHMA- A156.13 Series 1000-Grade Mortise Locks.

1.3 SUBMITTALS

A. General submit following in accordance with conditions of contract and Division 1 specification
   sections.

B. Submit complete schedule of finish hardware.

C. Submit manufacturer's product literature describing hardware items indicating compliance with
   schedule for function, quality and appearance.
D. Submit in triplicate a complete schedule of key marking, identifying level for each key within the existing master key system at substantial completion.

E. Prior to substantial completion turn over keys and permanent cores to Owner.

F. Submit certification of compliance with Supplier's Qualifications specified in Quality Assurance in Part 1 herein.

G. Templates: for doors, frames and other work required to be factory prepared for door hardware.

1.4 QUALITY ASSURANCE

A. Door and frame prep: Before hardware installation, verify that all doors and frames are properly prepared to receive specified hardware. Hollow metal frames shall be prepared for ANSI strike plates per A115.1-2 (4 7/8” high), hinge preps will be mortised and reinforced with a minimum of 10 gauge reinforcement material; minimum of 14 gauge reinforcement material for closer. Hollow metal doors shall be properly prepared and reinforced with a minimum of 16 gauge material for either mortised or cylindrical locks as specified. It is preferred that all hollow metal doors receiving door closers have 14 gauge reinforcement. If this is not possible, the use of sex bolts is mandatory.

B. Hardware installation: The manufacturer’s representative for the locking devices and closing devices must inspect and approve in writing, the installation of their products. Hardware installed incorrectly must be reported to the architect prior to the architect’s final punch list.

C. Single source responsibility: Obtain each type of hardware from a single manufacturer.

D. Supplier qualifications: a recognized Architectural Door Hardware Supplier, with warehousing facilities in the project’s vicinity, who employ’s a full time, and experienced Architectural Hardware Consultant (AHC), in good standing with DHI, who is available to owner, architect, and contractor, at reasonable times during course of project, for consultation. Supplier shall employ a full time field service coordinator to diagnose and service problems with installed hardware.

1.5 PRODUCT HANDLING

A. Tag: each item or package separately with door opening# and hardware schedule item number.

B. Packaging: of door hardware is the responsibility of the supplier. Ship material in original factory cartons properly marked as noted above.

C. Contractor to provide secure lockup for hardware delivered to jobsite but not yet installed. Report any shortages of hardware within (5) working days so that replacements can be provided in time to prevent delay of project.

1.6 MAINTENANCE

A. Maintenance tools and instructions: furnish a complete set of specialized tools and maintenance instructions to the owner following acceptance of a project. All hardware cartons contain whatever specialized tools are required for installation of that item. Contractor/installer shall be responsible for putting aside at least three sets of such tools to be turned over to owner. Also maintenance and installation instructions provided with hardware.
PART 2 - PRODUCTS

2.1 MATERIALS AND MANUFACTURERS – GENERAL

A. Furnish all template hardware with proper fasteners, wood or machine screws, for installation to doors and frames.

B. Include all fasteners, brackets and accessory items needed for proper installation.

C. Only manufacturers listed for each product category are approved for use on this project. Products from manufacturers other than those listed will not be accepted.

2.2 HINGES

A. Provide 5 knuckle anti-friction hinges as listed. See hardware sets for models/types/sizes.

2.3 CYLINDERS AND KEYING

A. Provide best removable core cylinder shells for all locks.

B. All cylinders for locksets should be Best Peaks Patented, as NKU utilizes a propriety Best Peak Patented keyway. NKU will purchase the cores directly from Best and install the permanent cores independent of the contractor.

C. Contractor shall furnish (3) key blanks per lock/cylinder to NKU.

2.4 HEAVY DUTY MORTISE LOCKS

A. Locks shall meet or exceed the requirements of ANSI/BHMA A156.13 Series 1000, Operational Grade 1, and Security Grade 1 standard trims.

B. Locks shall be easily re-handed without opening the lock body.

C. Locks shall comply with UL10C and UBC 7-2 positive pressure requirements.

D. Construction
1. Lock functions shall be manufactured in a single sized case formed from 12 gauge steel minimum, and shall be multi-functional lock body.
2. Lock cases shall be closed on all sides and back.
3. Locks shall have field adjustable, beveled, armored front, with a 0.125 inch (3mm) thickness minimum.
4. Locks shall have a one piece, 3/4 inch (19mm) throw anti-friction stainless steel latch.
5. Locks shall have a 2-3/4 inch (70mm) backset standard.
6. Strikes shall be non-handed with a curved lip.
7. Locks shall have 10 year limited warranty.
8. Levers shall be solid cast or forged. Filled or hollow levers are not acceptable.
   a. All lock trim should be of lever handle design that meets all ADA and fire code requirements.
   b. Mechanical rooms and other hazardous areas should have knurled handles or some other warning surface (per ADA requirement) for those with sight impairments.
2.5 EXIT DEVICES

A. Exit Devices
   1. Shall be available in a complete matching series, push pad design with contrasting material on touch pad.
   2. Rail assemblies shall be manufacturers standard.
   3. Lever trim where specified shall match lockset trim.
   4. Provide strikes as required to suit frame conditions. Provide monitor strikes where listed.
   5. Shall be listed by a recognized testing agency for “accident hazard” and for fire doors a “fire exit hardware” listing.
   6. All exit device mechanicals to be warranted for a period of 5 years for defects in materials and workmanship. Electrical features to be warranted for a period of 2 years. Warranty period shall start from date of substantial occupancy.

2.6 DOOR CLOSERS

A. Provide ANSI A156.4 grade one door closer with 10 year warranty against defects in materials and workmanship.
B. Provide multi-sized closers, non-handed, with spring power adjustment. Adjustment range to be from size 1 thru 6 to suit ADA requirements.
C. Provide all necessary mounting brackets, drop plates, parallel arm brackets, and/or adjustable length arms to permit installation of door closers opposite of the corridor or hall side wherever possible. Supplier to indicate on his schedule the type of mounting to be used for each application.
D. Closers shall have individual non-critical adjustment valves for door speed, latching speed and back check control.
E. Provide with high impact, non-corrosive covers which completely conceal all valves to discourage tampering.
F. Closer bodies shall be manufactured of porous free cast iron
G. Arms shall be heavy forged steel specifically designed for application required.

2.7 OVERHEAD STOPS

A. Provide with stainless steel channel and arms. To be sized as required to suit actual door sizes.

2.8 KICK PLATES, STOPS, FLUSH BOLTS, PUSH/PULLS

A. Kick, Armor and Mop Plates
   1. Where listed provide stainless steel kick plates 0.050” thick, beveled three sides with countersunk mounting holes to accept oval head screws.
B. Stops
   1. Wall stops NOT permitted.
   2. Provide floor mounted doorstops for all doors not equipped with overhead controls.
      a. Ives FS434 Floor Stop (Part #: FS434 IVES).
   3. Place door stop away from wall a sufficient distance to prevent damage from coat hooks or door handles to door or wall.
C. Flush Bolts, Coordinators
   1. Provide automatic, self-latching, or manual flush bolts, UL approved where required, suitable for door construction used

D. Push/pulls
   1. Provide as listed, pulls shall be barrier free design.

2.9 FINISHES
A. Provide materials with BHMA finishes as follows:
   1. Exterior Door Hinges: 628 Aluminum.
   2. Locksets: 626 satin chromium plated.
   5. Flush Bolts, Stops, Misc.: 626 satin chromium plated.

2.10 MISCELLANEOUS
A. Weather stripping should be a brush type. Basis for reference is National Guard Products 601A or DkB or DkB, 602A or DkB, etc.

B. Provide bronze thresholds in all entrance doors; with specific approval of the project manager an aluminum threshold may be used.

2.11 FASTENERS
A. Provide phillips head machine screws for hollow metal and aluminum doors and phillips head wood screws for wood doors

2.12 MANUFACTURERS
A. Approved manufacturers: first manufacturer listed is the catalog number that is listed in hardware sets.
   1. Hinges ST Stanley Hager, Bommer
   2. Hinges Continuous IV Ivest Trimco, Rockwood
   3. Motise Locksets BE Best Corbin / Russwin, Sargent
   4. Exit Devices VD Von Duprin 99 Series Precision 2100 Series
   5. Closers LN LCN Sargent, Norton
   6. Cylinders BE Best No Substitution
   7. Key System BE Best “Peaks” No Substitution
   8. Pulls IV Ives Trimco, Rockwood
   9. Push Plates IV Ives Trimco, Rockwood
10. Kick / Armor Plates IV Ives Trimco, Rockwood
11. Thresholds, Sweeps, Door Seals & Weatherstrip PE Pemko Reese, National Guard
12. Stops IV Ives Trimco, Rockwood
13. Flush Bolts IV Ives Trimco
PART 3 - EXECUTION

3.1 QUALITY ASSURANCE

A. Fire rated doors: hardware for fire rated openings shall be installed in compliance with NFPA 80 and all local code requirements.


C. The manufacturer’s representative for the locking devices and closing devices must inspect and approve, in writing, the installation of their products. Hardware installed incorrectly must be reported to the architect prior to the architect’s final punch list.

3.2 WARRANTY

A. General warranty: special warranties specified in this article shall not deprive owner of other rights owner may have under other provisions of the contract documents and shall be in addition to and run concurrent with other warranties made by contractor under requirements of the contract documents.

B. Special warranty: written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
   1. Structural failures including excessive deflection, cracking, or breakage.
   2. Faulty operation of operators and door hardware.
   3. Deterioration of metals, metal finishes and other material beyond normal weathering.

C. Warranty period for exit devices: five years from date of Final completion, unless otherwise indicated.

D. Warranty period for manual closers: ten years from date of Final Completion.

E. Warranty period for mortise locksets: ten years from date of final Completion.

F. Warranty period for cylindrical locksets: seven years from date of Final Completion.

G. Warranty period for flat goods, trim, stops, bolts, thresholds: 1 year from date of final completion.

H. Maintenance service: maintenance instructions: Furnish a complete set of maintenance instructions as needed for owner’s continued adjustment, maintenance and removal and replacement of door hardware.

3.3 DELIVERY AND STORAGE

A. Supplier to receive hardware at his warehouse and individually mark all material with door and item numbers. Drop shipments by manufacturers directly to jobsite will not be permitted. Hardware to be shipped in original factory cartons.
B. Contractor to provide secure lock up for hardware delivered but not installed. Report and shortages with (5) working days.

3.4 INSTALLATION

A. Installation: Mount hardware units at heights recommended by the “Door and Hardware Institute” or as required by manufacturer’s installation instructions install all hardware as per ANSI A250.6 and AWS, Section 9.

B. Adjustment: adjust all operating items of hardware to insure proper operation and function of every unit. Replace all items that cannot be adjusted to operate properly as intended for the particular application.

C. Maintenance manual and tools: Furnish complete set of specialized tools required to adjust, maintain and replace hardware items. Provide owner with maintenance and parts manuals covering all items requiring same.

3.5 HARDWARE SCHEDULE

A. Materials listed in the following hardware sets are intended to be complete and appropriate for the listed application at the time the Specifications were prepared. However, it is the responsibility of the hardware supplier and his hardware consultant to supply materials as required in the indicated quality and in quantities and functions for proper operation of the doors on which hardware is to be installed. Notify Architect of any actual or perceived inappropriate material listings during bidding as described in Instruction to Bidders, Supplementary Instructions to Bidders and related sections.

B. Door Numbers listed in Hardware Sets are for reference only. In case of discrepancy of Door Numbers in Specifications and in Door Schedule on Drawings, Drawings take precedence.

HARDWARE SET 01

Doors: 602A

Each to receive:

| 1   | EA  | Continuous Hinge | 224HD CUT TO 69-3/4” | 628 | IVE |
| 1   | EA  | Communicating Lock | 45H-7G-14-R | 626 | BS  |
| 1   | EA  | Cylinder | 1E74 x RP3 x cam required | 626 | BS  |
| 1   | EA  | Rim | 1E72 x RP | 626 | BS  |
| 1   | EA  | Removable / Interchangeable Core | 7-pin Best “Peaks” | 626 | BS  |
| 1   | EA  | Overhead Holder | 81SH-SHIM1 | 630 | GLY |
| 1   | SET | Seals | 700ES 2/42” 2/70” | AL | NGP |
| 1   | EA  | Threshold | 426E x width of frame | AL | NGP |
| 1   | EA  | Kick plate | 8400 32” HIGH x 2” LDW x B4E | 630 | IV  |
| 1   | EA  | Sweep | 345ANB X width of frame | AL | PE  |
| 1   | EA  | Drip Cap | 16A 46” | AL | NGP |

Notes: All locks and cylinders must be supplied with permanent cores, with two keys each.

Lock operation: exit egress shall be readily open-able from the egress side without the use of a key or special knowledge or effort.
HARDWARE SET 02
Doors: 609A, 609B
Each to receive:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Model No.</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Continuous Hinge</td>
<td>224HD CUT TO 69-3/4&quot;</td>
<td>628</td>
</tr>
<tr>
<td>1</td>
<td>Dormitory Lock</td>
<td>45H-7TD-14-R</td>
<td>626</td>
</tr>
<tr>
<td>1</td>
<td>Cylinder</td>
<td>1E74 x RP3 x cam required</td>
<td>626</td>
</tr>
<tr>
<td>1</td>
<td>Rim</td>
<td>1E72 x RP</td>
<td>626</td>
</tr>
<tr>
<td>1</td>
<td>Removable / Interchangeable Core</td>
<td>7-pin Best “Peaks”</td>
<td>626</td>
</tr>
<tr>
<td>1</td>
<td>Overhead Holder</td>
<td>815H-SHIM1</td>
<td>630</td>
</tr>
<tr>
<td>1</td>
<td>Seals</td>
<td>700ES 2/42” 2/70”</td>
<td>AL</td>
</tr>
<tr>
<td>1</td>
<td>Threshold</td>
<td>430E x width of frame</td>
<td>AL</td>
</tr>
<tr>
<td>1</td>
<td>Kick plate</td>
<td>8400 32&quot; HIGH x 2&quot; LDW x B4E</td>
<td>630</td>
</tr>
<tr>
<td>1</td>
<td>Sweep</td>
<td>345ANB X width of frame</td>
<td>AL</td>
</tr>
<tr>
<td>1</td>
<td>Drip Cap</td>
<td>16A 46”</td>
<td>AL</td>
</tr>
</tbody>
</table>

Notes: All locks and cylinders must be supplied with permanent cores, with two keys each.

Lock operation: exit egress shall be readily open-able from the egress side without the use of a key or special knowledge or effort.

MANUFACTURERS USED
- AB ABH
- BS BEST
- GLY GLYNN-JOHNSON
- HN PC HENDERSON
- IV IVES
- LC LCN
- NGP NATIONAL GUARD PRODUCTS
- PE PEMKO
- RO ROCKWOOD
- VD VON DUPRIN
- ST STANLEY

END OF SECTION
SECTION 09 2216
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Steel stud framing for soffits and where else indicated.
   2. Steel furring for partitions, and where else indicated.

B. Products installed but not supplied under this Section
   1. Division 05 Section - Miscellaneous Rough Carpentry: Wood blocking in stud partitions for wall mounted items.

1.2 REFERENCES

A. Work specified herein shall conform to applicable portions of the following referenced standards:
   1. ASTM C645 “Standard Specification for Nonstructural Steel Framing Members”.
   3. Other standards as referenced herein.

1.3 SUBMITTALS

A. Submit manufacturer's product data indicating compliance with requirements specified herein.

1.4 DELIVERY, STORAGE AND HANDLING

A. Protect metal from rusting; do not install rusted metal.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

A. Acceptable manufacturers of studs and other related wall and ceiling framing components:
   1. Clark Western Building Systems, Inc.
   2. Dietrich Ind., Inc.
   3. Marino/Ware
   4. The Steel Network

2.2 MATERIALS

A. Comply with referenced standards and manufacturer's standards except where more restrictive requirements are specified herein.

B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
   1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653, G60, hot-dip galvanized unless otherwise indicated.

C. Steel studs for non-bearing partitions of gypsum board or veneer plaster base on both faces of partition:
   1. Channel type; style as recommended by stud manufacturer for wind load of 5 lbs. per sq. ft. and maximum deflection of L/360; 20 gage minimum.
   2. 20 gage studs minimum, unless heavier stud required by manufacturer at door jambs, for fire rating, and for partition height.
      a. 18 gage minimum at Lead-lined door frames.
   3. Floor and ceiling tracks: Type recommended by stud manufacturer.
   4. Sizes as indicated on drawings. If drawings do not indicate size for a given partition, use same size as adjacent partition studs; studs within manufacturer's height limits.

D. Furring and cross-furring channels for forming soffits and bulkheads: 3/4 inch 16 gage cold rolled painted steel.

E. Wall furring brackets: Adjustable type, 20 gage, galvanized.

F. Contractor’s option in lieu of blocking specified in Section 061050: Metal reinforcing (blocking) in studs: 6 inch wide 20 gage continuous steel strapping.

G. Resilient attachment devices: Type recommended by manufacturer for condition indicated.

H. Other materials, not specifically described but required for a complete installation of items furnished under this section: Furnish in strict accordance with recommendations of manufacturer of items used, and subject to approval of Architect.

PART 3 - EXECUTION

3.1 PREPARATION

A. Accurately layout work herein from dimensions given on Contract Drawings.

B. Coordinate with Section 061050 for wood blocking in steel stud partitions.

C. Unless otherwise indicated on Drawings, locate control joints at maximum intervals of 30'-0" o.c.; verify exact location with Architect in field. Construct as specified herein.

D. Coordinate with Facility Services Divisions for access panels provided therein.

3.2 INSTALLATION

A. Comply with referenced standards and manufacturer's recommendations except where more restrictive requirements are specified herein.
   1. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

B. Unless otherwise indicated on Drawings or specified herein, extend partitions to structure above. Where items such as ductwork prevent studs from extending to structure above, frame around such items, or stop studs below the items and brace the studs securely to structure above.

C. Construction at welded door frames occurring in steel stud walls with sound insulation:
D. General installation requirements for steel studs and shaft wall construction:

1. Refer to Division 07, Section, Joint Sealants, for acoustical sealant in partitions requiring same.

2. Bottom track: Attach track to structure. Seat studs squarely in track with stud web and flanges abutting track web, plumbed and aligned. Attach both flanges of each stud securely to track with stud manufacturer's recommended attachments.

3. Top track: Anchor track to overhead structure or member. Seat studs squarely in track with stud web and flanges abutting track web, plumbed or aligned. Attach both flanges of each stud securely to track with stud manufacturer's recommended attachments.
   a. At areas indicated on Drawings and where allowance is required for deflection of the structure above; use manufacturer's standard double top track to permit attachment of studs to lower track which slips inside upper track attached to structure, attach upper track to structure. Insert lower track into upper track; hold lower track down at least 1/2 inch below top of inside of upper track. Ensure minimum 3/4 inch engagement of lower track into upper track. Fully engage and attach each stud to lower track.

4. Provide framing for items recessed into walls as recommended by manufacturers of recessed items.

5. Provide jamb and head reinforcing for openings in walls as recommended by manufacturers of frames for openings.

6. Reinforcement for items attached to studs:
   a. For items bolted to partition, install 1-1/2 inch channels, nested to form a box, tied or welded to adjacent studs.
   b. For items screwed to partition, coordinate with Division 06, Section Miscellaneous Rough Carpentry for installation of wood block, tied to adjacent studs.
   c. Install reinforcement for the following:
      1) Wall bumpers for doors; coordinate with Division 08, Section, Door Hardware, to determine which doors have wall bumpers and to determine exact locations of bumpers.
   d. Toilet accessories, railings, water coolers and other wall mounted items; coordinate with other sections and Drawings to determine exact locations of wall mounted items.

E. Additional requirements for steel studs for non-bearing partitions:

1. Install studs with all flanges pointing in same direction to permit proper installation of board.

2. Stud spacing: Maximum 16-inches o.c. throughout; directly adjacent to corners, intersecting partitions and partition terminals; and on either side of control joints.

3. Partition at abutting masonry surface: Attach stud full height to masonry and set adjacent stud maximum 6 inches from masonry. At uninsulated exterior masonry or concrete, install separator material as specified herein.

4. Studs at door and window frames and other openings with or without frames: Install double studs at jambs and attach frame anchor clips to studs with screws. Attach both flanges of each stud securely to track with stud manufacturer's recommended attachments. At door heads and opening tops and bottoms, install runner track; screw runner tracks to strut studs above and below openings.

5. Chase walls: Install two rows of studs of size and spacing to span full height. Brace between stud rows with minimum 1/2 inch thick by 12 inches high gypsum board, maximum 4'-0" vertical spacing between braces.

6. Coordinate with board application for location of solid blocking at abutting edges of board.
7. Provide angle as specified herein for support at 1/2 height walls. Locate at ends of walls that are greater than 5'-0" from a corner or intersecting wall.

F. Wall furring:
   1. Location: On interior surfaces of exterior walls and where else indicated.
   2. Install vertically, spaced maximum 24 inches o.c., attached directly to wall surface unless otherwise indicated; shim furring plumb as necessary.
   3. Control joints: Install channels on each side of control joints.

G. Vertical and horizontal soffits, and bulkheads:
   1. Frame with 3/4 inch channels attached to adjacent partition framing and structure above and tied together with specified tie wire.
   2. Brace as required with 3/4 inch or 1-1/2 inch channels as appropriate for span of bracing.
   3. Attach cross furring channels to furring channels with tie wire at maximum 16 inches o.c.
   4. Installation Tolerances: Install soffits are level to within 1/8 inch in 12 feet.

END OF SECTION
SECTION 09 2900
GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exterior Sheathing on vertical and horizontal surfaces.
   2. Metal accessories.
   3. Finishing at joints, accessories and other surfaces.

B. Products Supplied but Not Installed under this Section
   1. Division 09 Section - Steel Studs and Furring.

1.2 REFERENCES

A. Work specified herein shall conform to applicable portions of the following referenced standards:
   3. "Recommended Specification on Levels of Gypsum Board Finish", endorsed by the following associations:
      c. Gypsum Association (GA).
      d. Painting and Decorating Contractors of America (PDCA).

1.3 SUBMITTALS

A. Product Data: For all installed products/components, including accessories, and finishing materials
   1. Product Certificates: Signed by manufacturers certifying that products furnished comply with requirements

1.4 QUALITY ASSURANCE

A. Work specified herein shall comply with the most stringent requirements of referenced standards except where otherwise specified herein. Reference to or repetition of portions of referenced standards shall not negate any unreferenced or unrepeated portions of referenced standards.

B. Single-Source Responsibility
   1. For Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.
2. For Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

A. Comply with referenced standards.

B. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

C. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, surface contamination, construction traffic, and other causes

1. Neatly stack gypsum panels flat to prevent sagging.
2. Do not stock materials specified herein in piles in excess of floor load limits.

1.6 PROJECT CONDITIONS

A. Temperature and ventilation: Per referenced standards.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

A. Manufacturers and products listed in this Section 09 2900 are specified standards, intended to further define the design and performance intent of Contract Documents. Equivalent products by the following manufacturers subject to compliance with requirements specified herein and approved by Architect shall be acceptable:

1. Georgia-Pacific Corp.
2. National Gypsum Co.
3. United States Gypsum Company (USG)

B. Panels, General:

1. Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
2. Comply with ASTM C1396.

2.2 MATERIALS

A. Exterior Gypsum Board Sheathing for walls

   1) Provide in following areas.
      a) Exterior Face of Walls and as indicated on drawings.

B. Screws: Self-drilling, self-tapping steel screws of size and type recommended by manufacturer and complying with ASTM C1002.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

C. Joint Compound for Exterior Applications:
1. Tape, joint compound for "Exterior Gypsum Board": Type recommended by manufacturer.

D. Metal accessories: Corner bead, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below
   1. Corner bead: No. 103.
   2. Casing trim; at locations described in Part 3 herein:
      a. No. 200-A, LC-bead with both face and back flanges; face flange to receive joint compound.
      b. No. 200-B, L-bead with face flange only; face flange to receive joint compound.
      c. No. 400 Series; U bead with face and back flange; face flange formed to be left without application of joint compound.
   Control joint: No. 093; one-piece control joint formed with V-shaped slot and removable strip covering slot opening.

E. Grommet / bushing accessories: clear nylon or white rubber drywall grommet or bushing at locations indicated on drawings and where wire hangers for cloud ceilings or fixtures penetrate existing and patched existing gypsum board suspended ceilings. Size per drawings.

F. Sealant at cut edges of Mold/Moisture Resistant Board: Type recommended by board manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION - GENERAL

A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.

B. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges. Do not force into place.

1. Install in maximum practical lengths to minimize or limit end (butt) joints. If butt joints do occur, stagger joints and locate as far as possible from center of walls or ceilings.

2. Avoid placing cut ends against tapered edge.

3. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

4. Stagger vertical joints on opposite sides of partitions. Do not place vertical joints, other than control joints, within 8 inches of external corners of windows, doors or other such openings.

5. Construction Tolerance:
   a. 1/8 inch in 8'-0" maximum variation from plumb or level in any exposed surface except at joints.
   b. 1/16 inch between planes of abutting edges or ends at joints.
c. Maximum gap of 1/4 inch at end joints.

C. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints.

D. Form control and expansion joints with space between edges of adjoining gypsum panels.

E. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

F. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

G. Attach gypsum panels to framing provided at openings and cutouts.
   1. Cut openings in gypsum board for electrical outlets plumbing, piping, etc., to fit snugly, and small enough to be covered by plates and escutcheons; properly support gypsum board around cutouts and openings.
   2. Do not make joints other than control joints at corners of framed openings.

H. Form control and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.

I. Isolate perimeter of nonload-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4- to 1/2-inch wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

J. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.
   1. Space screws a maximum of 12 inches o.c. for vertical applications.
   2. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.
   3. Install ceiling screws or nails from center toward edges.
   4. Do not allow surface of screw or nail head to cut paper.

3.3 INSTALLING TRIM ACCESSORIES

A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.
   1. Control joints: Install trim for control joints at framing members located for control joints.
   2. Install accessories with attachments recommended by manufacturer.
   3. Install access panels as recommended by manufacturer of same.
B. Install cornerbead full length at external corners.

C. Casing Trim:
   1. Apply full length in the following locations.
      a. Type 200-A, LC bead, at exposed ends.
      b. Type 200-B, L bead, at ends abutting adjacent construction.
      c. Type 200-A or 200-B, as applicable, wherever shown on drawings.
         i) Install LC-bead where back flange can be attached to framing or supporting substrate.
         ii) Install L-bead where edge trim can only be installed after gypsum panels are installed.
      d. Install U-bead where indicated.
   2. Where gypsum board abuts exterior metal window or door frames, apply insulating tape and
      apply casing trim; sealant installed in Section 079200 between metal surface and casing trim
      on edge of gypsum board.

D. Install trim for control joints at framing members located for control joints and in specific
   locations approved by Architect for visual effect according to manufacturer's recommendations.
   1. Control joint locations unless otherwise indicated on Drawings:
      a. Partitions and Ceilings: 30'-0" maximum in either direction; maximum 900 sq. ft.

3.4 ADDITIONAL INSTALLATION REQUIREMENTS

A. Install "M/R" board with uncut long edge on 1/4 inch spacer strip at bottom. Seal ends, cut-edges
   and penetrations of each piece with specified sealant before installation; remove spacer strip but do
   not seal gap left after removal of spacer strip.

B. Refer to and coordinate with Section 072000 to ensure that insulation and vapor barrier are
   installed prior to installation of ceiling gypsum board to prevent condensation occurring within
   gypsum board.

C. Additional requirements for ceiling, bulkhead and soffit installation on metal furring:
   1. Install panels at right angles to furring channels and fasten with recommended length of Type
      S screw spaced as recommended in referenced standards but not more than 8 inches on center
      within field and along abutting ends.
   2. Neatly fit and stagger end joints. Locate abutting end or edge joints at web surface of furring
      channel.

3.5 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control
   joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum
   board surfaces for decoration.

B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint
   compound.

C. Apply joint tape over gypsum board joints, except those with trim accessories having flanges not
   requiring tape.

D. Use the following joint compound combination as applicable to the finish levels specified:
   1. Embedding and First Coat: Ready-mixed, drying-type, all-purpose or taping compound.
   2. Fill (Second) Coat: Ready-mixed, drying-type, all-purpose or topping compound.
3. Finish (Third) Coat: Ready-mixed, drying-type, all-purpose or topping compound.

E. Finishing: Comply with referenced standards and the following:

1. Except where otherwise specified below, degree of finish shall comply with Level 4 of referenced "Recommended Specification on Levels of Gypsum Board Finish". Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges.

2. Partial finishing: Finish to Level 2 of above-referenced standard on the following surfaces:
   a. Surfaces which will not be exposed to view in the finished building.
   b. Where an additional layer of gypsum board is required to achieve fire-resistance rating.
   c. Where not exposed to view and gypsum board is to act as air or smoke barrier.
   d. Mold/Moisture Resistant Board:
      1) Finish over fasteners and at joints as recommended by board manufacturer.
      2) Where tile is to be installed over board, do not finish board except at joints as specified immediately above.
      3) Where board is to be painted, finish with Level 5 finish of referenced "Recommended Specification on Levels of Gypsum Board Finish":
         a) Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound over the entire surface

3.6 ADJUSTMENT

A. After trim has been applied, and prior to decoration, correct surface damage and defects as required to leave work smooth and without observable blemishes which will show through decoration, as acceptable to Architect.

B. Remove dust and dirt and clean to paintable condition acceptable to Architect.

C. Promptly remove any residual joint compound from adjacent surfaces.

END OF SECTION
SECTION 09 6120
CONCRETE FLOOR SEALER

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes: Preparation and sealing of concrete floors.

1.2 SUBMITTALS
A. Submit items indicated below for review by Architect.
   1. Submit manufacturer's literature indicating compliance with requirements specified herein.
   2. Submit in triplicate manufacturer's recommended maintenance procedures for Owner's use.
   3. Submit manufacturer's literature indicating that materials for installation and cleaning are in
      compliance with EPA and other applicable standards for indoor air quality.

1.3 ENVIRONMENTAL REQUIREMENTS
A. Comply with temperature and humidity requirements of manufacturer before, during and after
   application.
B. Condition materials after delivery to site and immediately prior to installation at temperatures
   recommended by manufacturer.
C. For odor control within building, provide sufficient ventilation to outdoor air prior to, during and
   after installation of materials specified herein. Comply with EPA and other applicable standards
   for indoor air quality.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
A. Any one of the following manufacturers shall be acceptable:
   2. Euclid Chemical Co.
   3. L & M Construction Chemicals, Inc.
   5. W.R. Meadows, Inc.
   6. Sonneborn Building Products.
   7. Florock, System 3700 Solvent Based Epoxy Primer

2.2 MATERIALS
A. Cleaner: L&M "Citrex". Non-acidic heavy duty degreaser and cleaner.
B. Concrete Sealer; L&M, “PermaGuard SPS”, High gloss, emulsified polymer sealer.
   1. VOC: Less than 50 grams/liters.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate for defects that will adversely affect execution and quality of work. Clean substrate free of grease, wax, oil and any other material which will inhibit bond. Use cleaning procedure recommended by manufacturers of flooring materials specified herein.
   1. Remove dirt and debris from control joints in floor, prior to application.

B. Ensure that concrete is not exhibiting cracking and moisture content is within limits recommended by manufacturers of products specified herein using methods recommended by manufacturers of products specified herein.

C. Do not start work until unsatisfactory conditions are corrected.

3.2 APPLICATION OF CLEANER

A. Apply cleaner in one or two coats, as required by manufacturer for condition of concrete, with mechanical scrubber or bristle broom. Ensure that floors are satisfactory for receiving sealer.
   1. Apply full strength and heavy stains. Other areas can be diluted according to manufacturer’s recommendations.

B. If application of cleaner specified herein, does not clean floors to condition approved by sealer manufacturer, clean with a shot blast machine which thoroughly removes all residue from the floor surface and automatically vacuums up the residue while cleaning, thereby leaving no dust or contaminants in the air. The finest possible shot shall used for effective preparation. The finish shot blasted floor shall have uniform appearance.

3.3 APPLICATION OF SEALER

A. Seal Coat: Apply full strength, evenly at recommended coverage. Do not allow material to puddle. After sealer had dried a minimum of 4 hours, burnish with soft white pad.

B. Continue manufacturer's recommended application procedures until manufacturer's recommended final appearance is achieved.

3.4 ADJUSTMENT AND CLEANING

A. Clean floor surfaces soiled by work specified herein; use only cleaning materials and methods recommended by manufacturer of material being cleaned, and in compliance with EPA and other applicable regulations for maintaining indoor air quality.

END OF SECTION
SECTION 09 9100

PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Preparation and finishing of interior surfaces.

1.2 SYSTEM DESCRIPTION

A. Interior finishing: Work not concealed by other construction including metal frames and other ferrous metal, gypsum board, and other unfinished surfaces. Also paint factory primed exterior surfaces of cabinets occurring in walls required to be painted.

B. Other painting
   1. Items left unfinished by requirements of other sections.
   2. Mechanical and electric work described in Part 3.

C. Finishing of surfaces not indicated on Drawings or scheduled in Part 3 herein, or where color has not been selected:
   1. Surfaces specified herein to be finished shall be finished as specified herein. Omission on Drawings or in Schedule in Part 3 herein of finishes for surfaces shall not nullify specification requirements for finishing of omitted surfaces.
   2. Surfaces specified above shall be finished as specified herein whether or not color has been selected. If colors are not selected for a specific surface, consult with Architect for color selection.

D. Work not included: Unless otherwise indicated, do not finish following surfaces:
   1. Concrete floors.
   2. Surfaces of copper, bronze, nickel, stainless steel, aluminum, lead and bright metal.
   3. Items with factory applied finishes, except as otherwise specified herein. (Note: Factory primed surfaces shall be painted herein as specified herein.)
   4. Factory finished wood surfaces.
   5. Factory finished interior surfaces of cabinets.
   6. Factory finished items having color and finish required by Kentucky Building Code, NFPA, OSHA and other regulatory agencies.

E. Color selection: Architect will select colors and provide color schedule to Contractor.
   1. Final color selections shall be coordinated with the University’s in-house Interior Designer and the Project Manager.
   2. NKU’s local Sherwin Williams store near campus has NKU’s entire campus color palette on file, and they will be able to provide the corresponding Sherwin Williams color to match NKU legacy colors originating from other paint manufacturers.
      a. The store number is 859-431-5345; ask for Jason or Paul.
   3. All ceilings and soffits shall receive a flat white ceiling paint.
1.3 SUBMITTALS

A. Submit items indicated below for review by Architect:
   1. Color samples of manufacturer's full range of standard and custom colors.
   2. Manufacturer's literature indicating compliance with specifications if selected manufacturer is specified standard.
   3. If Contractor elects to provide materials of a manufacturer listed in Part 2 other than specified standard, submit for approval an item by item listing of proposed products for each surface to be finished. Provide complete color charts and the following data from selected manufacturer for each product to establish equivalency with specified standard for type, quality, gloss, and number of coats.
      a. Product name.
      b. Recommended use and number of coats.
      c. Recommended primer.
      d. Numerical degree of sheen.
      e. Proposed manufacturer's chart of equivalent products by other manufacturers if published. (Architect has similar charts by various manufacturers for comparison).
   4. Submit 6 inch by 9 inch draw-down samples of paint from selected paint manufacturer in colors, types and finishes selected by Architect for final approval by Architect.
   5. Submit manufacturer's literature indicating that materials are in compliance with EPA and other applicable standards for indoor air quality.

1.4 QUALITY ASSURANCE

A. Products of manufacturers other than the specified standard manufacturer shall have characteristics, specified under Submittals above, that match as closely as available from the alternative manufacturer those of the specified standard manufacturer.

1.5 MAINTENANCE STOCK

A. Provide one (1) container of each type of finish coating in each color selected, in manufacturer's standard unopened containers, of the following sizes:
   1. Where less than 5 gallons are required: One quart.
   2. Where 5 gallons or more are required: One gallon.

B. Provide chart to indicate colors and manufacturers for each color of each type of finish for Owner's use for maintenance.

C. Identify colors on the containers.

D. Do not leave opened containers for maintenance stock unless directed otherwise by Owner. (Refer to Adjustment and Cleaning in Part 3 herein.)

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original containers with seals unbroken and label intact.

B. Prime un-primed wood and metal as soon as delivered to site, as specified herein. Thoroughly prime exposed edges of plywood trim.

C. Store materials used in job in place or places designated by Architect. Do not store more materials than permitted by codes or Underwriters Laboratories.
D. Protect materials from excessive heat or freezing temperatures.

E. Inspect materials immediately prior to use. Do not use, and replace with new, any materials that show any of the following signs of possible deterioration:
   1. Skimmed-over top.
   2. Unusual odor.
   3. Excessive separation.
   4. Excessive thickness.

1.7 PROJECT CONDITIONS

A. Environmental requirements:
   1. Do no painting in dusty areas.
   2. Maintain minimum temperature of 60 degrees F., until newly coated items have dried for a period of time recommended by manufacturer of coating.
   3. Provide lighting levels of 80 foot candles measured mid-height at substrate surface.
   4. Provide ventilation required by manufacturer of product requiring ventilation.

B. For odor control within building, provide sufficient ventilation to outdoor air prior to, during and after installation of materials specified herein. Comply with EPA and other applicable standards for indoor air quality.

C. Protection:
   1. Protect persons, motor vehicles, existing surfaces, work of other trades against damage, injury, or soiling from materials, tools, or utensils used. Immediately remove spatters from surfaces not to be finished.
   2. Move furniture and other movable objects, equipment, fittings, and accessories; protect and replace upon completion of a space.
   3. Cover surfaces to be protected with drop cloths, free of holes and of adequate size.
   4. Remove oily rags and waste from building each night; take every precaution to avoid damage of fire. Do not dispose of paint or any materials of this section into plumbing fixtures or any piping.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

A. Unless otherwise indicated, products of Sherwin Williams Paint Company are specified as standards. Comparable top line products, meeting requirements specified in Submittals and other portions of Part 1 herein, by the following manufacturers shall be acceptable:
   1. Benjamin Moore.
   2. Devoe Paints.
   4. PPG Industries, Inc.
   5. Pratt and Lambert Company.
B. Products for any given treatment shall be those of one manufacturer unless otherwise acceptable to Architect.

C. Containers of any one color shall have same batch number of manufacturer for color uniformity.

D. Ensure that materials comply with requirements of EPA and other applicable standards for indoor air quality.

2.2 MATERIALS

A. Priming and finishing products: Refer to painting schedule in Part 3 of this section.

B. Linseed oil, shellac, turpentine, thinner, and other materials: Pure and of highest quality. Use only such materials as specified by manufacturer on label of container.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces scheduled to receive finishes of this section for defects that will adversely affect execution and quality of work. Determine dryness of moisture-holding materials by use of a reliable electronic moisture meter. If field verification cannot be made as specified above, consult with paint manufacturer to ensure that surfaces are in satisfactory condition to receive products specified herein.

1. Do not start work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. General requirements:

1. Clean floors, adjacent surfaces and surfaces to be painted to a paintable condition.

2. Cut out scratches, cracks, abrasions in surfaces, adjoining trim as required; fill with spackle flush with adjoining surface; when dry, sand smooth and seal before priming.

3. Do not add thinners or dryers except as recommended by manufacturer or approved by Architect.

4. Do not start painting work until draw-down samples have been approved by Architect.

B. Preparation of existing surfaces

1. Remove existing wall coverings and adhesive in its entirety.

2. Scrape, sand and clean existing surfaces to remove loose paint and other material to attain as smooth a surface as practicable as approved by paint manufacturer and Architect.

a. Comply with coating manufacturer's recommendations.

b. Pressure clean chalky surfaces to a sound substrate.

3. Cut out scratches, cracks, abrasions in surfaces, adjoining trim as required; fill with spackle all holes, scratches, cracks, abrasions, and gouges flush with adjoining surface; when dry, sand smooth before priming.

C. Additional requirements for metal surfaces:

1. Wash entire surface with mineral spirits, or otherwise prepare surface as required by paint manufacturer; ensure that preparation materials and procedures do not damage adjacent surfaces. Remove rust or scale with 3M Company "Scotch-Brite Clean Strip" wheels; clean to bare metal.
2. Where factory primed surfaces are smooth, sand to ensure bond of coats specified herein. (Note: Prime as specified herein if desired finish color is not attainable over factory priming.)

3. Preparation of galvanized metal surfaces unless otherwise recommended by paint manufacturer:
   b. Remove soil, cement spatter and other surface dirt with a stiff brush, scraper or other suitable means. Take care not to damage galvanizing.
   c. Remove oil or grease by wiping or scrubbing surface with suitable rags or brushes wetted with a suitable solvent such as mineral spirits, turpentine and high-flash naphtha. (Do not use gasoline, benzene, low-flash naphtha or other volatile or explosive substance.) Provide adequate ventilation. Clean with clean solvent and clean rags or brushes.
   d. If alkaline detergents such as trisodium phosphate are used, rinse with hot water under pressure to ensure total removal of alkaline residue.
   e. Do not use vinegar or other acids for cleaning under any circumstances.
   f. If stronger solvents than specified above are needed to remove foreign materials, provide adequate ventilation. Use these solvents only if above-specified solvents are inadequate.
   g. Touch up damaged galvanized surfaces with zinc-rich paint to ensure continuity of galvanized surfaces.

D. Additional requirements for application on wood:
   1. On open grain wood, apply paste wood filler and allow to "set"; wipe wood filler across wood grain, then with grain to secure clean surface.
   2. Sand and clean between coats. Use fine sandpaper.
   3. Ensure that exposed edges of painted plywood trim are thoroughly filled with paint.

E. Mask off fire rating labels on fire-rated doors and frames.

3.3 APPLICATION

A. General requirements:
   1. Primer may be omitted on existing surfaces in conditions acceptable to paint manufacturer and approved by Architect.
   2. In addition to surfaces indicated on Drawings or specified herein, paint all surfaces visible from any angle within finished spaces including, but not limited to, such surfaces as tops of frames, bottoms, tops and edges of non-factory-finished doors, insides of non-factory-finished cabinets such as electrical cabinets, and other such surfaces not normally seen, except do not paint over fire labels on fire-rated doors and frames.
   3. Paint bottoms of non-factory-finished doors prior to hanging of doors. Paint door frames prior to installation of door silencers. Coordinate with door sections in Division 8.
   4. Finish frames and stops of non-factory finished metal and wood glazed frames prior to glazing. Touch up prefinished glazing stops of prefinished wood glazed doors after glazing; use matching stain. Coordinate with applicable sections in Division 8.
   5. Finish closets and alcoves same as adjoining rooms unless otherwise specified. Finish other surfaces same as nearest adjoining surfaces unless otherwise specified, scheduled, noted or directed by Architect.
   6. Make work uniform in appearance, of approved color, smooth and free from runs, sags, skips, and brush marks.
a. Strictly duplicate approved samples in completed work. Apply additional coats, if required to reproduce approved samples, without additional cost to Owner.
b. Apply materials as recommended by manufacturers.
c. Make edges of paint adjoining other materials or colors sharp and clean without overlapping.
d. Finishes found defective: Prepare and apply additional coats to achieve specified finish and color.
e. Application of any coating to a surface constitutes acceptance of surface by Contractor. If, after treatment, completed finish (or any portion thereof) shows blisters, checks, peels, dampness or other irregular condition of surface, Contractor shall, at his own expense, remove applied treatment and refinish part affected to satisfaction of Architect.
f. After Architect's acceptance of preceding coat, apply each succeeding coat of material. Otherwise Contractor shall assume responsibility to recoat work if not in compliance with specified requirements. Notify Architect when particular coat is completed, ready for inspection.
g. Stir coatings thoroughly; keep at uniform consistency.

7. Prime un-primed concealed and exposed surfaces of wood and metal as soon as delivered to site, using priming materials specified herein. Prepare as specified above prior to application of primer. On galvanized surfaces, allow primer to dry and cure for one week to ensure proper adhesion.

8. Finish paint coats:
   a. Dry mil thickness: As recommended by manufacturer.
   b. Number of coats specified in schedule shall be minimum. Provide additional coats as necessary to match color selected, particularly dark colors, at no additional cost to Owner. Refer to Part 1 (Color Selection) of this section.

9. Tint prime to approximate shade of final coats; tint succeeding coats toward color of final coat to permit easy identification of each coat.

10. Do necessary patching of nail holes, cracks after first coat, with putty of color to match that of finish. Bring putty flush with adjoining surface.

11. Apply each coat to a thoroughly dry preceding coat.

12. Provide prime coat as specified herein for respective surfaces on walls to receive wall covering specified in Section 097200.

B. Primer may be omitted on existing surfaces in conditions acceptable to paint manufacturer and approved by Architect.

3.4 ADJUSTMENT AND CLEANING

A. Immediately prior to acceptance of Project by Owner, touch up mars and defects in coated surfaces as directed.

B. If mars and defects cannot be corrected by touch up, spot coat and recoat entire surface as directed.

C. Upon completion remove paint and varnish spots from floors, glass and other surfaces, and leave in first class condition. Use only cleaning materials and methods recommended by manufacturer of material being cleaned, and in compliance with EPA and other applicable regulations for maintaining indoor air quality.

D. Remove from site rubbish, accumulated materials and unused portions of opened containers resulting from operations; leave work in clean, orderly condition acceptable to Architect. Do not
leave opened containers for Owner's maintenance unless directed otherwise by Owner. Refer to Maintenance Stock in Part 1 herein.

3.5 PAINTING SCHEDULE

A. Wood painted: MDO interior wall finish and other finish carpentry and Architectural Woodwork items specified for opaque finish:
1. 1 coat Suprime #11 (Alkyd)
2. 2 coats Aqua-Satin (Latex)

B. Ferrous Metal; including but not limited to metal doors and frames, metal trim at cutouts in doors, frames, panelboards, exposed steel items, railings, stairs, and ladders, and metal trim:
1. Pretreat galvanized surfaces as specified.
2. Ensure that factory primed door and frame surfaces have been prepared as specified in Section 081000.
3. Spot prime bare or rusted areas with SW Pro-Cryl Universal Primer, B66-310 Series @ 2.0 – 4.0 mils dft.
   a. VOC: <100 g/L.
4. 2 Coats: SW Pro Industrial Zero VOC Acrylic Semi-Gloss B66W00600 Series @ 2.5 – 4.0 mils dft per coat.

C. CMU Substrates:
1. High-Build Latex System: Dry film thickness not less than 10 mils (0.25 mm).
   a. Prime Coat: As recommended in writing by topcoat manufacturer.
   b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
   c. Topcoat: Latex, exterior, high build, MPI #40.

D. Mechanical and electrical work:
1. 1 coat Primer as recommended by paint manufacturer.
2. 1 coat finish paint same as painted surface to which item is attached or painted surface behind item. Paint dull black on interior portions of ductwork visible through grilles and registers.

3.6 SCHEDULE OF MECHANICAL AND ELECTRICAL WORK TO BE PAINTED

A. Paint sight-exposed galvanized and non-galvanized steel and other unprimed and factory primed items of mechanical and electric work, in conformance with above paint product schedules, including, but not limited to, items attached to walls or ceilings required to be painted or otherwise finished, or in front of walls or ceilings required to be painted or otherwise finished, and not exempted in Part 1 herein:
1. Coordinate with Facility Service Division specifications to see that their identification marking follows painting specified herein.
2. Painting of mechanical and electrical work is limited to those items exposed in public areas or staff occupied work spaces.

END OF SECTION
SECTION 10 1400
SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Interior Room Identification, directional, and informational signage as required by the Kentucky Building Code and ADAAG.
   2. Signs for Roof Level: Area of Refuge, 2 Stairs and Elevator

1.2 SYSTEM DESCRIPTION

A. General:
   1. Drawings and Specifications cover the aesthetic requirements only. Provide labor and materials necessary to make a complete installation and to meet the specified performance requirements. Systems shall be complete with all necessary supports, panels, closures and trim to provide signage identified herein and on Drawings.
   2. Sign systems indicated on Drawings and materials specified are intended to establish a standard of quality for appearance and performance.

B. References:
   1. Comply with requirements of The Americans with Disabilities Act Accessibility Guideline (ADAAG).

1.3 SUBMITTALS

A. Action Submittals:
   1. Submit shop drawings showing construction, mounting, and full scale layout of signs.
      a. Include floor plans with schedule and location of signs.
      b. Provide the copy layout for each sign for approval before fabrication of sign panels.
      c. Include wiring diagrams from manufacturer for illuminated signs.
   2. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:
      a. Submit samples of each type of sign. Include sample of graphic images, and style of changeable letters and numerals.

B. Informational Submittals:
   1. Submit manufacturer's product data indicating compliance with specification requirements.
      a. Provide manufacturer’s recommendations and installation instructions.

C. Closeout Submittals:
   1. Provide manufacturer’s recommended maintenance and cleaning requirements for all material used.
1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm shall have minimum of five years of successful experience in providing products specified.

B. Installer Qualifications: Signage shall be fabricated and installed by an experienced fabricator of installer who is an authorized representative of the sign manufacturer and has been consistently engaged in work of equivalent scope for a minimum of five successful in-service performance years. The contractor is responsible for the structural stability of all signs and mounting.
   1. Notify Architect of discrepancies in the drawings or sign schedule, or in the field dimensions or conditions.

C. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

1.5 COORDINATION

A. Coordinate placement of anchorage devices with templates for installing signs.

1.6 DELIVERY, STORAGE AND HANDLING

A. Protect plaque from damage during fabrication, delivery, storage and installation.

B. Wrap and protect until delivery to job site. Keep wrapping and protection on plaque until installed.

PART 2 - PRODUCTS

2.1 INTERIOR SIGNAGE

A. General:
   1. Comply with NKU Signage standards.
      a. Coordinate with NKU Project Manager.
      b. 2-ply plastic, 1/8-inch thick. Color and size as indicated on Drawings.
   2. Interior signage to meet ADA requirements.
      a. Provide accessibility pictogram shall be included on sign for restrooms that are accessible.
      b. Letter size and style: Meet requirements of Kentucky Building Code, and ADAAG.
      a. 1-inch diameter with 1-inch projection from wall, unless noted otherwise on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items, including anchor inserts, are sized and located to accommodate signs.

C. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 INSTALLATION

A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
   1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.

3.3 CLEANING AND ADJUSTMENT

A. Patch, refinish adjacent work damaged or marred during installation.

B. Touch-up mars, defects. Remove and refinish, or replace with new, damaged portions as directed by Architect.

C. Just prior to final acceptance of building, thoroughly clean plaque, leave in condition acceptable to Architect.

D. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION
SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes: Wall mounted fire extinguishers and cabinets.

1.2 SUBMITTALS
A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.
   1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
B. Samples for Verification: For each type of exposed finish required, prepared on 6 by 6 inches square sample.
C. Product Schedule: Provide complete fire extinguisher and cabinet schedule, including types, locations, sizes.

1.3 QUALITY ASSURANCE
A. Products specified herein shall be supplied by one manufacturer.
B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
C. Coordination:
   1. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
   2. Coordinate sizes and locations of fire protection cabinets with wall depths and rough openings.

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHERS AND CABINETS
A. Acceptable Manufacturers:
   1. J.L. Industries.
   2. Larsen's Manufacturing Co.
B. Portable, chemical-type fire extinguishers in cabinets and wall mounted without cabinets: U.L. 3A:40-B:C; J.L. "Cosmic 6E".
C. Steel cabinets:
   1. Type: Fully-recessed as indicated on Drawings.

GBBN Project No. 13372.01
Issue Date: 06/25/14
a. Provide semi-recessed frames with rolled edges; flat trim at full-recessed.
2. Doors: Tempered glass vertical duo vision panel.
3. Finish throughout: Manufacturer's standard white baked acrylic enamel paint finish.
4. Provide manufacturer’s standard breakaway steel cam lock.

D. Identification of fire extinguishers:
   1. In cabinet: Die-cut pressure sensitive vinyl lettering spelling "FIRE EXTINGUISHER" on door. Provide lettering as selected by Architect from manufacturer's standard letter sizes, styles, colors and layouts.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine surfaces and openings to receive items specified for defects that will adversely affect execution and quality of work.
B. Coordinate with Owner to examine fire extinguishers for proper charging and tagging.
   1. Remove and replace damaged, defective, or undercharged fire extinguishers.
C. Do not start installation of items until unsatisfactory condition has been corrected.

3.2 PREPARATION
A. Prepare recesses for fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION
A. Install items in locations and at mounting heights indicated in strict conformance with manufacturer's printed specifications, recommendations and shop drawings.
   1. Locate, install items plumb, square, level; anchor securely in place.
   2. Make attachment with anchors approved by manufacturer. At stud walls, attach wall-mounted items to studs or blocking between studs.
B. Provide and install cover molds, fillers, closure pieces, scribe strips, similar items necessary for secure installation and proper operation as acceptable to Architect.
C. Identification: Apply vinyl lettering at locations indicated.
D. Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

3.4 ADJUSTING AND CLEANING
A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION
SECTION 23 0170
OPERATION AND MAINTENANCE OF HVAC SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:
   1. Operation and Maintenance Manuals.
   2. Instructions for Owner’s Personnel.

1.3 ALLOWANCES

1.4 DEFINITIONS

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:
   1. Include plans, elevations, sections, and mounting details.
   2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Detail fabrication and assembly.
   4. Include diagrams for power, signal, and control wiring.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Drawings drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved.

B. Qualification Data: For manufacturer.

C. Seismic Qualification Certificates: For equipment, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Welding certificates.

E. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For equipment and systems to include in operation and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.


C. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

1.9 DELIVERY, STORAGE, AND HANDLING

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components that fail(s) in materials or workmanship within specified warranty period.

1. Warranty Period: one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 OPERATING AND MAINTENANCE MANUALS

A. The contents of operating and maintenance manuals shall include the following:

1. Description of mechanical equipment and systems.

2. Operating instructions.

3. Routine maintenance schedules and procedures.

B. Organization - A manual of such purpose shall be arranged in two parts, with Part I dealing with information pertaining to systems and Part II covering information pertaining to equipment. These may be bound in as many volumes as may be required for convenience of use and reference.
1. Part 1 - Systems:
   a. The systems volumes shall be organized into Divisions wherein each Division represents a
genetic function. Systems shall be classified under appropriate Divisions. An example of
such an arrangement is as follows:
   b. Division Title  Division No.
      1) Ventilating
         a) Building Exhaust
   c. The material for each system shall be organized in sections descriptive of the following
basic areas of information:
      1) Descriptive Information.
      2) Operating Instructions.
      3) Inspection and Maintenance Instructions.
   d. Sections could be organized to include the following categories of information:
      1) Descriptive Information
      2) Function of service.
      3) Classification.
      4) Design capability.
      5) Performance characteristics.
      6) Principal components.
      7) Distribution arrangement.
      8) Schematic diagram.
      9) Control diagram.
     10) Equipment Data.
      11) Inventory designation.
      12) Manufacturer and model.
      13) Size and rating.
      14) Pressure, speed and temperature limitations.
     15) Operating Instructions.
     16) Starting and stopping procedures.
     17) Adjustment and regulation.
     18) Seasonal start-up.
     19) Seasonal shut-down.
     20) Logs and records.
     21) Inspection and Maintenance.
     22) Inspection schedule and checklist.
     23) Schedules and procedures for lubrication, replacements, adjustment, cleaning,
painting, protection and testing.
     24) Inspection and maintenance records.
   e. Reference Documents:
      1) Construction drawing list.
      2) Construction specifications.
      3) Record drawings.
      4) Test and balance records.

2. Part 2 - Equipment:
   a. This part of the manual shall be composed of manufacturers and fabricators data on
equipment and materials organized into divisions wherein each division represents a
generic classification of equipment such as:
   b. Division Title
      1) Air Conditioning and Ventilating
   c. Each division shall be organized in sections wherein each section would represent a
specific type of equipment in Division 1, the sections shall include the following:
      1) Fans - Axial
         a) propeller
   d. Each section shall include the following manufacturer information:
      1) Descriptive Literature
a) Catalog cuts, brochures or shop drawings  
b) Dimensional drawings  
c) Materials of construction  
d) Parts designations  

2) Operating Characteristics  
a) Performance tables and charts  
b) Performance curves  
c) Pressure, temperature and speed limitations  
d) Safety devices  

3) Operating Instructions  
a) Pre-start check list  
b) Start-up procedures  
c) Inspection during operation  
d) Adjustment and regulation  
e) Testing  
f) Detection of malfunction  
g) Precautions  

4) Inspection Instruments and Procedures  
a) Normal and abnormal operating temperature, pressure and speed limits  
b) Schedule and manner of operation  
c) Detection signals  

5) Maintenance Instructions and Procedures  
a) Schedule of routing maintenance  
b) Procedures  
c) Troubleshooting chart  

6) Parts List  
a) Spare Parts  
b) Essential inventory  
c) Distributor directory  

7) Service and Dealer Directory  

8) Service Contracts  

PART 3 - EXECUTION  

3.1 INSTRUCTIONS FOR THE OWNER'S PERSONNEL  

A. Arrange for suppliers and/or installers to meet with the Owner’s operating and maintenance personnel to provide instruction in the proper operation and maintenance of equipment that requires routine servicing. Include the following:  

1. Review of operation and maintenance manuals.  
2. Required tools.  
3. Lubricants.  
4. Spare parts.  
5. Cleaning.  
6. Hazards.  
7. Warranties and maintenance agreements.  

B. Demonstrate equipment and systems operation including the following:  

1. Start-up.  
2. Shut-down.  
3. Emergency conditions.
4. Safety procedures.
5. Setpoint and schedule adjustments.

END OF SECTION
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 all sections.

1.2 SUMMARY

A. Scope:
   1. The base bid shall include furnishing all materials, labor, tools, equipment and installation of all work required to install complete mechanical systems as outlined in the contract documents.
   2. Submittal of a bid indicates that the contractor has examined the drawings, specifications, and visited the site and has included all required allowances for a complete bid.
   3. Contractor shall be designated as the sub-contractor for that section of work unless specifically stated otherwise.

B. Permits, Fees, Inspection, Laws and Regulations
   1. Permits and fees of every nature required in connection with this work shall be obtained and paid for by this contractor who shall also pay for all the installation fees and similar charges.
   2. Laws and regulations which bear upon or affect the various branches of this work shall be complied with by this contractor, and are hereby made a part of this contract.
   3. All work which laws require to be inspected shall be submitted to the proper public officials for inspections and certificates of final approval must be furnished to the Owner before final acceptance will be given by the Engineer.

1.3 ELECTRONIC FILES

A. Drawings for this project were prepared using AutoCAD software. Electronic files are available upon request for use by the successful contractor(s) for planning, coordination and installation.

B. There will be no charge for drawing files that were prepared using AutoCAD. These files will be available in the version in which they were created.

C. The Request Drawings Form can be accessed, filled out and submitted at the following internet address at the bottom of the page: http://www.klhengrs.com.

1.4 QUALITY ASSURANCE

A. General Standards
   1. The installation of all work shall conform to the applicable State and Local codes and statures. The applicable provisions of the following standards shall govern:
      a. State Building Code and applicable local amendments.
      b. Local Building Code (if applicable)
c. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
d. American Society of Test Materials (ASTM)
e. National Fire Protection Association (NFPA)
f. Underwriters Laboratories (UL)
g. National Sanitation Foundation (NSF)
h. Sheet Metal & Air Conditioning Contractors National Association (SMACNA)
i. American National Standards Institute (ANSI)
j. Building Code Seismic Relative Displacement Requirements

B. Definitions and Descriptions
1. “AS SHOWN” – As shown, indicated or described on the contract documents.
2. “CONTRACT DOCUMENTS” – Drawings, specification sections, contracts and submittals.
3. “CONTRACTOR DOCUMENTS” – All documents submitted by the contractor.
4. “PROVIDE” – To furnish and install.
5. “WORK” – All labor, materials and equipment described by the contract documents.
6. “WORK OF OTHER TRADES” – Work included in this contract that is normally described in other Sections of the Specifications under the Construction Specification Institute’s 28 Division format.
7. “REMOVE” – To disconnect, dismantle or disconnect and dismantle as necessary. All removals not designated for reuse nor designated to be salvaged for the Owner is the property of the contractor unless stated otherwise.
8. “REPLACE” – To remove existing and provide new as indicated in the same location.
9. “COORDINATE” – To locate and avoid both new and existing equipment, services and obstructions.
10. “REROUTE” – To remove part of system and provide extension to system to circumvent obstruction.
11. “RELOCATE” – To remove existing, install existing in a different location and make operational.
12. “REINSTALL” – To remove existing, install existing in the same location and make operational.

C. Qualifications
1. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

D. Supervision and Workmanship
1. Workmanship throughout shall conform to the standards of best practice and all labor employed must be competent and qualified to do all the work required.
2. Contractor shall furnish the services of an experienced superintendent to be in constant charge of the work at all times.
3. Quality Assurances: Contractor if requested shall demonstrate his ability to perform all work to be included under the contract. Assurance if requested, shall be in the form of a list of past projects of similar size and complexity and a list of six (6) references pertaining to those projects. Failure to demonstrate these quality assurances shall be taken as a statement of the contractor’s inability to perform.
4. Contractor shall have a minimum five (5) years experience in the installation of HVAC systems similar to the systems specified.
5. Inspection: Provisions shall be made for owner’s representative to make rough-in and open ceiling inspections prior to covering up work.

E. Materials
1. All materials installed shall be new, full weight and of the best quality. All similar materials shall be of the same type and manufacturer.
2. Contractor is responsible for the safety and good condition of the materials and equipment installed until final acceptance by the Owner. Materials shall be stored to prevent damage, freezing or weathering prior to installation.

3. When several materials, products or items of equipment are specified by name for one use, the contractor may select any one of those specified and shall include with his bid and Equipment List listing the equipment selected.

4. Any manufacturer(s) other than scheduled shall have unit dimensions, weights and clearances equal to or less than any specified base-bid equipment, unless reviewed by the Engineer.

5. The responsibility for costs incurred from deviation from the base scheduled and specified equipment shall be this contractor. Use of any equipment will be considered as a statement that capacities, requirements, clearances and arrangements have been checked, verified and found satisfactory and meet the intent of the scheduled and specified equipment. Such additional costs shall be approved in advance by appropriate Contract Modification for these increases.

6. All manufacturer or Mechanical Contractor provided electrical disconnect switches shall comply with current National Electric Code requirements and rated to meet or exceed the overcurrent device serving the equipment.

F. Specifications
   1. Specifications shall be interpreted in connection with the drawings hereinbefore described, and if anything is shown on drawings and not mentioned in the specifications, or vice versa, it is to be included in the work the same as though clearly set forth by both.
   2. Furthermore, all materials or labor previously required to fully complete the work shall be included in the contractor's work even though each item necessarily involved be not specifically mentioned or shown. Such work and/or materials shall be of the same grade or quality as the parts actually specified and shown. Should there be a conflict between the plans and specifications, the greater quantity or better quality shall be furnished.

G. Plans
   1. Plans are diagrammatic indicating required size, points of termination of ducts and suggested routes. However, it is not intended that drawings indicate all necessary offsets. It shall be the work of the contractor to install ductwork in such manner as to conform to the structure, avoid obstructions, provide required service clearances and preserve headroom. Take field measurements to make these determinations. Do not rely on measurements taken or provided by others or scaled from drawings.
   2. Coordination Drawings: The contractor shall provide a 1/4" scale double line set of coordination drawings to the Engineer prior to installation of the systems. This contractor shall provide all necessary coordination drawings required to make sure all disciplines are coordinated and fit into specified mechanical spaces (i.e. ceilings, chases, and all others). The top elevation of all disciplines shall be clearly marked throughout the drawings so that no interferences occur. Drawings shall depict actual clearances of installed equipment, penetration locations and service clearances. Indicate scheduling, sequencing, movement and positioning of large equipment during construction. Indicate where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the work. Conflicts in equipment and materials shall be corrected prior to installation. Contractor shall provide drawings showing all disciplines for coordination.
   3. Exact location of electric outlets, heating equipment, lighting fixtures, ducts, etc., shall be coordinated so there will be no interferences at installation between the various trades. It is the work of the contractor to prepare complete coordination drawings indicating exact location of all items. The engineer shall have the option to move any piece of mechanical equipment up to fifteen feet from location shown on contract documents without any additional cost.
   4. All ducts shall be run as straight as possible and symmetrical with architectural items.

H. Utility Verification Requirements
1. Field verify locations of underground and aboveground utilities, or those otherwise obscured from view, in the vicinity of work prior to commencing work.
2. Obtain on-site approval from local utility prior to connected to existing services.
3. Failure to perform the above shall result in contractor proceeding at their risk and accepting full responsibility for incorrect connections.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment and materials according to factory shipping requirements. Pack components in factory-fabricated protective containers. Units shall be delivered in sections of such size as will pass through available openings.

B. Store equipment and materials in clean dry place and protect from weather and construction traffic. When stored inside, do not exceed structural capacity of the floor.

C. Handling and rigging of equipment and products shall be as recommended by the manufacturer. Components and equipment damaged during shipment or handling shall not be installed. Replace and return damaged components to the manufacturer.

D. All equipment and materials shall have the ability to be returned to the manufacturer after purchase and charged a reasonable restocking fee by the manufacturer equal to a small portion of the cost.

1.6 WARRANTY

A. The contractor shall provide a guarantee in written form stating that all work under this section shall be free of defective work, materials, or parts for a period of one year from the date of substantial completion owner's final acceptance and shall repair, revise or replace at no cost to the owner any such defects occurring within the guarantee period. Contractor shall also state in written form that any items or occurrences arising during the guarantee period will be attended to in a timely manner and will in no case exceed four (4) working days from date of notification by owner.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine products or materials before installation. Reject products or materials that are wet, moisture damaged, or mold damaged.

C. Examine walls, floors, roofs, etc. for suitable conditions where product or system will be installed.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ARCHITECTURAL COORDINATION ITEMS

A. Cutting and Patching:
   1. Cut and drill all openings in walls and floors required for the installation. Secure approval of
      Engineer before cutting and drilling. Neatly patch all openings cut.
   2. Cutting and patching to be held to a minimum by arranging with other contractors for all sleeves
      and openings before construction is started.

B. Fire Caulking:
   1. Patching through fire rated walls and enclosures shall not diminish the rating of that wall or
      enclosure. Patch shall be equal to rockwool, firestop, caulk or approved "rated" patch.
   2. Provide products equivalent to the following:
      a. For Floor Openings: Instant Firestop; 305-SL
      b. For Wall Openings: Instant Firestop; 344-GG
      c. Mineral Felt: Instant Firestop; Type MW
      d. For Insulated Pipes: Instant Firestop; Type PI
      e. For Fill Areas: Instant Firestop; C-1000
   3. For larger openings where pipes penetrate fire rated enclosures that cannot be sealed with products
      described above, utilize approved UL products equal to 3M FireDam Spray 200. Install per
      manufacturer’s instructions.

C. Access Panels and Pathways:
   1. Furnish all access panels required for proper servicing of equipment. Provide access panels for all
      concealed valves, vents, controls, cleanout doors, and sprinkler devices required by NFPA. Provide
      access panels for all fire and/or fire & smoke dampers. Provide frame as required for finish. Furnish panels to General Contractor. Exact locations to be approved by the Architect.
      Minimum size to be 12” x 12”, units to be 16 gauge steel, locking device shall be screwdriver cam
      locks.

3.3 INSTALLATION

A. Equipment shall be installed in accordance with manufactures installation recommendations.

B. Provide and maintain service, maintenance and operating clearances as required by the manufacturer.

3.4 CLEANING EQUIPMENT AND PREMISES

A. Clean all parts of the apparatus and equipment. Exposed parts which are to be painted shall be cleaned of
   cement, plaster and other materials and all oil and grease spots shall be removed. Such surfaces shall be
   carefully wiped and all corners and cracks scraped out.

B. Exposed metal work shall be brushed down with steel brushes to remove rust and other spots and left
   smooth and clean. Remove trapped elements during cleaning and flushing period, after which they shall
   be replaced and adjusted.

C. During the progress of the work, the contractor shall clean up after his men and leave the premises and all
   portions of the building in which he is working in a clean and safe condition.
3.5 FIELD QUALITY CONTROL

A. Prepare test and inspection reports.

B. Prepare and provide Utility Verification reports.

3.6 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Unit may be started up and utilized only after the floor has been prepared and after drywall sanding has occurred 100%. Coordinate with all trades prior to startup.

3.7 ADJUSTING

A. Adjust hardware and moving parts to function smoothly, and lubricate as recommended by manufacturer.

3.8 PROTECTION

A. Protect installed equipment, ductwork, piping, devices and accessories during construction. Items damaged during construction will not be accepted and shall be replaced by this contractor with new at this contractor's expense.

B. Remove and replace products or materials that are wet, moisture damaged, or mold damaged.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION
SECTION 23 0503
SUBMITTALS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 Specification Sections and Division 23 General Requirements Section apply to this Section.

1.2 SUMMARY

A. Section Includes: Administrative, content and format requirements for preparation and submission of submittals.

B. Work of this Section is supplemental and additive to the requirements of Section 013300 where included in the Project Manual.

1.3 PRICE AND PAYMENT PROCEDURES

A. Payment in full or in part may be withheld from the Contractor for failure to comply with submittal requirements articulated in the Contract Documents.

1.4 SUBMITTALS

A. Submittals shall be furnished for each Section that includes one or more of the following elements of work:
   1. Supply of one or more products.
   2. Installation of one or more products.
   3. Integration of one or more products.
   4. Programming of one or more products.
   5. Creation of one or more deliverable products.
   6. Labeling of one or more products.
   7. Contractor-based design or engineering of one or more products or systems.

1.5 REFERENCES

A. Definitions:
   1. Component Identifier / Component ID: See Device ID.
   2. Device.ID: The unique identifier given to a specific instance of a product, module and assembly. Identifiers are unique within the context of the system and product in which it is used.
   3. Product Identifier / Product ID: See Device ID.
PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. Submittals shall be routed through established Project channels as identified by the Owner’s representative.

B. Coordinate, assemble, title, transmit and track Project submittals.

C. Label each submittal of each type similarly for consistency and so they appear as if prepared by the same entity. Like-type submittals (e.g., Product Data) from different Sections shall have the same appearance and organization as those of other Sections.

D. Submittals prepared by subcontractors or vendors shall not be accepted unless prepared in compliance with the Contract Documents.

E. Submittal items listed in this Section represent the common items required to be supplied for the various specification Sections throughout the duration of the Project. Individual Sections will vary and may include additional or lesser requirements.

F. Engineer reserves the right to require additional submittals or to waive select submittal requirements on a Section-by-Section basis.

G. The cost for preparation and transportation of submittals is Work of the Contract.

H. Bind physical/hardcopy submittals together. Do not submit loose or paper clipped documents.

I. Supply separate submittals for each Section. Do not combine multiple Sections together into a single submittal, except where expressly directed within the Contract Documents.

J. Where electronic submittals are required or permitted, comply with the requirements for electronic submittals as identified in the Contract Documents.

K. Organize submittals as identified in the Contract Documents.

L. Furnish submittals for different Sections each with its own transmittal form. A single transmittal shall not be used to identify submittals for more than one (1) Section at a time. This allows for tracking and processing efficiency, so that:
   1. Each Section may be reviewed simultaneously by different individuals, as appropriate.
   2. Individual Sections may be processed and returned more quickly than others when some Sections require longer review times.
   3. Submittals that are returned and marked as “Revise and Resubmit” do not cause submittals for other Sections to be also be resubmitted due to the fact that they were bound together as a single unit.
M. Use of Electronic Drawings from the Owner’s Design Team:
   1. Plan drawings for the Project were created with AutoCAD.
   2. If expressly permitted by the Owner and the terms of the Contract, editable electronic versions of
      standard-scale, AutoCAD-based plan drawings may be made available for the creation of shop and
      as-built drawings.
   3. Due to the proprietary nature of internal design systems, editable native-software versions of some
      drawings, including but not limited to system diagrams and details will not be made available in
      an editable form. In these cases, electronic versions of the drawings may be made available only
      in PDF, JPG or similar non-editable electronic form, at the sole discretion of the Designer.

3.2 SUBMITTAL TYPES

A. The following are the common submittal types referenced in this Section:
   1. Quality Assurance (QA).
   2. Quality Control (QC).
   3. Product Data (PD).
   4. Shop Drawing (SD).
   5. Samples (SS).
   6. Training (TG).
   7. Field Observation Response (FO).
   8. Pre-Acceptances (PA).
   9. Closeout Submittal (CO).

3.3 SEQUENCE

A. Quality Assurance Submittal:
   1. When not expressly requested to be supplied with bid, the Quality Assurance submittal(s) shall be
      supplied upon request. When requested the submittal shall be delivered to the Designer within 16
      business hours.

B. Product Data Submittal:
   1. Submit following contract award or notice of intent to award a contract. Product data shall be
      submitted and reviewed prior to procurement of materials.

C. Shop Drawing Submittal:
   1. Submit for review prior to commencement of fabrication and installation.
   2. Submit concurrently with Section-specific Product Data submittals.

D. Training Submittal:
   1. Submit thirty (30) days prior to the first training session.

3.4 IDENTIFICATION

A. Identify each submittal uniquely.

B. Identify each submittal by specification Section number, submittal type, and submittal iteration.

C. The format for labeling the submittals shall be as follows:
   1. Section Number–Submittal Type Abbreviation–Submittal Iteration.
2. Examples:
   a. First Product Data Submittal for section 23 31 13.00: “233113-PD-00.”
   b. Revised Product Data Submittal for section 23 31 13: “233113-PD-01.”

3.5 CONTENTS

A. General:
   1. Transmittal:
      a. Supply a dedicated transmittal for submittals for each individual Section.
      b. Itemize the specific submittals included by Section, submittal type, and iteration.
   2. Title Sheet:
      a. Include a separate title sheet with each submittal, of each type.
      b. Title sheets for each Section, for each submittal type, shall have the same appearance.
      c. Title sheets for product data submittals shall be 8-1/2 inches x 11 inches.
      d. Title sheets for drawings shall be the same size as the associated drawings.
      e. Create title sheets to have the appearance and information identified on the sample title sheet published at the end of this Section.
   3. Index:
      a. Include an index outlining and identifying the contents of the submittal.
      b. The index for drawing submittals shall be incorporated onto the title sheet of the corresponding drawing set.
   4. Checklists:
      a. Include the checklist(s) published in the Contract Documents corresponding to the type of submittal being supplied. Applicable checklists are found at the end of this Section and within individual Sections.
   5. Title Blocks:
      a. Drawing submittals shall be created on the Contractor’s, manufacturers, or vendor’s own title block. The title blocks of the Owner, Architect, Engineer, Designer or their Consultants shall not be reproduced on any document (electronic or hardcopy) that is prepared or altered by the Contractor.
   6. Legend:
      a. Drawing submittals shall include a legend of symbology.
   7. Resubmittals:
      a. Resubmittals shall include a replica of the reviewer’s comments that necessitated the resubmittal, along with an accompanying item-by-item explanation of the actions taken and changes that will be found within the resubmittal.

B. Quality Assurance:
   1. List of Subcontractors to be used on the Project along with a description of the role each shall play on the Project.
   2. Proof of Quality Assurance compliance, as identified within each Division 23 Section “Quality Assurance” and in each individual Section.
   3. The last six (6) projects that the Contractor (and each proposed Subcontractor) has completed that are of similar scope, size and contract value. References shall include:
      a. Owner’s name and current contact information.
      b. Project address.
      c. Description of the system(s) and scope of actual work performed.
      d. Monetary contract value of the Work performed.

C. Product Data Submittals:
   1. Product Datasheets:
a. Separate manufacturer datasheets for each product.
b. Datasheets shall be manufacturer originals or first generation printed versions (i.e., from PDF) of the manufacturer’s official electronic datasheet:
   1) Distributor modified, distributor branded, and/or html based “web” datasheets are not acceptable.
   2) Datasheets shall include size and technical support data.
c. Where manufacturer’s datasheets depict multiple products, versions and options, indicate via highlighting, underlining, or with bold visible arrows the model(s), version(s) and option(s) being supplied. Exact catalog number(s) shall be indicated.
d. Each datasheet shall be labeled with the Section paragraph reference number. Datasheets shall include the Drawing reference when no specific paragraph reference exists within the Section.

D. Shop Drawings Submittals:
1. General:
   a. Drawing descriptions identify the required contents of common drawings required under the Contract.
   b. Drawings identified within individual Sections, along with any additional drawings deemed necessary by the Designer, are required.
   c. Drawing Scales:
      1) Floor plans shall be drawn to scale.
      2) Section drawings shall be drawn to scale.
      3) Elevation drawings shall be drawn to scale.
      4) Details of physical items shall be drawn to scale.
      5) System drawings and schematic drawings shall be drawn 1:1 (no scale).
   d. Sizes:
      1) Sheet sizes shall match the size of the Contract Drawings sheets, except where otherwise expressly requested or approved in advance by the Designer.
2. Floor Plans:
   a. Location of major system components.
   b. Location of equipment that is Work of another Section to which Work interconnects.
3. Reflected Ceiling Plans:
   a. Location of ceiling devices, coordinated with devices that are Work of others, and existing devices (where applicable).
4. System Diagrams:
   a. Hybrid schematic / block wiring diagram.
   b. System products depicted.
   c. Product inputs, outputs and other ports depicted.
   d. Product brand, model, description, options, and accessories declared.
   e. Equipment ID assignment for each product.
   f. Interconnections depicted between system products.
   g. Interconnections depicted between system products and related system products.
5. Custom Assemblies and Products:
   a. Manufacturer.
   b. Materials.
   c. Finish and color(s).
   d. Parts list.
   e. Nomenclature sizes, colors.
   f. Dimensions.
   g. Schematic diagram(s), where applicable.
6. Mounting Details:
   a. Depicting the materials and means of securing installed products.
   b. Finishes and colors of exposed parts.
E. Training Submittals:
1. Proposed schedule.
2. Training agendas for each session.
3. Identification of personnel that will conduct training.
4. Handouts proposed for distribution during training.

F. Field Observation Reports Submittals:
1. Written responses to Field Observation Reports supplied to the Contractor during the course of the Project:
   a. The response shall include a copy of the original Field Observation Report.
   b. The response shall include detail of the corrective action taken, the date the action was taken and the identity of the individual who took the action.

G. Closeout Submittals:
1. As-Built Drawings:
   a. General:
      1) Requirements for Shop Drawings apply to “As-Built” drawings.
   b. Required Drawings:
      1) Title Sheet.
      2) Floor Plans.
      3) System Diagrams.
      4) Mounting Details.
      6) As-built version of each Project shop drawing.
   c. Drawing Formats:
      1) Electronic Editable: Editable version using the native application used to create the file (e.g., Revit, AutoCAD, Star-Draw, Visio, VidCAD).
      2) Non-Editable: PDF file format.
      3) Printed Hardcopy.
      4) Sheets shall be the same size and feature consistent title block information in the lower-right corner.
   d. Drawing Organization:
      1) Hardcopy drawings shall be bound together into logical sets, bound along the left edge of the sheets.
      2) The first page of the set shall include a detailed index and sheet-by-sheet description of each drawing sheet.
2. Operation and Maintenance Manuals:
   a. Manual Format:
      1) Hard-cover 3-ring type binder.
      2) Front clear plastic cover pocket complete with Project and system Information insert.
      3) Clear plastic spine pocket with Project and system Information insert.
      4) Binder sized to suit the contents only, neither oversized nor undersized.
      5) Maximum binder thickness: 3 inches.
   b. Manual Contents and Organization:
      1) General:
         a) Separate binder (or binder set) for each system, labeled. Provide no more than one system per binder (or binder set).
         b) Separate CD-ROM (or CD-ROM set) for each system, labeled. Provide no more than one system per CD-ROM (or CD-ROM set).
         c) Do not overfill. Binders shall not be filled beyond an easily usable capacity.
         d) Insert labeled tabs within binder to identify separate contents of the manual.
         e) Labeled sub-directories shall be created on the CD-ROM to label and separate contents for the manual.
2) Project Information Cover:
   a) Title of Project.
   b) Name and address of Owner, Designer, Architect, Contractor of Record and Subcontractor.
   c) System name and specification references.

3) Index:
   a) Contents of the manual.

4) Warranty Statement:
   a) A warranty statement shall be included for each system. The warranty statement shall reiterate the terms of warranty identified within the Contract Documents, as well as identify how the Owner is to obtain warranty service.
   b) The warranty statement shall clearly identify which products are covered by Manufacturer warranties beyond the Contractor required minimum warranty period. The term of manufacturer warranty shall also be identified (e.g., 2 year parts and labor).
   c) A separate warranty statement shall be supplied for each system.
   d) Identify the date that the warranty for the system starts. This date shall be the date listed on the Certificate of Substantial Completion (if one was issued to the contractor specifically for the system) or the date listed on the Notice of Final Completion.
   e) Supply standard out-of-warranty service rates and service contact information.

5) Product Datasheets (supply only in the electronic version of Operation and Maintenance Manual):
   a) Manufacturer datasheets for each product supplied.

6) Manufacturer Owner / User Manuals:
   a) Manufacturer’s Owner’s or User’s manual for each product.
   b) Manufacturer’s Installation instructions and other documentation supplied with the product.

7) Test Reports and Checklists:
   a) Test reports, checklists, and other forms generated and completed during the course of the Project.

8) Training Information:
   a) Photocopy of training outlines / agendas.
   b) Photocopy of training session handouts.
   c) Photocopy of training sign-in sheets.
   d) Photocopy of signed delivery receipt for each training session recording (applicable to those Sections/systems requiring recording).

9) As-Built Drawings:
   a) The hardcopy manual shall contain reduced scale printed version (11x17) of system-specific drawings.
   b) The electronic manual shall contain electronic PDF version of the as-built drawings.

10) Software (electronic manual only):
    a) Editable configuration files for system equipment.
    b) Software source code use in supplied products.
    c) Compiled versions of configuration files and source code.
    d) Software required for reviewing and editing supplied files.

### 3.6 QUANTITY

A. General:
   1. The quantity of submittals required shall be the greater of the following:
      a. Quantity identified within Division 01.
b. Quantity identified within the individual Section.
c. Quantity identified herein.
2. In addition to the Contract required quantity, the Contractor shall also submit any additional quantities required for its own use and records, and for distribution to other trades.
3. The Designer shall retain a copy of each submittal received. Others in the submittal communication chain may also retain copies.

B. Product Data Submittals:
1. Two (2) Hardcopies.
2. One (1) Electronic.

C. Shop Drawings Submittals:
1. Two (2) Hardcopies.
2. One (1) Electronic.

D. Training Submittals:
1. Two (2) Hardcopies.
2. One (1) Electronic.

E. Field Observation Reports Submittals:
1. Two (2) Hardcopies.
2. One (1) Electronic.

F. Pre-Acceptance Submittals:
1. Two (2) Hardcopies.
2. One (1) Electronic.

G. Closeout Submittals:
1. Two (2) Hardcopies.
2. One (2) Electronic.

3.7 REJECTION

A. The following items are representative reasons that submittals may need to be revised and resubmitted:
1. Binding submittals for multiple Sections together.
2. Failing to supply separate transmittal for submittals for each Section.
3. Failing to include a submittal title sheet.
4. Failing to use and accurately complete the published title sheet.
5. Failing to supply and accurately complete the submittal checklists.
6. Failing to supply product data and shop drawings at the same time.
7. Failing to supply product data sheets.
8. Failing to supply product data sheets with the correct product and required accessories enumerated.
9. Failing to supply shop drawings.
10. Failing to supply shop drawings with required information.
11. Failing to supply accurate information.
12. Failing to supply relevant information required by the Specifications.
13. Failing to supply products that are in compliance with the Specifications.
14. Failing to supply the required information in the required format.
3.8 RESUBMITTALS

A. Revise and Resubmit:
   1. When a submittal is rejected and flagged as “Revise and Resubmit,” the entire submittal shall be reviewed, revised and resubmitted in totality.
   2. Resubmittals shall be checked for compliance with the Contract Documents, inclusive of requirements for submittals. In addition, any comments and deficiencies identified by the reviewer shall be appropriately acted upon.

B. Exceptions Noted:
   1. When a submittal is flagged as “Exceptions Noted,” the specific actions identified shall be taken.
   2. If the reviewer’s comments include selective rejection of products, the resubmittal shall be limited to include those items commented upon.

C. Resubmittals shall:
   1. Include a copy of the reviewer’s previous comments.
   2. Include a written description of the action(s) taken.
   3. Be labeled chronologically.
   4. Be inclusive of all corrective action identified by the previous reviewer.

3.9 ELECTRONIC SUBMITTALS

A. Electronic submittals shall only be permissible where electronic submittals are expressly required and where express approval for such has been granted.

B. Electronic submittal files shall be compatible for opening and viewing with electronic PDF file readers that fully support and recognize the Adobe PDF Portable Document Format Standard, version 1.5.

C. Major text within the files shall be electronically searchable using the search-for-text features of current generation Adobe PDF reader software. Files shall be prepared in such manner that reviewers will have the option to search for and find words and phrases that appear within the document, electronically. Documents featuring raster-based text and text that is otherwise not searchable shall not be acceptable. This precludes the use of documents that have been electronically scanned and then converted to or embedded within an electronic file.

D. The organization, contents, and labeling of information along with other requirements for submittals apply also to electronic versions of the submittals.

E. Single File Submission:
   1. Option 1 – Single File, PDF Format:
      a. Single PDF file submittals shall be assembled from a series of individual files that are organized, indexed, bound together as one composite file that is bookmarked to aid the reviewer in navigating the content.
      b. The file shall feature a navigational tree of contents, organized by content groups (e.g., Title Page, Index, Datasheets, Shop Drawings). Content groups shall be organized in the same relative order identified within the Contract Documents.
      c. Within each content group shall be the supporting elements of the group (e.g., product datasheets under the Datasheets group). Each element of the content group shall appear separately as a subordinate element of the group (e.g., separate entry for each product...
datasheet, separate entry for each shop drawing), and viewable from the navigational contents tree.

d. Under the Datasheets content group, individual product datasheet entries shall be identified by Make/Brand and Model (e.g., Carrier – 48TJ008 – Gas-Fired Rooftop Unit). Entries shall be organized in a sorted manner, first by make, then by model.

e. If the resulting size of the composite PDF file exceeds 10 Megabytes, supply the submittal using the Single Zip File method instead, as described in this Section.

f. The file name used to label the submittal shall be the section number followed by the submittal instance number for that Section (e.g., 233113-PD-01.pdf).

1) Where the Designer directs the supply of multiple zip files for a submittal, add additional text to the file name to identify that the file is part of a multi-file set of submittals, as per the following examples:
   a) 233113-PD-01 (1 of 3).pdf
   b) 233113-PD-01 (2 of 3).pdf
   c) 233113-PD-01 (3 of 3).pdf

2. Option 2 – Single File, Zip Format:
   a. Single Zip File submittals shall be assembled from a series of individual PDF files and file directories that are contained with a single compressed WinZip compatible “.zip” file.
   b. The file shall contain separate top-level directories that are used to group related content (e.g., 00-Title Page, 01-Index, 02-Datasheets, 03-Shop Drawings), with each directory appearing in the same relative order as that identified in the Contract Documents.
   c. Within each content group directory shall be separate PDF-compliant files featuring the information required (e.g., separate datasheet file for each product, separate file for each drawing, separate file for each shop drawing).
   d. Product datasheet files shall be named using a consistent naming convention that enables those files to appear sorted and grouped when the file is opened for navigation, viewing or extraction by the reviewer.
   e. Product datasheet files shall be consistently named with the make/brand of the product, followed by model number, followed by any additional information beneficial (e.g., Carrier – 48TJ008 – Gas-Fired Rooftop Unit).
   f. Consult the Designer for supplement instructions should the WinZip file exceed 50 Megabytes in size.
   g. The file name used for the submittal shall be the Section number followed by the submittal instance number for that Section (e.g., 233113-PD-01.zip).

1) Where the Designer directs the supply of multiple zip files for a submittal, add text to the file name that identifies the file is part of a multi-file set as per the following examples:
   a) 233113-PD-01 (1 of 3).zip
   b) 233113-PD-01 (2 of 3).zip
   c) 233113-PD-01 (3 of 3).zip

END OF SECTION
SUBMITTAL TITLE SHEET
EXAMPLE
(Form. Sub-1)

PROJECT TITLE:
Project Name Line 1
Project Name Line 2
Project Name Line 2

SUBMITTAL TYPE:
Product Data

SECTION SUBMITTAL NUMBER
233113-PD-00

SECTION TITLE:
Metal Ducts

Date Prepared:
yyyy-mm-dd

CONTRACTOR OF RECORD:
Firm Name
Address1
Address 2
City, State, Zip
Phone (000) 000-0000, Fax (000) 000-0000
Project Manager: Full Name
PM E-Mail: xxxxxxxx@xxxx.xxx

SECTION SUBCONTRACTOR(S):

<table>
<thead>
<tr>
<th>Firm Name</th>
<th>Address 1</th>
<th>Address 2</th>
<th>City, State Zip</th>
<th>Phone (000) 000-0000</th>
<th>Fax (000) 000-0000</th>
<th>PM Name: Full Name</th>
<th>PM E-Mail: <a href="mailto:xxxxxxxx@xxxx.xxx">xxxxxxxx@xxxx.xxx</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm Name</td>
<td>Address 1</td>
<td>Address 2</td>
<td>City, State Zip</td>
<td>Phone (000) 000-0000</td>
<td>Fax (000) 000-0000</td>
<td>PM Name: Full Name</td>
<td>PM E-Mail: <a href="mailto:xxxxxxxx@xxxx.xxx">xxxxxxxx@xxxx.xxx</a></td>
</tr>
</tbody>
</table>
### PRODUCT DATA SUBMITTAL

#### CHECKLIST

*(Form: Sub-2)*

*Each line below featuring text shall be supplied with an answer.*

<table>
<thead>
<tr>
<th>Transmittal</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Title Sheet.</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Name.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Spec Section number.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Submittal iteration number.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>(0 for first iteration, 1 + for each subsequent iteration (e.g. 231513-0, 231513-1))</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Contractor of Record identified.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Sub-contractor / vendor / supplier name identified.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Title Sheet appearance consistent with sample title sheet.</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Checklists included.</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>This checklist.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Checklists from Section being.</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

| Previous submittal review, with contractor actions and comments. | Yes | No |

<table>
<thead>
<tr>
<th>Product Datasheets included.</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Datasheets are manufacturer originals.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Datasheets for each product included.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Section paragraph and/or drawing reference on each datasheet.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Product accessories and options identified.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Products organized by paragraph (or alphabetically by brand).</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>No photocopies, faxes and other illegible datasheets included.</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shop Drawings included.</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shop drawings accompany this product data submittal.</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

| This submittal contains product data for one section only. | Yes | No |

---

*This checklist serves as simple and abbreviated reminder of the contents and format of the aforementioned submittal. Refer to the 23 05 03.00 “Submittals for HVAC” and each specific Section for additional submittal requirements. Submittals are subject to rejection if this checklist is not accurately completed and supplied along with the specified information. Reproduce this checklist and submit with each submittal for each Section.*
SYSTEM DIAGRAMS
SHOP DRAWING CHECKLIST
(Form: Sub-3)

Each line below featuring text shall be supplied with an answer.

<table>
<thead>
<tr>
<th>NO</th>
<th>YES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmittal</td>
<td></td>
</tr>
<tr>
<td>Title Sheet</td>
<td></td>
</tr>
</tbody>
</table>

Diagram assumes a hybrid schematic block-diagram like appearance.

Product Blocks included.
- Each system product depicted.
- Make/brand identified.
- Model number identified.
- Description of each product instance is declared.
  (e.g. "Boiler", "Chiller", "Rooftop Unit")

Product Interconnections depicted.
- Interconnection between system products shown.
- Interconnection between system products and related system products.

This checklist serves as simple and abbreviated reminder of the contents and format of the aforementioned submittal. Refer to the 23 05 03 “Submittals for HVAC” and each specific Section for additional submittal requirements. Submittals are subject to rejection if this checklist is not accurately completed and supplied along with the specified information. Reproduce this checklist and submit with each submittal for each Section.
SECTION 23 0513
COMMON MOTOR REQUIREMENTS FOR HVAC

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. Motors Furnished with HVAC Equipment

B. Related Sections:
   1. Section 23 05.03.00 “Submittals for HVAC”

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
   3. Clearly state equipment markings (i.e. AHU-1), capacities, voltages and model numbers on all submittals.

B. Shop Drawings:
   1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: drawings and details, drawn to scale, on which all items, including other trades, are shown and coordinated with each other, code required clearances, manufactured recommended service clearances, using input from installers of the items involved.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For equipment to include in operation and maintenance manuals.
1.6 **QUALITY ASSURANCE**

A. Comply with NFPA 70, “National Electrical Code”

1.7 **WARRANTY**

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components of equipment that fail(s) in materials or workmanship within specified warranty period.
   1. Warranty Period: One year from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 **MATERIALS AND EQUIPMENT**

A. All mechanical equipment shall be UL listed for use with "HACR" circuit breakers.

B. The motor control apparatus shall be furnished complete as a part of the motor and apparatus which it operates when called for in certain instances in the Mechanical Division. Motor control apparatus except as above shall be complete, factory wired and tested, ready for connections to be made under Division 26.

2.2 **MOTORS**

A. All motors shall be in accordance with the latest standards of NFPA 70, "National Electrical Code".

B. Refer to HVAC/Electrical Coordination Schedule and the Electrical specifications and drawings for the exact voltage of motors.

C. Wherever in these specifications, a motor voltage is listed, the motor shall be wound for the listed voltage and none other will be accepted.

D. Service Factors indicated for motors are minimum values and apply at frequency and utilization voltage at which motor is connected. Provide motors, which will operate in the service factor range when supply voltage is within 10 percent of motor voltage rating.

E. Provide grounding rings and brushes on motor shaft to divert shaft to ground current flow around bearings.

F. Temperature Rise: Based on 100 degree F ambient except as otherwise indicated.

G. Three-Phase Motors
   1. Squirrel cage induction type.
   2. NEMA design letter Designation "B".
   3. Internal thermal overload protection.
   5. Energy Efficient Motors: equal or greater than NEMA MG-1.
   6. 1.25 Service factor.
7. Multi Speed Motors: separate windings for each speed.

H. Single-Phase Motors
   1. Internal thermal overload protection.
   2. Motor starters incorporated as an integral part of equipment shall be NEMA standard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine products or materials before installation. Reject products or materials that are wet, moisture damaged, or mold damaged.

C. Examine walls, floors, roofs, and equipment for suitable conditions where equipment will be installed.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ELECTRICAL INSTALLATION

A. All electrical work associated with this section shall be in accordance with the latest standards of NFPA 70, "National Electrical Code".

B. Electrical wiring shall be provided under Division 26 unless specifically called for in another section of the specifications.

C. An enclosed safety type, NEMA Type HD motor disconnect switch shall be furnished and installed for each motor installation unless specifically mentioned as furnished under another section of these specifications.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Inspection: Arrange and pay for a factory-authorized service representative to perform the following:
   1. Prepare a written report on findings and recommended corrective actions if any are required.

3.4 STARTUP PROCEDURES

A. Energize motor, verify proper operation of motor, drive system, and fan wheel.
B. Measure and record motor electrical values for voltage and amperage.

3.5 MOTOR ADJUSTMENT

A. Adjust hardware and moving parts to function smoothly, and lubricate as recommended by manufacturer.

3.6 PROTECTION

A. Remove and replace products or materials that are wet, moisture damaged, or mold damaged.

END OF SECTION
SECTION 23 3423
HVAC POWER VENTILATORS

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. Propeller fans.

B. Related Sections:
   1. Section 23 05 03 “Submittals for HVAC”.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on actual Project site elevations.

B. Operating Limits: Classify according to AMCA 99.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:
   1. Certified fan performance curves with system operating conditions indicated.
   2. Certified fan sound-power ratings.
   3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   4. Material thickness and finishes, including color charts.
   5. Dampers, including housings, linkages, and operators.
   6. Roof curbs.
   7. Fan speed controllers.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Wiring Diagrams: For power, signal, and control wiring.

C. Delegated-Design Submittal: For unit hangars and supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
2. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

C. UL Standards:
   1. Power ventilators shall comply with UL 705.

1.8 COORDINATION

A. Coordinate size and location of structural-steel support members.

PART 2 - PRODUCTS

2.1 PROPELLER FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Acme Engineering & Manufacturing Corporation.
   2. Breidert Air Products.
   4. Loren Cook Company.

B. Housing: Galvanized-steel sheet with flanged edges and integral orifice ring with baked-enamel finish coat applied after assembly.

C. Steel Fan Wheel: Formed-steel blades riveted to heavy-gage steel spider bolted to cast-iron hub.
D. Fan Drive: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

E. Fan Drive:
1. Resiliently mounted to housing.
2. Statically and dynamically balanced.
3. Selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
4. Extend grease fitting to accessible location outside of unit.
5. Service Factor Based on Fan Motor Size: 1.4.
6. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
   a. Ball-Bearing Rating Life: ABMA 9, L10 of 100,000 hours.

F. Accessories:
1. Bird Screens: Provide removable bird screens, 1/2" mesh, 16-ga aluminum or brass wire.
2. Louvers: Provide matching wall louver.

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."
   1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Enclosure Type: Totally enclosed, fan cooled.

2.3 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Install units with clearances for service and maintenance.
3.2 CONNECTIONS

A. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:
   1. Verify that shipping, blocking, and bracing are removed.
   2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
   3. Verify that cleaning and adjusting are complete.
   4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
   5. Adjust belt tension.
   6. Adjust damper linkages for proper damper operation.
   7. Verify lubrication for bearings and other moving parts.
   8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
   9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
  10. Shut unit down and reconnect automatic temperature-control operators.
  11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

C. Replace fan and motor pulleys as required to achieve design airflow.

D. Lubricate bearings.

END OF SECTION
SECTION 26 0501
COMMON REQUIREMENTS FOR ELECTRIC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and Division-1 Specification sections, apply to work of Division 26 sections.

B. E-series drawings apply to work of Division 26 sections and vice versa.

1.2 SPECIAL CONDITIONS

A. Owner's representative or engineer may relocate luminaire(s), wiring device(s) or equipment outlet(s) prior to installation within a 15 foot limit at no additional charge.

B. Complete work, or part(s) thereof, at such time as may be designated by the owner's representative, so that it can be used for temporary or permanent use. Do not construe such use of the system as an acceptance of same by Owner.

C. Review load summaries of power distribution equipment prior to rough-in or installing conductors, and after coordinating with suppliers and other trades, including relevant submittals. Bring abnormal conditions to the attention of the design professional, such as significant load conditions, and unusual phase imbalances.

1.3 GENERAL STANDARDS

A. Provide work in compliance with applicable provisions of the following standards. Provide UL listing and UL label for electrical materials, equipment luminaires, devices, etc.

B. Provide work in strict accordance with the latest edition of applicable codes including (but not limited to) the following codes and standards.
   1. National Electrical Code (NEC), NFPA 70
   2. Life Safety Code, NFPA 101
   3. Other Provisions of NFPA as applicable
   4. Local Electrical Codes
   5. Local utility company requirements
   6. ADA/ADAAG requirements
   7. ASME
   8. Kentucky Building Code
1.4 PERMITS AND REGULATIONS

A. Provide written notification to Engineer's office with list of inspection agency choices if multiple electrical plan review or inspection agencies are permitted in the jurisdiction of the project. The final agency selection belongs to the Engineer.

B. Provide electrical materials, installation methods, workmanship, testing, etc., unless otherwise specified, that conforms with the latest rules, regulations and specifications of the National Electrical Code, the National Board of Fire Underwriters, local and state codes having jurisdiction and applicable utility companies.

C. If a discrepancy between Division 26 drawings and specifications, and codes, laws, ordinances, rules and regulations is discovered, immediately notify the engineer and proceed no further with related work until response is received.

D. Obtain and pay for permits, certificates of inspection and approval, etc. required for this branch of the work.

E. Furnish owner with certificates of final inspection and approval prior to final acceptance of this branch of the work.

1.5 SPECIFICATIONS AND TERMINOLOGY

A. Unless otherwise indicated in specifications or on drawings, wherever the term "furnish" appears in documents, interpret to mean "supply and deliver to project site, ready for installation, and install". See definition of “install” in paragraph below.

B. Wherever the term "install" appears in documents, or is intrinsically included as part of “furnish” and/or “provide” in paragraphs above and below, interpret to mean "Assemble, wire and connect loose-shipped components on site. Place in position for service or use, including material, labor, accessories, services, and testing. Wire, connect, and render fully operational for intended use ". Note that most products to be installed shall also be furnished under Division 26, though some products require only installation under Division 26 - depending on context and application.

C. Wherever the terms "provide", "include", “shall be”, “to be”, “equip with”, “consisting of”, or similar terms appear in documents, interpret to mean "Furnish and Install".

D. Wherever the word "work" appears in documents, interpret to mean “material, labor, accessories, services, testing, etc. as required to render respective work fully operational”.

E. Wherever the words “equal” or “equivalent” or similar terms are used in documents in reference to products other than basis-of-design, equivalency shall be as determined by Design Professional.

F. Wherever the word “flush” appears, interpret to mean “recessed in respective surface with visible face flush and even with respective surface”.

G. Wherever the words "(the) (this) contractor", "(the) (this) subcontractor", "E.C./EC", “electrical contractor”, “electrical subcontractor” or similar terms appear in Division 26 specifications or on
electrical drawings, they refer the entity responsible for providing electrical work indicated on electrical drawings, and in Division 26 Project Manual sections.

1.6 EXPLANATION AND PRECEDENCE OF DRAWINGS

A. For the purposes of clearness and legibility, drawings are essentially diagrammatic and although size and locations of equipment are drawn to scale wherever possible, make use of data on drawings and verify information at building site.

B. The drawings indicate required size and points of termination of conduit and partially suggest proper routes to conform to the structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate necessary offsets. Install conduit and equipment in such manner as to conform to structure, avoid obstructions, preserve headroom and keep openings and passageways clear without further instructions.

C. Coordinate work with affected entities and installers. Locate and install equipment and devices accordingly. Refer to coordination drawings of other trades.

D. Locate apparatus be located symmetrical with architectural elements and install at exact height and locations as shown on architectural drawings.

E. Fully research peculiarities and limitations of space available for installation of work along with materials to be furnished and installed. Exercise due and particular caution to ensure that parts of the installed work are made quickly and easily accessible. Although the locations of the equipment and conduit may be shown on the drawings in certain positions, be guided by the architectural details and conditions existing at the job site, correlating electrical work with that of others. Provide offsets as required to provide a neat workmanlike arrangement.

F. Where connecting lines are shown outside the confines of a building, serving indoor or exterior wall-mounted luminaires, devices, outlets, etc., they are shown for circuiting clarification and are not intended to be installed outside of the building. Provide such conduit, raceway and cabling work within the confines of the building, concealed wherever possible.

1.7 SUBMITTALS

A. Refer to Division 1 Section pertaining to Submittals.

B. Refer to Section 260503, Submittals for Electrical Systems.

C. Provide Equipment List for items of material and equipment, which must be reviewed by the Engineer prior to the start of work. Provide submittals in a timely manner allowing for long lead items. No item of equipment will be permitted on the site until acceptance of that equipment has been given. Provide copies of drawings and manufacturer cuts and performance data for Engineer’s review. Organized in same order as listed in equipment list and include reference to page and paragraph numbers of the specifications. Do not purchase material until the final versions of the submittals are reviewed by the Design Professionals as “No Exceptions” or as “Exceptions Noted”.
D. Clearly indicate sufficient definition in submittals so they can be properly reviewed for compliance with documents.

1.8 MATERIALS AND EQUIPMENT

A. Unless specifically indicated otherwise provide (furnish and install) all specified and drawn equipment, raceway, boxes, luminaires, controls, wiring, cabling, supports and other materials as required to render all electrical and electrically operated equipment, luminaires, devices, etc. fully operational. Unless specifically indicated otherwise provide (furnish and install) all materials that are specified under Division 26. Discrepancies or uncertainties perceived by a bidder, or other questionable interpretations by a bidder, are subject to final interpretations and decisions by the owner’s representative unless addressed before bidding by addendum or unless qualified or excepted within bids.

B. Provide material manufacturers equivalent in quality, performance, aesthetics, and product support (factory and local) to that specified as basis of design. Other products, materials, articles, devices, luminaires or forms of construction not mentioned as basis of design, required or acceptable is subject to review by the Design Professional and possible rejection. Listing of a manufacturer by name alone as an acceptable product within these specifications shall not necessarily equate another manufacturer or model to what is specified. Provide materials with manufacturing, aesthetic, durability, duty, dimensional and performance characteristics equal to or exceeding the quality, performance and characteristics of the basis-of-design specifications and products.

C. Provide materials that are new, full weight, of the best quality. Provide similar materials that are of the same type and manufacturer. Provide materials, apparatus and equipment with Underwriter's Laboratory, Inc. label where regularly supplied.

D. Maintain safety and good condition of the materials and equipment installed until final acceptance by the Owner. Store materials to prevent damage and weathering prior to installation.

E. When several materials, products or items of equipment are specified by name for one use, select one of those specified.

F. Bear costs, if any, incurred from deviation from basis-of-design equipment, luminaires, materials, methods, etc. Use of equipment, luminaires, materials, methods, etc. that deviate from the basis of design will be considered as a statement that clearances, arrangements, performance, etc. have been checked, found satisfactory, and is compliant with applicable codes and regulations.

G. Wire and connect electrical equipment furnished under this branch of work, other branches of work and by the owner. Review documents of other trades to identify electrically operated/controlled equipment that is furnished or installed by the owner, or by other trades. Provide power connections and local disconnects for same. Provide control wiring (including relays, starters, etc.), as required to render equipment fully operable unless indicated otherwise on drawings or in project manual. Determine exact requirements in field from respective equipment installer.

H. Test and field-verify the following conditions prior to applying power to any luminaires, equipment, etc. Take corrective action if necessary to ensure systems and equipment are energized safely and to proper and properly configured power sources.
   1. Proper and expected voltages and service configurations exist at service entrance(s).
   2. Proper and expected voltages and configurations exist at all facility power sources.
   3. Current-carrying conductors are connected to the correct lines/phases.
4. Grounded (neutral) conductors are properly referenced and connected.
5. Grounding electrode and equipment grounding conductors are properly referenced and connected.
6. Ground resistance complies with NFPA 70 and other specified requirements.

I. In cases where luminaires, devices, equipment, or other electrical materials are furnished by Owner or others, provide the following services: receive, transport and securely store materials on site; remove materials and components from packaging; assemble all materials and components per factory instructions; install, wire and connect materials and components as recommended by manufacturer for a fully operational installation.

J. Except where otherwise indicated, provide fully-rated or series-rated overcurrent protection (OCP). If fault current values are not indicated at nodes on drawings, also provide fault current calculations and furnish results with equipment submittals. Provide equipment and OCP rated to meet or exceed the calculated available series-rated fault current at the respective node in the power distribution system. Furnish electronic copies of the electrical documents to the manufacturer’s representative and/or equipment supplier so that properly rated and braced equipment is provided under base bid.

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver equipment and materials according to factory shipping requirements. Pack components in factory-fabricated protective containers. Deliver units in sections of such size as will pass through available openings.

B. Store equipment and materials in clean dry place and protect from weather and construction traffic. When stored inside, do not exceed structural capacity of the floor.

C. Handle and rig work for equipment and products as recommended by the manufacturer. Do not install components and equipment damaged during shipment or handling - return damaged components to the manufacturer and replace with new.

1.10 QUALITY ASSURANCE

A. Provide references on request that demonstrate ability to perform work of this division, including list of past projects similar in size, scope of work and complexity.

B. Interpret specifications in connection and conjunction with the drawings. If work is shown on drawings and not mentioned in the specifications, or vice versa, provide the work as though clearly set forth by both.

C. Provide materials and labor required to fully complete the work even though each item necessarily involved may not be specifically mentioned or shown. Provide such work and materials of the same grade or quality as the parts actually specified and shown.

D. Provide the quantity and quality levels indicated as a minimum. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for the context of the requirements. Should there be a conflict between the plans and specifications, provide the greater quantity and better quality.
E. Install equipment and materials in strict accordance with manufacturer's written instructions.

F. Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified by applicable UL Standards. Accomplish tightening by utilizing proper torquing tools, including torque screwdriver, beam-type torque wrench, and ratchet wrench with adjustable torque settings. Ensure that sealing grommets expand to form watertight seal.

G. Upon completion of installation of equipment and electrical circuitry, energize circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

H. Prior to energizing, check installed wires and cables with megohm meter to determine insulation resistance levels to assure requirements are fulfilled. Prior to energizing, test wires and cables for proper phase to phase connections, for electrical continuity and for short-circuits. Ensure that direction of rotation of each motor fulfills requirement.

I. Furnish the service of an experienced superintendent who is constantly in charge of the work, together with qualified journeymen, wiremen and specialists as required to properly install, connect, adjust, start, operate and test the work involved.

J. The superintendent's qualifications are subject to the review and acceptance by the owner's representative. Unless the owner's representative grants prior special permission, utilize the same electrical superintendent throughout the duration of the project.

1.11 CLEANING EQUIPMENT AND PREMISES

A. Clean parts of the apparatus and equipment. Clean exposed parts of cement, plaster and other materials. Remove oil and grease spots. Carefully wipe such surfaces and neatly scrape out corners and cracks.

B. Brush down exposed metal work with steel brushes to remove rust and other spots and leave them smooth and clean. Remove trapped elements during cleaning and flushing period, after which replace and adjust them.

C. During the progress of the work, clean up and leave the premises and portions of the building in which work has occurred in a clean and safe condition. Provide this cleaning on a per-shift basis.

1.12 PROJECT CLOSEOUT

A. General
   1. Refer to Division1 Section pertaining to Project Closeout.
   2. Refer to Section 260503.00, Submittals for Electrical Systems.
   3. Final payment will not be made until receipt, review and acceptance, by the owner's representative, of documentation defined under Project Closeout and in Section 260503.00, Submittals for Electrical Systems.
   4. Test electrical work and ensure that it rings entirely free from ground.
5. Provide proper instruction of equipment and systems to the satisfaction of the owner's representative.

6. Make arrangements for meetings at such times as will be convenient to entities concerned for the purpose of instructing the designated personnel on the correct operation and maintenance of each individual system furnished and each system installed.

B. Record Documents

1. Obtain two complete sets of electrical prints and use them to provide progress record drawings which are separate, clean, prints reserved for the purpose of showing a complete picture of the work as actually installed (including routing of conduit and cables). These drawings also serve as work progress report sheets. Make notations, neat and legible thereon daily as work proceeds. Make these drawings available for inspection at all times and keep them at the job at a location designated by the owner's representative.

2. Maintain the clean, undamaged set of prints of drawings as well as a set of submittal drawings and coordination drawings. Mark the sets to show the actual installation where the installation varies from the Documents as originally shown. Include locations of underground and concealed items if placed other than shown on the Documents. Do not permanently conceal construction until this required information is recorded. Mark which drawing is most capable of showing conditions fully and accurately. Where shop drawings are used, record a cross-reference at the corresponding location on the Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

3. Show changes in: size, type, capacity, etc., of material, device or piece of equipment, location of device or piece of equipment; location of outlet or source of building service systems; routing of piping, conduit, or other building services. Record location of concealed equipment, electrical service work, conduits and other piping/work by indication of measured dimensions to each line from readily identifiable and accessible walls or corners of building. Indicate approved substitutions, modifications, and actual equipment and materials installed.

4. Affix near the titleblock on each drawing the Contractor’s Company Name(s), signature of Contractor’s Representative(s) and current date.

1.13 WARRANTY/GUARANTEE

A. General

1. Provide a warranty/guarantee in written form stating that work, materials, equipment and parts are warranted to be free of defect for a period of one year from the date of owner's final acceptance, and defects will be repaired, revised or replaced (owner’s option) at no cost to the owner if such defects occur within the guarantee period. Also state in written form that occurrences arising during the warranty/guarantee period will be attended to in a timely manner and will in no case exceed four (4) working days from date of notification by owner. Replace defective items to the satisfaction of the owner's representative and the Engineer.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 26 0502
COMMON ELECTRIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 GENERAL

A. Furnish and install all labor and material, tools and equipment necessary to render all systems complete and operational, and ready for turnover to Owner.

1.2 ACTION SUBMITTALS

A. Refer to Section 260503, Submittals for Electrical Systems.

B. Product Data: For lock-out/tag-out devices, access doors, sealants and fire/smoke stopping products.

1.3 INFORMATIONAL SUBMITTALS

A. Refer to Section 260503, Submittals for Electrical Systems.

B. Welding Certificates.

1.4 WELDING

A. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel." Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.5 HEIGHT OF BOXES

A. Outlet mounting heights as indicated on the plans are approximate. Determine the exact mounting heights (and locations) of outlets in the field with relation to architectural detail and equipment being served. Coordinate outlet location with equipment, with furniture plans and with architectural elevation plans. Where mounting heights are not detailed or dimensioned, contact the owner's representative for direction.

B. Prior to rough-in, coordinate final mounting heights of system outlet boxes in field with Owner's representative. Install boxes at heights as follows, to center of box, unless directed otherwise in field or otherwise noted on E-series drawings or architectural plans. In cases where using center of box for measurement would result in a switch-height device having an operable component higher than 48 inches above finished floor, install boxes lower as needed so that uppermost part of operable component is no higher than 48 inches. Height of boxes dimensioned from ceiling apply to rooms having ceilings 9' or less; in rooms having higher ceilings, locate these as directed in the field.

- Switches – Counters: 44” (field verify & match counter recept. heights)
- Switches – Elsewhere: 46”
- Receptacles – Counters: 44” (field-verify)
- Receptacles – Elsewhere: 18”
Wall Mounted Luminaires: As noted on plans or as directed by Architect
Communication Outlets: 18"
Telephone Outlets - Desk Phone 18"
Telephone Outlets - Wall Phone 46"
Data Outlets 18"
Fire Alarm Manual Pull Stations 46” to top of operating handle
Fire Alarm A/V Annunciators 80” to bottom of outlet box
Fire Alarm Door Holders 84"
Other Outlets/Fixtures/Equipment As directed by Architect

1.6 ACCESS DOORS

A. Do not use access doors unless special prior written permission is granted from the Owner's representative. Install pull boxes, junction boxes, etc. in areas which are accessible after completion of construction. Do not install pull boxes or junction boxes above gypsum board or similar inaccessible ceiling systems. Where there is no other recourse but to provide an access door/panel, and where approval of Owner’s representative has been obtained, provide required access doors/panels as required for a complete code-compliant electrical installation as defined below.

B. For installation in masonry, concrete, ceramic tile and wood paneling provide 1 inch-wide-exposed perimeter flange and adjustable metal masonry anchors. For gypsum wallboard and plaster provide perforated flanges with wallboard bead. For full-bed plaster applications provide galvanized expanded metal lath and exposed casing bead, welded to perimeter of frame.

C. Set frames accurately in position and securely attached to supports, with face panels plumb and level in relation to adjacent finish surfaces. Adjust hardware and panels after installation for proper operation. Provide locking devices that are flush screwdriver-operated cam locks.

D. Provide factory-fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Provide continuously welded steel joints and seams, with welds ground smooth and flush with adjacent surfaces. Provide frames that are 16-gage steel, with a 1-inch-wide exposed perimeter flange for units installed in unit masonry, pre-cast or cast-in-place concrete, ceramic tile and wood paneling. Provide Standard Flush Panel Doors that are 14-gage sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees; factory-applied prime paint. Provide Fire-Rated Units that are insulated flush panel doors, with continuous piano hinge and self-closing mechanism.

E. Provide unit assemblies that are rated for the respective fire and/or smoke rating of the surface to which they are installed.

F. Subject to compliance with requirements, provide products by one of the following:
   1. Bar-Co., Inc.
   2. J.L. Industries.
   5. Nystrom, Inc.
1.7 LOCK-OUT TAG-OUT DEVICES

A. Provide permanently installed lock-out tag-out devices compliant with NFPA 70 and OSHA, with padlocking provisions, at source overcurrent devices for the following applications.
   1. Where the normal NFPA 70-compliant location of the disconnecting means is impracticable or introduces additional or increased hazards to persons or property.
   2. Where otherwise required by NFPA 70.
   3. Where required by OSHA.
   4. Where otherwise required by any other authority having jurisdiction.
   5. Where indicated in specifications.
   6. Where indicated on drawings.

1.8 ELECTRICAL INSTALLATIONS

A. Install work conduit, wiring, outlet box type work in finished areas concealed. Such work installed in unfinished areas may be exposed at the discretion of the Owner's representative.

B. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the work.

C. Provide systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible.

D. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and architectural/structural components.

E. Install electrical equipment to facilitate servicing, maintenance, and repair and replacement of equipment components. Install equipment for ease of disconnecting, with minimum of interference with other installations. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope. Protect the structure, furnishings, finishes, and adjacent materials.

F. Verify dimensions by field measurements. Take measurements and be responsible for exact size and locations of openings required for the installation of work. Figured dimensions are reasonably accurate and should govern in setting out work. Where detailed method of installation is not indicated or where variations exist between described work and approved practice, follow direction of the owner's representative.

G. Provide branch subfeeder circuits as shown on the plans. The symbols used to indicate the purpose of which the various outlets are intended are identified in the Electric Legend. Where outlets are indicated by letters on plans, provide corresponding switches to control them.

H. Provide no wire size smaller than No. 12 for branch circuits unless otherwise noted on plans for control circuits. Provide larger sizes where required by prevailing codes or indicated on contract documents. Provide neutral conductor for all multi-pole feeders. Provide neutral conductor(s) for all multi-pole feeders and branch circuits unless this contractor determines in field that the affected load(s) will never have need for a neutral conductor and NEC does not mandate otherwise. Provide minimum 3/4” conduit size.
I. Do not install device wall outlets directly back to back, where located on opposite sides of common walls. Offset outlets by at least two feet for applications in fire rated walls and smoke rated walls and applications in acoustically treated walls. Offset outlets by at least one foot for other applications.

J. Provide wires continuous from outlet to outlet and properly splice joints. Provide insulation value for joints 100% in excess of that of the wire. Mechanical wire splicers may be used. Where friction and rubber tape is used, provide tape conforming to Federal Specifications HH-T-11 and HH-T-111. Where plastic electrical tape is used, provide Scotch #33, or approved equal. Provide minimum 8” tail for conductors terminating at each wired outlet at their outlet fittings to facilitate installment of devices, luminaires, etc.

K. If during construction it becomes apparent that some specific minor changes in layout will effect a neater job or better arrangement, make such alterations without additional compensation and without having to offer credit. Obtain Engineer's review before making such changes.

L. Provide workmanship throughout that conforms to the standards of best practice. Marks, dents and finish scratches are prohibited on exposed materials, luminaires, fittings, etc. Clean inside of panels and equipment boxes.

1.9 CONNECTORS

1. Provide complete assembly of materials for each type of required electrical connection, including but not limited to, pressure connectors, terminals (lugs), electrical insulating tape, heat-shrinkable insulating tubing, cable ties, solderless wire-nuts, and other items and accessories as needed to complete splices and terminations of types indicated.

2. Unless otherwise indicated, provide wires/cables (conductors) for electrical connections that match, including sizes and ratings, of wires/cables that are supplying electrical power. Provide copper conductors with conductivity of not less than 98% at 90 degrees C.

3. Provide electrical connectors and terminals that mate and match, including sizes and ratings, with equipment terminals, and that are recommended by equipment manufacturer for intended applications.

4. Provide electrical insulating tape, heat-shrinkable insulating tubing and boots, wire nuts, cable ties, etc. as recommended for use by accessories manufacturers for intended applications.

5. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment. Cover splices with electrical insulating material to achieve insulation at least 100 percent in excess of electrical insulation rating of those conductors being spliced. Prepare cables and wires, by cutting and stripping covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes which will remain on conductors. Do not "ring" copper conductors while skinning wire.

6. There may be cases where circuit or feeder conductor sizes are too large or too small to fit into the lugs normally supplied with the end-use equipment, due to circumstances such as increasing conductor sizes to offset voltage drop, unusual breaker frame sizes, etc. In such cases provide appropriate factory lug kits for affected equipment if recommended by manufacturer; elsewhere provide insulated butt-splices with tails sized to fit respective lugs.

7. Provide connectors that are specifically UL listed and labeled for the exact splicing/termination application, including for instances where solid conductors are spliced/connected to stranded conductors.

8. Ground metal frames of portable and stationary direct-wired electrically operated equipment by connecting frames to the circuit equipment grounding conductor and to grounded metal raceway. Provide necessary electrical connections between the specified equipment and junction boxes.
disconnect switches, and starters near equipment with flexible metallic conduit and matched connectors. Do not expose flexible conduit in finished areas.

9. Connect electrical equipment furnished under this branch of work, other branches of work and by the owner. Review documents of other trades to identify electrically operated/controlled equipment that is furnished or installed by the owner, or by other trades. Provide power connections and local disconnects for same. Provide control wiring (including relays, starters, etc.), as required to render equipment fully operable unless indicated otherwise on drawings or in project manual. Determine exact requirements in field from respective equipment installer.

1.10 COORDINATION

A. Commence with coordination in a timely manner. Subsequent additional compensation, special allowances, additional construction time, etc. will not result from failure to coordinate (including providing related information to other trades for review) in a timely manner. Do not fabricate or install work before properly coordinating with other trades.

B. Plans are diagrammatic indicating design intent and indicating required size, points of termination and, in some cases, suggested routes of raceways, etc. However, it is not intended that drawings indicate fully coordinated conduit routing, necessary offsets, etc. The drawings are an outline to indicate the approximate location and arrangement of ductwork, piping, equipment, outlets, raceways, cables, etc. Install piping, conduit, raceways, cable assemblies, etc. as straight as possible and symmetrical (perpendicular to or parallel with) with architectural items. Work in and on the building installed diagonal to building members is prohibited.

C. Consult the plans of other trades while planning installations and before installing work so that work will not interfere with that of other trades.

D. Refer to Section 260533.00, Raceways and Boxes for Electrical Systems, for special material and installation requirements that relate to coordination.

E. Participate in multi-trade coordination efforts. Participate in preparation of coordination drawings by other trades, prior to fabrication or installation of equipment, materials, etc. Coordinate actual clearances of installed equipment. Coordinate exact location of electrical outlets, lighting fixtures, conduits, raceways, equipment, cable assemblies, applicable devices, etc. well in advance of installation so there will be no interferences at installation between the various trades.

F. Ensure that work and working clearances in electrical rooms and similar spaces complies with NEC Article 110. This also applies to finalizing locations of disconnects, starters, contactors and other electrically operated equipment that may require testing or maintenance while energized. Layout all affected equipment on paper, and meet with electrical inspector on-site as needed, prior to ordering related materials or commencing with installations, to ensure compliance with NEC Article 110.

G. Coordinate and correct conflicts in equipment and materials prior to installation. If a conflict cannot be resolved, refer the matter to the owner's representative for a final decision as to method and material.

1.11 CUTTING, PATCHING AND SEALING

A. Related Requirements:
1. Section 260544.00 "Sleeve and Sleeve Seals for Electrical Raceway and Cabling" for penetrations.
B. General
1. Comply with requirements of Division 07 “Thermal and Moisture Protection”.
2. Provide cutting and patching for the admission of work. Perform cutting, fitting, and patching for electrical equipment and materials as required to:
   a. Uncover Work to provide for installation of ill-timed Work.
   b. Remove and replace defective Work.
   c. Remove and replace Work not conforming to requirements of the Contract Documents.
   d. Remove samples of installed Work as specified for testing.
   e. Install equipment and materials in existing buildings.
3. Upon written instructions from the owner's representative, uncover and restore work to provide for observation of concealed work by owner's representative or by inspection authority having jurisdiction.
4. During cutting and patching operations, protect adjacent installations (structure, finishes, furnishings, etc.). Where applicable, provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to system components and components of other trades.
5. Patch surfaces and building components using new materials matching existing materials as applicable and using experienced Installers. Refer to Division 1 for definition of experienced "Installer" or determine qualifications as directed in field by owner's representative.
6. Patch through fire rated walls and enclosures in a manner that does not diminish the rating of that wall or enclosure. Provide materials used for patching to meet or exceed the smoke and fire rating of the respective surface being patched.
7. Neatly cut and drill openings in walls and floors required for the installation. Secure approval of Owner's Representative before cutting and drilling in work that is already in place. Neatly patch openings cut.
8. Hold cutting and patching to a minimum by arranging with other trades for sleeves and openings before construction is started.
9. Provide factory-assembled watertight wall and floor seals, of types and sizes required; suitable for sealing around conduit, pipe, and tubing passing through concrete floors and walls. Construct seals with steel sleeves, malleable iron body, neoprene sealing grommets and rings, metal pressure rings, pressure clamps, and cap screws.
10. Fabricate pipe sleeves from Schedule 40 rigid, heavy wall, full weight galvanized steel pipe; remove burrs. Use sleeves which are two standard sizes larger than conduit passing through respective sleeve.
11. Provide sleeve seals for piping which penetrates foundation walls below grade, exterior walls and roofs, caulk between sleeve and pipe with non-toxic, UL-classified caulking material to ensure watertight seal. Elsewhere modular provide mechanical type seals, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.
12. Provide standard Schedule 40 black steel pipe sleeves two sizes larger than pipes passing through floors, bearing walls and masonry construction. Cut sleeves through walls flush with both faces. Extend sleeves through floors one inch above floor top elevation. Provide a pipe curb assembly equal to Pate Co. for piped penetrating roof. Furnish and set forms required in masonry walls and foundations to accommodate pipes.
13. Seal all new floor, ceiling, wall, slab, etc. penetrations to match or exceed existing assembly fire ratings. Provide sleeve seals for all sleeves, provide sleeves for all penetrations. All penetrations of fire-rated or smoke-rated wall, floors ceilings, etc. shall be sealed immediately after raceways are installed. All new electrically related work shall be supported directly from building structural members. New electrically related work shall not be supported from ductwork, ductwork hanger, ceiling supports, existing conduit support, etc. All conduits (and cable assemblies, where applicable) shall be routed parallel to building structural members. Any and all noncomplying work installed by the electrical contractor shall be removed and reinstalled to the satisfaction of the owner’s representative and the engineer, at the expense of the electrical contractor.
C. Grout
   1. Provide non-shrink, nonmetallic grout, premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout, recommended for interior and exterior applications.

D. General Joint Sealer Application
   1. Provide joint sealers, joint fillers, and other related materials compatible with each other and with joint substrates under conditions of service and application.
   2. Apply joint sealers under temperature and humidity conditions within the limits permitted by the joint sealer manufacturer. Do not apply joint sealers to wet substrates.
   3. Clean affected surfaces, joints, etc. immediately before applying joint sealers to comply with recommendations of joint sealer manufacturer.
   4. Apply sealant primer to substrates as recommended by manufacturer. Protect adjacent areas from spillage and migration of sealant, using masking tape. Remove tape immediately after tooling without disturbing seal.
   5. Comply with joint sealer manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.
   8. Immediately after sealant application and prior to time shinning or curing begins, tool sealants to form smooth, uniform beads; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
   9. Provide colors for exposed seals that are selected by the Owner's representative from manufacturer's standard colors.

E. Elastomeric Joint Sealers
   1. Comply with requirements of Division 07 Section “Joint Sealants”.
   2. Provide one-part, nonacid-curing, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for masonry, glass, aluminum, and other substrates recommended by the sealant manufacturer.
   3. Provide one-part, mildew-resistant, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for glass, aluminum, and nonporous joint substrates; formulated with fungicide; intended for sealing interior joints with nonporous substrates; and subject to in-service exposure to conditions of high humidity and temperature extremes. Provide silicone sealant equal to the following:
      a. "Dow Corning 790", Dow Corning Corp.
      c. "Dow Corning 786", Dow Corning Corp.

F. Acrylic-Emulsion Sealants
   1. Provide one-part, non-sag, mildew-resistant, paintable complying with ASTM C 834 recommended for exposed applications of interior and protected exterior locations involving joint movement of not more than plus or minus 5 percent. Subject to compliance with requirements, provide one of the following:
      b. "AC-20", Pecora Corp.
      d. "Tremco Acrylic Latex 834", Tremco, Inc.

G. General Fire Stopping Material Application
   1. Fire stopping requirements/locations are not indicated on electrical drawings. Review architectural and other drawings to determine fire/smoke rated walls and floors and rating
requirements of same. Provide required fire stopping work associated with electrically related penetrations. Provide fire stop pillows, putty or sealant, as applicable, with minimum UL classification for 3 hour fire and cold side temperature ratings.

2. Clean affected surfaces, joints, etc. immediately before applying fire stopping to comply with recommendations of manufacturer.

3. Comply with fire stop material manufacturers’ printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.

4. Install fire stop materials, including forming, packing, and other accessory materials, to fill openings around electrical services penetrating floors and walls, to provide fire-stops with fire-resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.

5. Caulk between sleeves and pipes with rockwool and caulk around sleeves with sealing compound that meets applicable fire ratings required.

6. Provide patch equal to rockwool, firestop, caulk or approved "rated" patch.

7. Where a smoke or fire-resistance classification is indicated on architectural drawings or otherwise, provide the following as applicable.
   a. Fire stop pillows, putty or sealant with minimum UL classification for 3 hour fire and cold side temperature ratings for electrically related penetrations.
   b. Access door assembly with panel door, frame, hinge, and latch from manufacturer listed in the UL “Building Materials Directory” for rating required; Provide UL Label on each fire-rated access door.

H. Wall and Floor Opening Fire Stopping for Open Cable Tray and J-Hook Paths
   1. Provide Fire Stop Pillows equal to Nelson FSP #AA500 PLW or #AA501 PLW as applicable, UL Classified for 3 hour fire and cold side temperature ratings, quickly removable and reusable, non-toxic and requiring no special tools.

I. Wall/Floor Opening Fire Stopping for Work Likely to Need Ongoing Moves/Adds/Changes
   1. Provide Fire Stop Putty equal to Nelson FSP #AA400 series, UL Classified for 3 hour fire and cold side temperature ratings, reusable when penetrating items are removed or added and requiring no special tools, mixing, curing or drying time.

J. Fire Stopping for Other Wall and Floor Openings
   1. Provide Fire Stop Sealant equal to Nelson #AA491 series, UL Classified for 3 hour fire and cold side temperature ratings, non-sagging, permanently flexible, non-toxic, non-shrinking, water/air/smoke-tight and easily re-penetrated. Provide firestopping materials for the following locations:
      a. For Floor Openings
      b. For Wall Openings
      c. For Insulated Pipes
      d. For Fill Areas
   2. Apply sealant primer to substrates as recommended by manufacturer. Protect adjacent areas from spillage and migration of primers, using masking tape. Remove tape immediately after tooling without disturbing joint seal.
   3. Immediately after sealant application and prior to time shining or curing begins, tool sealants to form smooth, uniform beads; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or that are not approved by sealant manufacturer.
PART 2 - PRODUCTS (INCLUDED IN PART 1 ABOVE AS APPLICABLE)

PART 3 - EXECUTION (INCLUDED IN PART 1 ABOVE AS APPLICABLE)

END OF SECTION
**Submittal Form - 260502.00 – Common Electrical Materials And Methods**

Provide And Complete This Sheet And Submit As A Cover Sheet For Submittals Requested Within This Section.

<table>
<thead>
<tr>
<th>Electrical Contractor: _______________________</th>
<th>Electrical Supplier: _______________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical Contractor Rep: ____________________</td>
<td>Electrical Supplier Rep: ____________________</td>
</tr>
<tr>
<td>Electric Contractor Ph. Number: ________________</td>
<td>Electric Supplier Ph. Number: ________________</td>
</tr>
<tr>
<td>Electric Contractor Rep Email: _________________</td>
<td>Electric Supplier Rep Email: _________________</td>
</tr>
</tbody>
</table>

Submitted Access Door Manufacturer: _______________________________________
Submitted Sealant Manufacturer: ___________________________________________
Submitted Fire/Smoke Stopping Product Manufacturer(S): _______________________
_______________________________________________________________________

<table>
<thead>
<tr>
<th>Manufacturers Listed As Basis Of Design Or Listed Equivalent Manufacturers?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>If No, Explain</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Welder Certificates Included?</th>
<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>If No, Explain</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Manufacturer’s Warranties Meet Or Exceed The Warranty Period Specified?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>If No, Explain</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Lock-Out/Tag-Out Devices, Sealants, Fire/Smoke-Stopping And Access Doors Included?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>If No, Explain</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SECTION 26 0503
SUBMITTALS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 Specification Sections and Division 26 Common Requirements for Electric.

B. Submittal Forms are included at the end of most Division 26 specification sections, addressing action submittals and applicable information submittals. Include the form as the secondary cover sheet for action submittals and applicable information submittals of each affected section. Note that other submittals are also required as part of the project, even though they may not be addressed in these Submittal Forms.

1.2 SUMMARY

A. Section Includes: Administrative, content and format requirements for preparation and submission of submittals.

B. Work of this Section is supplemental and additive to the requirements of Section 013300 where included in the Project Manual.

1.3 PRICE AND PAYMENT PROCEDURES

A. Payment in full or in part may be withheld from the Contractor for failure to comply with submittal requirements articulated in the Contract Documents.

1.4 SUBMITTALS

A. Submittals shall be furnished for each Section that includes one or more of the following elements of work:

1. Supply of one or more products.
2. Installation of one or more products.
3. Integration of one or more products.
4. Programming of one or more products.
5. Creation of one or more deliverable products.
6. Labeling of one or more products.
7. Contractor-based design or engineering of one or more products or systems.
PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. Submittals shall be routed through established Project channels as identified by the Owner’s representative.

B. Coordinate, assemble, title, transmit and track Project submittals.

C. Label each submittal of each type similarly for consistency and so they appear as if prepared by the same entity. Like-type submittals (e.g., Product Data) from different Sections shall have the same appearance and organization as those of other Sections.

D. Submittals prepared by subcontractors or vendors shall not be accepted unless prepared in compliance with the Contract Documents.

E. Submittal items listed in this Section represent the common items required to be supplied for the various specification Sections throughout the duration of the Project. Individual Sections will vary and may include additional or lesser requirements.

F. Design Professional reserves the right to require additional submittals or to waive select submittal requirements on a Section-by-Section basis.

G. The cost for preparation and transportation of submittals is Work of the Contract.

H. Bind physical/hardcopy submittals together. Do not submit loose or paper clipped documents.

I. Supply separate submittals for each Section. Do not combine multiple Sections together into a single submittal, except where expressly directed within the Contract Documents.

J. Where electronic submittals are required or permitted, comply with the requirements for electronic submittals as identified in the Contract Documents.

K. Organize submittals as identified in the Contract Documents.

L. Furnish submittals for different Sections each with its own transmittal form. A single transmittal shall not be used to identify submittals for more than one (1) Section at a time. This allows for tracking and processing efficiency, so that:
   1. Each Section may be reviewed simultaneously by different individuals, as appropriate.
   2. Individual Sections may be processed and returned more quickly than others when some Sections require longer review times.
   3. Submittals that are returned and marked as “Revise and Resubmit” do not cause submittals for other Sections to be also be resubmitted due to the fact that they were bound together as a single unit.
M. Use of Electronic Drawings from the Owner’s Design Team:
   1. Plan drawings for the Project were created with AutoCAD.
   2. If expressly permitted by the Owner and the terms of the Contract, editable electronic versions of standard-scale, AutoCAD-based plan drawings may be made available for the creation of shop and as-built drawings.
   3. Due to the proprietary nature of internal design systems, editable native-software versions of some drawings, including but not limited to system diagrams and details will not be made available in an editable form. In these cases, electronic versions of the drawings may be made available only in PDF, JPG or similar non-editable electronic form, at the sole discretion of the Design Professional.
   4. The Request Drawings form can be accessed, filled out and submitted at the following internet address (scroll down to bottom of home page): http://www.klhengrs.com.

3.2 SUBMITTAL TYPES

A. The following are the common submittal types referenced in this Section:
   1. Quality Assurance (QA).
   2. Quality Control (QC).
   3. Product Data (PD).
   4. Shop Drawing (SD).
   5. Samples (SS).
   6. Training (TG).
   7. Field Observation Response (FO).
   8. Closeout Submittal (CO).

3.3 SEQUENCE

A. Quality Assurance Submittal:

B. Product Data Submittal:

C. Shop Drawing Submittal:
   1. Submit for review prior to commencement of fabrication and installation.
   2. Submit concurrently with Section-specific Product Data submittals.

D. Samples Submittal:
   1. Submit concurrent with, or soon after, product data and shop drawings and prior to installation of Work.

E. Training Submittal:
   1. Submit thirty (30) days prior to the first training session.

F. Field Observation Report Submittal:
   1. Submit five (5) business days prior to punch list walkthrough.

G. Closeout Submittal:
   1. Submit following completion of onsite work but not more than ten (10) business days following successful Acceptance Testing.
3.4 IDENTIFICATION

A. Identify each submittal uniquely.

B. Identify each submittal by specification Section number, submittal type, and submittal iteration.

C. The format for labeling the submittals shall be as follows:
   1. Section Number–Submittal Type Abbreviation–Submittal Iteration.
   2. Examples:
      a. First Product Data Submittal for section 261513: “261513-PD-00.”
      b. Revised Product Data Submittal for section 261513: “261513-PD-01.”
      c. Second Revised Product Data Submittal for 261513: “261513-PD-02.”

3.5 CONTENTS

A. General:
   1. Transmittal:
      a. Supply a dedicated transmittal for submittals for each individual Section.
      b. Itemize the specific submittals included by Section, submittal type, and iteration.
   2. Title Sheet:
      a. Include a separate title sheet with each submittal, of each type.
      b. Title sheets for each Section, for each submittal type, shall have the same appearance.
      c. Title sheets for product data submittals shall be 8-1/2 inches x 11 inches.
      d. Title sheets for drawings shall be the same size as the associated drawings.
      e. Create title sheets to have the appearance and information identified on the sample title sheet published at the end of this Section.
   3. Index:
      a. Include an index outlining and identifying the contents of the submittal.
      b. The index for drawing submittals shall be incorporated onto the title sheet of the corresponding drawing set.
   4. Checklists:
      a. Include the checklist(s) published in the Contract Documents corresponding to the type of submittal being supplied. Applicable checklists are found at the end of this Section and within individual Sections.
   5. Title Blocks:
      a. Drawing submittals shall be created on the Contractor’s, manufacturers, or vendor’s own title block. The title blocks of the Owner, Architect, Engineer, Design Professional or their Consultants shall not be reproduced on any document (electronic or hardcopy) that is prepared or altered by the Contractor.
   6. Legend:
      a. Drawing submittals shall include a legend of symbology.
   7. Resubmittals:
      a. Resubmittals shall include a replica of the reviewer’s comments that necessitated the resubmittal, along with an accompanying item-by-item explanation of the actions taken and changes that will be found within the resubmittal.

B. Quality Assurance:
   1. List of Subcontractors to be used on the Project along with a description of the role each shall play on the Project.
   2. The last six (6) projects that the Contractor (and each proposed Subcontractor) has completed that are of similar scope, size and contract value. References shall include:
      a. Owner’s name and current contact information.
b. Project address.
c. Description of the system(s) and scope of actual work performed.
d. Monetary contract value of the Work performed.

3. Financial Disclosure of the Contractor: Prior to contract award, upon request.

C. Product Data Submittals:
1. Bill of Materials (BOM):
   a. Separate list for each system:
      1) When a Section covers products for use in multiple systems, supply separate BOM for each unique system covered by the Section. Label each with the system name, space/room name, and room number.
   b. Include the following:
      1) Make, model, and description of each product.
      2) Quantity estimates for each product.
      3) Section paragraph number from which the product requirement is derived. Use drawing and detail references when the requirement is derived from the Drawings.
   c. Organize the BOM to follow the order in which products appear within the Section. Products shown on the Drawings but not enumerated within the Specifications shall be placed at the end of the list and include a reference to the Drawing from which the product requirement was derived.

2. Product Datasheets:
   a. Separate manufacturer datasheets for each product.
   b. Datasheets shall be manufacturer originals or first generation printed versions (i.e., from PDF) of the manufacturer’s official electronic datasheet:
      1) Distributor modified, distributor branded, and/or html based “web” datasheets are not acceptable.
      2) Datasheets shall include size and technical support data.
   c. Where manufacturer’s datasheets depict multiple products, versions and options, indicate via highlighting, underlining, or with bold visible arrows the model(s), version(s) and option(s) being supplied. Exact catalog number(s) shall be indicated.
   d. Each datasheet shall be labeled with the Section paragraph reference number. Datasheets shall include the Drawing reference when no specific paragraph reference exists within the Section.

D. Shop Drawing Submittals:
1. General:
   a. Drawing descriptions identify the required contents of common drawings required under the Contract.
   b. Drawings identified within individual Sections, along with any additional drawings deemed necessary by the Design Professional, are required.
   c. Drawing Scales:
      1) Floor plans shall be drawn to scale.
      2) Section drawings shall be drawn to scale.
      3) Elevation drawings shall be drawn to scale.
      4) Details of physical items shall be drawn to scale.
      5) Rack layouts and custom furniture and console drawings shall be drawn to scale.
      6) System drawings and schematic drawings shall be drawn 1:1 (no scale).
   d. Sizes:
      1) Sheet sizes shall match the size of the Contract Drawings sheets, except where otherwise expressly requested or approved in advance by the Design Professional.

2. Floor Plans:
   a. Location of system devices and faceplates.
   b. Primary and secondary system cabling pathway(s).
   c. Location of equipment racks.
d. Location of equipment-housing furniture.
e. Location of equipment enclosures.
f. Location of major system components.
g. Location of equipment that is Work of another Section to which Work interconnects.

3. Reflected Ceiling Plans:
a. Location of ceiling devices, coordinated with devices that are Work of others, and existing devices (where applicable).

4. System Diagrams:
a. Hybrid schematic / block wiring diagram.
b. System products depicted.
c. Product inputs, outputs and other ports depicted.
d. System cables depicted.
e. Product brand, model, description, options, and accessories declared.
f. Interconnections depicted between system products.
g. Interconnections depicted between system products and related system products.
h. Declaration of the cable types, including brand, model, description and color. An accurate cable key is acceptable.
i. Unique identification (e.g., number) assignment for each cable.
j. Cable color coding schema.
k. Termination typicals, keyed to diagram interconnections.

5. Custom Assemblies and Products:
a. Manufacturer.
b. Materials.
c. Finish and color(s).
d. Parts list.
e. Nomenclature sizes, colors.
f. Dimensions.
g. Schematic diagram(s), where applicable.

6. Mounting Details:
a. Depicting the materials and means of securing installed products.
b. Finishes and colors of exposed parts.

E. Training Submittals:
1. Proposed schedule.
2. Training agendas for each session.
3. Identification of personnel that will conduct training.
4. Handouts proposed for distribution during training.

F. Field Observation Reports Submittals:
1. Written responses to Field Observation Reports supplied to the Contractor during the course of the Project:
a. The response shall include a copy of the original Field Observation Report.
b. The response shall include detail of the corrective action taken, the date the action was taken and the identity of the individual who took the action.

G. Closeout Submittals:
1. Certificates of Final Inspection and Approval:
a. Furnish certificates of final inspection and approval prior to final acceptance of this branch of the work.
2. As-Built Drawings:
a. General:
   1) Requirements for Shop Drawings apply to “As-Built” drawings.
b. Required Drawings:
SUBMITTALS FOR ELECTRICAL SYSTEMS

1) Title Sheet.
2) Floor Plans.
3) Power Distribution Diagrams.
4) Labeling Schema.
5) As-built version of each Project shop drawing.
6) Coordination drawings and similar construction-related documentation.

c. Drawing Formats:
   1) Electronic Editable: Editable version using the native application used to create the file (e.g., Revit, AutoCAD, Star-Draw, Visio, VidCAD).
   2) Non-Editable: PDF file format.
   3) Printed Hardcopy.
   4) Sheets shall be the same size and feature consistent title block information in the lower-right corner.
d. Drawing Organization:
   1) Hardcopy drawings shall be bound together into logical sets, bound along the left edge of the sheets.
   2) The first page of the set shall include a detailed index and sheet-by-sheet description of each drawing sheet.

3. Operation and Maintenance Manuals:
   a. Manual Format:
      1) Hard-cover 3-ring type binder.
      2) Front clear plastic cover pocket complete with Project and system Information insert.
      3) Clear plastic spine pocket with Project and system Information insert.
      4) Binder sized to suit the contents only, neither oversized nor undersized.
      5) Maximum binder thickness: 3 inches.
   b. Manual Contents and Organization:
      1) General:
         a) Separate binder (or binder set) for each system, labeled. Provide no more than one system per binder (or binder set).
         b) Separate CD-ROM (or CD-ROM set) for each system, labeled. Provide no more than one system per CD-ROM (or CD-ROM set).
         c) Do not overfill. Binders shall not be filled beyond an easily usable capacity.
         d) Insert labeled tabs within binder to identify separate contents of the manual.
         e) Labeled sub-directories shall be created on the CD-ROM to label and separate contents for the manual.
      2) Project Information Cover:
         a) Title of Project.
         b) Name and address of Owner, Design Professional, Architect, Contractor of Record and Subcontractor.
         c) System name and specification references.
      3) Index:
         a) Contents of the manual.
      4) Warranty Statement:
         a) A warranty statement shall be included for each system. The warranty statement shall reiterate the terms of warranty identified within the Contract Documents, as well as identify how the Owner is to obtain warranty service.
         b) The warranty statement shall clearly identify which products are covered by Manufacturer warranties beyond the Contractor required minimum warranty period. The term of manufacturer warranty shall also be identified (e.g., 1 year parts and labor).
         c) A separate warranty statement shall be supplied for each system.
         d) Identify the date that the warranty for the system starts. This date shall be the date listed on the Certificate of Substantial Completion (if one was issued
to the contractor specifically for the system) or the date listed on the Notice of Final Completion.

e) Supply standard out-of-warranty service rates and service contact information.

5) Bill of Materials:
   a) List of products supplied.
   b) Serial numbers of each product.
   c) IP addresses of those products configured to have static IP addresses.
   d) MAC addresses of products featuring network communication ports (wired and/or wireless).
   e) Network device names for those products configured for DHCP.

6) Product Datasheets (supply only in the electronic version of Operation and Maintenance Manual):
   a) Manufacturer datasheets for each product supplied.

7) Manufacturer Owner / User Manuals:
   a) Manufacturer’s Owner’s or User’s manual for each product.
   b) Manufacturer’s Installation instructions and other documentation supplied with the product.

8) Spare and Replacement Parts Schedule:
   a) Complete spare parts schedule for components of equipment furnished, which are not factory generic information, but accurate for the equipment actually provided.
   b) Itemized list of each piece of mechanical equipment having electrical connections with circuit and panelboard locations; also list with each item related expendable equipment required such as fuse size and type, pilot lights, catalog numbers of fuses, overloads, etc. as applicable.
   c) Itemized list of each luminaire type with catalog number of replacement lamps, ballasts, trims, lenses and accessories.

9) Maintenance Procedures:
   a) Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

10) Function and Operating Descriptions:
    a) Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.

11) Operating Procedures:
    a) Manufacturer's printed operating procedures including start-up, break-in, normal operating instructions, regulation, control, stopping, shutdown, and emergency instructions.

12) Test Reports and Checklists:
    a) Test reports, checklists, and other forms generated and completed during the course of the Project.

13) Training Information:
    a) Photocopy of training outlines / agendas.
    b) Photocopy of training session handouts.
    c) Photocopy of training sign-in sheets.
    d) Photocopy of signed delivery receipt for each training session recording (applicable to those Sections/systems requiring recording).
    e) Separate CD-ROM (or CD-ROM set), labeled, for audio/video-recorded instructions to owner, for operations and maintenance for each system.

14) As-Built Drawings:
    a) The hardcopy manual shall contain reduced scale printed version (11x17) of system-specific drawings.
b) The electronic manual shall contain electronic PDF version of the as-built drawings.

15) Software (electronic manual only):
   a) Editable configuration files for system equipment.
   b) Software source code use in supplied products.
   c) Compiled versions of configuration files and source code.
   d) Software required for reviewing and editing supplied files.

### 3.6 QUANTITY

A. General:
   1. The quantity of submittals required shall be the greater of the following:
      a. Quantity identified within Division 01.
      b. Quantity identified within the individual Section.
      c. Quantity identified herein.
   2. In addition to the Contract required quantity, the Contractor shall also submit any additional quantities required for its own use and records, and for distribution to other trades.
   3. The Design Professional shall retain a copy of each submittal received. Others in the submittal communication chain may also retain copies.

B. Product Data Submittals:
   1. One (1) Hardcopy.
   2. One (1) Electronic.

C. Shop Drawings Submittals:
   1. One (1) Hardcopy.
   2. One (1) Electronic.

D. Training Submittals:
   1. One (1) Hardcopy.
   2. One (1) Electronic.

E. Field Observation Reports Submittals:
   1. One (1) Hardcopy.
   2. One (1) Electronic.

F. Samples Submittals:
   1. One (1) Hardcopy.
   2. One (1) Electronic.

G. Closeout Submittals:
   1. One (1) Hardcopy.
   2. One (2) Electronic.

### 3.7 REJECTION

A. The following items are representative reasons that submittals may need to be revised and resubmitted:
   1. Binding submittals for multiple Sections together.
   2. Failing to supply separate transmittal for submittals for each Section.
3. Failing to include a submittal title sheet.
4. Failing to use and accurately complete the published title sheet.
5. Failing to supply and accurately complete the submittal checklists.
6. Failing to supply product data and shop drawings at the same time.
7. Failing to include a detailed BOM with the product data.
8. Failing to supply product data sheets.
9. Failing to supply product data sheets with the correct product and required accessories enumerated.
10. Failing to supply shop drawings.
11. Failing to supply shop drawings with required information.
12. Failing to supply accurate information.
13. Failing to supply relevant information required by the Specifications.
14. Failing to supply products that are in compliance with the Specifications.
15. Failing to supply the required information in the required format.

3.8 RESUBMITTALS

A. Revise and Resubmit:
   1. When a submittal is rejected and flagged as “Revise and Resubmit,” the entire submittal shall be reviewed, revised and resubmitted in totality.
   2. Resubmittals shall be checked for compliance with the Contract Documents, inclusive of requirements for submittals. In addition, any comments and deficiencies identified by the reviewer shall be appropriately acted upon.

B. Exceptions Noted:
   1. When a submittal is flagged as “Exceptions Noted,” the specific actions identified shall be taken.
   2. If the reviewer’s comments include selective rejection of products, the resubmittal shall be limited to include those items commented upon.

C. Resubmittals shall:
   1. Include a copy of the reviewer’s previous comments.
   2. Include a written description of the action(s) taken.
   3. Be labeled chronologically.
   4. Be inclusive of all corrective action identified by the previous reviewer.

3.9 ELECTRONIC SUBMITTALS

A. Electronic submittals shall only be permissible where electronic submittals are expressly required and where express approval for such has been granted.

B. Electronic submittal files shall be compatible for opening and viewing with electronic PDF file readers that fully support and recognize the Adobe PDF Portable Document Format Standard.

C. Major text within the files shall be electronically searchable using the search-for-text features of current generation Adobe PDF reader software. Files shall be prepared in such manner that reviewers will have the option to search for and find words and phrases that appear within the document, electronically. Documents featuring raster-based text and text that is otherwise not searchable shall not be acceptable. This precludes the use of documents that have been electronically scanned and then converted to or embedded within an electronic file.
D. The organization, contents, and labeling of information along with other requirements for submittals apply also to electronic versions of the submittals.

E. Single File Submission:
1. Option 1 – Single File, PDF Format:
   a. Single PDF file submittals shall be assembled from a series of individual files that are organized, indexed, bound together as one composite file that is bookmarked to aid the reviewer in navigating the content.
   b. The file shall feature a navigational tree of contents, organized by content groups (e.g., Title Page, Index, BOM, Datasheets, Shop Drawings). Content groups shall be organized in the same relative order identified within the Contract Documents.
   c. Within each content group shall be the supporting elements of the group (e.g., product datasheets under the Datasheets group). Each element of the content group shall appear separately as a subordinate element of the group (e.g., separate entry for each product datasheet, separate entry for each shop drawing), and viewable from the navigational contents tree.
   d. Under the Datasheets content group, individual product datasheet entries shall be identified by Make/Brand and Model. Entries shall be organized in a sorted manner, first by make, then by model.
   e. If the resulting size of the composite PDF file exceeds 10 Megabytes, supply the submittal using the Single Zip File method instead, as described in this Section.
   f. The file name used to label the submittal shall be the section number followed by the submittal instance number for that Section (e.g., 1513-PD-01.pdf).
      1) Where the Design Professional directs the supply of multiple zip files for a submittal, add additional text to the file name to identify that the file is part of a multi-file set of submittals, as per the following examples:
         a) 261513-PD-01 (1 of 3).pdf
         b) 261513-PD-01 (2 of 3).pdf
         c) 261513-PD-01 (3 of 3).pdf

2. Option 2 – Single File, Zip Format:
   a. Single Zip File submittals shall be assembled from a series of individual PDF files and file directories that are contained with a single compressed WinZip compatible “.zip” file.
   b. The file shall contain separate top-level directories that are used to group related content (e.g., 00-Title Page, 01-Index, 02-BOM, 03-Datasheets, 04-Shop Drawings), with each directory appearing in the same relative order as that identified in the Contract Documents.
   c. Within each content group directory shall be separate PDF-compliant files featuring the information required (e.g., separate datasheet file for each product, separate file for each drawing, separate file for each BOM).
   d. Product datasheet files shall be named using a consistent naming convention that enables those files to appear sorted and grouped when the file is opened for navigation, viewing or extraction by the reviewer.
   e. Product datasheet files shall be consistently named with the make/brand of the product, followed by model number, followed by any additional information beneficial.
   f. Consult the Design Professional for supplement instructions should the WinZip file exceed 50 Megabytes in size.
   g. The file name used for the submittal shall be the section number followed by the submittal instance number for that Section (e.g., 1513-PD-01.zip).
      1) Where the Design Professional directs the supply of multiple zip files for a submittal, add text to the file name that identifies the file is part of a multi-file set as per the following examples:
a) 261513-PD-01 (1 of 3).zip
b) 261513-PD-01 (2 of 3).zip
c) 261513-PD-01 (3 of 3).zip

END OF SECTION
SHOP DRAWING CHECKLIST

SUBMITTAL TITLE SHEET
EXAMPLE

PROJECT TITLE:
Project Name Line 1
Project Name Line 2
Project Name Line 2

SUBMITTAL TYPE:
Product Data

SECTION SUBMITTAL NUMBER
260000-PD-00

SECTION TITLE:
Section Name

Date Prepared:
yyyy-mm-dd

CONTRACTOR OF RECORD:
Firm Name
Address 1
Address 2
City, State, Zip
Phone (000) 000-0000, Fax (000) 000-0000
Project Manager: Full Name
PM E-Mail: xxxxxxxx@xxxx.xxx

SECTION SUBCONTRACTOR(S):

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<thead>
<tr>
<th>Firm Name</th>
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</thead>
<tbody>
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</tr>
<tr>
<td>Fax (000) 000-0000</td>
<td>PM Name: Full Name</td>
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<tr>
<td>PM E-Mail: <a href="mailto:xxxxxxxx@xxxx.xxx">xxxxxxxx@xxxx.xxx</a></td>
<td>PM E-Mail: <a href="mailto:xxxxxxxx@xxxx.xxx">xxxxxxxx@xxxx.xxx</a></td>
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PRODUCT DATA SUBMITTAL

CHECKLIST

Each line below featuring text shall be supplied with an answer.

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<td>This submittal contains product data for one section only</td>
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</table>

This checklist serves as simple and abbreviated reminder of the contents and format of the aforementioned submittal. Refer to the 260503 "Submittals for Electric" and each specific Section for additional submittal requirements. Submittals are subject to rejection if this checklist is not accurately completed and supplied along with the specified information. Reproduce this checklist and submit with each submittal for each Section.
SECTION 26 0505
EXISTING CONDITIONS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Perform a detailed pre-bid walk-through field inspection to review the existing structures and premises, to determine existing conditions, and to determine scope of required electrically related work. Include applicable accessible ceiling cavity areas in this inspection.

B. It is not the intent of this section, or of drawings, that existing conditions be accurately shown. Existing electrical work is shown to a very limited extent on drawings and is shown for general planning reference only. Locations and information were derived from cursory visual observations or from portions of documents that were prepared for previously installed work (not from record drawings or "as-builts").

C. Do not reuse removed electrical materials unless specifically indicated in project manual or on drawings. Existing wiring systems may be utilized only to the extent indicated in project manual, or on drawings, or as directed by Owner's representative in field.

D. Hold routing of new raceways in existing buildings as tightly as possible to the structure above. Obtain approval of owner's representative prior to installation.

E. If required to accommodate construction related activities temporarily remove, store in protected location on site, and reinstall conflicting electrical equipment, luminaires, or devices that are to remain or to be relocated.

F. The following applies to electrical materials that will remain or be reused under this project.
   1. Protect during construction activities.
   2. Clean and re-lamp luminaires immediately prior to occupancy of the finished construction area.
   3. Clean and service (if service is required) equipment in the construction area immediately prior to occupancy of the area.

1.2 AFFECT ON ADJACENT OCCUPIED AREAS

A. Maintain existing electrical service and feeders to occupied areas and operational facilities, unless otherwise indicated, or when authorized otherwise in writing by owner’s representative. Provide temporary service during interruptions to existing facilities. Schedule momentary outages when necessary for replacing existing wiring systems with new wiring systems. When that "cutting-over" has been successfully accomplished, remove related wiring that has been abandoned.

B. Carefully coordinate work and system shutdowns in advance with owner's representative, and with affected trades so that normal building activities and other construction trades are minimally affected. Perform electrically related construction work, which will affect an occupied area (including those which are located outside the immediate area of project work) at special times as directed by owner's representative in field.
C. Provide work in a manner that ensures existing systems and components remain fully operational in occupied spaces during occupied periods.

D. Provide and maintain temporary partitions and dust barriers adequate to prevent the spread of dust and dirt to adjacent finished areas and other system components. Protect adjacent installations during cutting and patching operations. Remove protection and barriers after demolition operations are complete.

1.3 EXISTING POWER DISTRIBUTION EQUIPMENT

A. This subsection applies for adding components to existing power distribution equipment.

B. Unless specifically indicated otherwise on drawings or in specifications provide new breaker in instances where new circuits or feeders are shown connected to existing circuit breaker type power distribution equipment.
   1. Provide factory-assembled, molded-case circuit breakers of frame sizes, characteristics, and ratings including RMS symmetrical interrupting ratings required. Provide breakers with permanent thermal and instantaneous magnetic trip, and with fault-current limiting protection, ampere ratings as indicated. Construct breakers for mounting and operating in any physical position, and operating in a minimum ambient temperature of 40 deg C. Provide breakers with mechanical screw type removable connector lugs, AL/CU rated. All branch circuit breakers shall be full ambient compensated thermal magnetic molded case with quick-make and quick-break action and positive handle trip indication, both on manual and on automatic operation.
   2. Breakers shall be of the over-the-center toggle operating type with the handle going to a position between "on" and "off" to indicate automatic tripping. All circuit breakers shall be full size. Do not use “tandem” or "split" breakers. All multi-pole breakers shall have internal common trip with all load side box lugs of one breaker in the same gutter. All circuit breakers shall have sealed cases to prevent tampering.
   3. All 15 and 20 ampere branch circuit breakers shall be UL Listed as SWD (switching duty). All 15-70 ampere branch circuit breakers shall be HACR Type. All branch circuit breakers serving all ballasted (fluorescent/HID) lighting loads shall be HID rated. Provide handle lock-on devices of the non-padlocking type for life safety, special systems and other essential circuits.

C. Provide components that are manufactured by the same manufacturer as the existing equipment in which they will be installed, and that are intended by the manufacturer to be installed in said equipment. Provide components with fault current (A.I.C.) ratings that meet or exceed the ratings of the existing power distribution equipment.

D. Update and fill out the panelboard’s circuit directory card upon completion of installation work. Directories shall be neatly typewritten. All panelboard directories shall include the actual room names/numbers that are selected for interior signage/designation.

E. All specific scheduling shown on drawings is shown to indicate new branch circuiting requirements. Exact numbering sequence of circuits shall be determined by this contractor in field after this contractor has performed final balancing.

F. Determine which existing branch circuits must remain active. Reconnect (or maintain in operation as applicable) and schedule them. Completely re-type panelboard directories for panelboards affected by this project using accurate “as-built” information. Where applicable for multi-wire branch circuits that are reused to feed new or replacement equipment designated on drawings, replace existing single-pole breakers with multi-pole breakers compliant with NFPA 70. Where applicable ensure that reconnected
shared neutrals are properly balanced with the correct phase conductors. Where applicable, provide correct color-coding for insulation of reconnected conductors in a manner compliant with NEC.

1.4 PRE-EXISTING CODE VIOLATIONS

A. Inspect existing electrical work in areas accessed under this project and bring into compliance with current NEC. This applies only to the extent that such work is uncovered in the immediate project areas affected by construction activities, and only to the limited extent that it applies to pre-existing general installation methods such as missing J.B. plate, open J.B. knockout, minor conduit re-anchoring and minor exposed wiring/connections.

B. If more extensive code or safety violations are discovered, immediately bring them to the attention of the Owner's representative (detailed in writing) along with proposed cost for corrections and impact (if any) on the construction schedule.

1.5 DEMOLITION

A. Where the term “demolition” is used herein, interpret it to mean “demolition” or “selective demolition” as applicable.

B. Provide electrical demolition work as required to accommodate project demolition and as required to accommodate new construction.

C. Disconnect and remove work to be abandoned, and as required to accommodate work of other trades, in areas affected by this project unless specifically noted otherwise on plans or determined otherwise during pre-demolition survey.

D. Remove accessible abandoned, inactive and obsolete raceway systems. Remove abandoned, inactive and obsolete wiring and controls. Remove abandoned, inactive and obsolete equipment, luminaires and devices. Abandoned raceways embedded in floors, walls, and ceilings may remain if such materials do not interfere with new installations. Remove abandoned electrical materials above accessible ceilings.

E. Remove related abandoned unused raceway back to the nearest respective “upstream” junction box that remains active even if outside of the confines of the project area.

F. Remove abandoned unused wiring back to its source even if sources are outside the confines of the project area.

G. Extend raceway and wiring as required to accommodate new or relocated electrical work.

H. Locate, identify, and protect electrical services passing through demolition areas and serving other areas outside the demolition limits. Maintain services to areas outside demolition limits. When services must be interrupted, install temporary services for affected areas.

I. It is recognized that there may be some conduit systems rendered inactive by demolition, causing disconnection of "downstream" outlets, etc. Investigate these types of conditions (for all systems) prior to demolition. Provide necessary corrective electrical work prior to demolition to ensure that such
"downstream" devices remain permanently active throughout demolition, during new construction, and after project completion.

J. Perform cutting and patching required for demolition.

K. Coordinate work carefully with owner prior to beginning electrical demolition work.

L. Maintain (or reconnect if applicable) remaining wiring.

M. Remove and relocate wiring, devices, conduit, etc. that conflict with construction related work of other trades as necessary to accommodate new work of respective trade.

N. Provide electrical disconnections, and reconnections where applicable, for equipment to be removed (or relocated) by other trades.

O. Existing branch circuit and systems conduit, not conflicting with new construction and not conflicting with overhead or ceiling cavity requirements, may be re-used at the discretion of the electrical installer after all abandoned conductors and cables have been removed from them. Do not exceed NEC required conduit fill and do not install wiring fed from different sources in common conduit (see Section 26 05 33).

P. Refer to owner’s representative for disposal instructions for abandoned electrical materials removed during demolition and thereafter. Neatly store electrical materials that the Owner elects to retain at the site as designated by the owner's representative. Legally dispose of materials that the Owner elects not to retain.

Q. Disconnect and remove electrical materials designated for salvage (removal and reuse, or for turning over to Owner) undamaged. Disconnect and remove wiring and "whips" from equipment terminal points.

R. Clean components to be reused inside and out, and reinstall where indicated on drawings. Modify and extend related existing wiring in conduit accordingly.

S. Carefully transport salvaged electrical materials to a protected on-site storage location as directed in field and neatly store them grouped by system type.

END OF SECTION
SECTION 26 0519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

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. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Acceptable Manufacturers: Subject to being equivalent and subject to compliance with requirements, provide product by one of the manufacturers listed below. If not listed, submit as substitution.
   1. Alcan Products Corporation; Alcan Cable Division.
   2. Alpha Wire.
   3. Belden Inc.
   5. General Cable Technologies Corporation.
   7. American Insulated Wire Corp
   8. Carol Cable Co., Inc

B. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658. Refer to Part 3 of this section for allowable types specific to this project.

C. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658. Refer to Part 3 of this section for allowable types specific to this project.

2.2 CONNECTORS AND SPLICES

A. Acceptable Manufacturers: Subject to being equivalent and subject to compliance with requirements, provide product by one of the manufacturers listed below. If not listed, submit as substitution.
1. AFC Cable Systems, Inc.
2. Gardner Bender.
4. Ideal Industries, Inc.
5. Ilsco; a branch of Bardes Corporation.
6. NSi Industries LLC.
7. O-Z/Gedney; a brand of the EGS Electrical Group.
8. 3M; Electrical Markets Division.
10. Square D, a Schneider Electric Company
11. Thomas & Betts
12. Arrow-Hart Div, Crouse-Hinds Co

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated. Use connectors with temperature ratings equal to or greater than those of the wires upon which used.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Provide wire, cable and connectors suitable for the temperature, conditions and location where installed.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Stranded Copper.

B. Branch Circuits: Stranded conductors.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Provide conductor insulation rated at 600VAC and 90 degrees C.

B. Provide THHN/THWN insulation for conductors size 500 kcmil (MCM) and larger, and for conductors #8 AWG and smaller. Provide THW or THHN/THWN insulation for other sizes as appropriate for the locations where installed.

C. Provide XHHW-2 insulation for wiring below grade and for wiring subject to moisture conditions.
3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Provide grounded ("neutral") conductor in all lighting control device (switch, dimmer, occupancy sensor, etc.) wall outlet boxes, even if not immediately used.

B. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

C. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

D. Use manufacturer UL approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

E. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

F. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

G. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

H. Install wire in raceway unless specifically permitted otherwise in this specification section, under other Division 26 sections, or on electrical drawings.

I. Provide dedicated parity sized neutral conductor for each branch circuit phase conductor fed from 15 ampere and 20 ampere branch circuit breakers.

J. Provide grounded ("neutral") conductor for all multi-pole feeders. Provide grounded ("neutral") conductor(s) for all multi-pole feeders and branch circuits unless this contractor determines in field that the affected load(s) will never have need for a grounded ("neutral") conductor and NEC does not mandate otherwise.

K. Provide grounded ("neutral") conductor in all lighting control device (switch, dimmer, occupancy sensor, etc.) wall outlet boxes, even if not immediately used.

L. Connect wires #6 AWG and larger to panels and apparatus by means of approved lugs or connectors large enough to enclose all strands of the conductors. Provide solderless type connectors.

M. Do not pull wire until raceways are complete, plastering is complete, and raceways are free of moisture. Install joints and splices only at NEC approved panels, accessible junction boxes, or accessible outlet boxes. Pull conductors simultaneously where more than one is being installed in same raceway. Use UL listed pulling compound or lubricant, where necessary to prevent damage to conductors. Use pulling means, including fish tape, cable, rope, and basket weave wire/cable grips that will not damage cables and raceways. Do not use rope hitches for pulling attachment to wire or cable. Conceal work in finished spaces.
N. Neatly dress work. Install work parallel and perpendicular to surfaces and exposed structural members, and follow surface contours where possible. Keep conductor splices to minimum. Install splice and tap connectors that possess equivalent, or better, mechanical strength and insulation rating than conductors being spliced. Use splice and tap connectors that are compatible with conductor material. Install wires continuous from outlet to outlet. Provide insulation value of joints at least 100 percent in excess of wire. Provide adequate length of conductors within electrical enclosures, and train the conductors to terminal points with no excess. Bundle multiple conductors, with conductors larger than #10 AWG cabled in individual circuits. Make terminations so there is no bare conductor at the terminal.

O. Derate cables per NFPA 70 where bundled, where passing through insulation, and where otherwise required to be compliant with NFPA 70 based on field conditions and/or means and methods that will be used.

P. Derate conductors per NFPA 70 where required based on quantities of conductors within raceways, and where otherwise required to be compliant with NFPA 70 based on field conditions and/or means and methods that will be used.

Q. Provide factory splice kits (U.L. approved for submersion in water and direct burial) for wire splicing in outdoor grade, or slab on grade, junction boxes and for all other wet locations.

R. Type AC/MC cable may be utilized only if NEC approved and if approved by local authority having jurisdiction and if included in the limited applications defined below.
   1. Provide for final connections to luminaires that are installed in accessible tile ceiling systems (limited to 6’ maximum in length and limited to “whips” from building electrical system junction boxes down to luminaires). Do not install Type AC/MC cable from fixture to fixture unless a special properly listed and labeled UL approved system is specifically indicated.
      a. Install wiring for emergency system circuits in steel conduit, no exceptions.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. If manufacturer’s torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 8 inches of slack.

D. Provide complete assembly of materials for each type of required electrical connection, including but not limited to, pressure connectors, terminal (lugs), electrical insulating tape, heat shrinkable insulating tubing, cable ties, solderless wire-nuts, and other items and accessories as needed to complete splices and terminations of types indicated.

E. Unless otherwise indicated, provide wires/cables (conductors) for electrical connections that match, including sizes and ratings, of wires/cables that are supplying electrical power. Provide copper conductors with conductivity of not less than 98% at 90 degrees C.

F. Provide electrical connectors and terminals that mate and match, including sizes and ratings, with equipment terminals, and that are recommended by equipment manufacturer for intended applications.
G. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Mate and match conductors of electrical connections for proper interface between electrical power supply and installed equipment. Cover splices with electrical insulating material to achieve insulation at least 100 percent in excess of electrical insulation rating of those conductors being spliced. Prepare cables and wires, by cutting and stripping covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes which will remain on conductors. Do not "ring" copper conductors while skinning wire.

H. There may be cases where circuit or feeder conductor sizes are too large or too small to fit into the lugs normally supplied with the power distribution equipment or end-use equipment, due to circumstances such as increasing conductor sizes to offset voltage drop, unusual breaker frame sizes, type of conductors used, etc. In such cases provide appropriate factory lug kits for affected equipment if recommended by manufacturer; elsewhere provide insulated butt-splices with tails sized to fit respective lugs.

I. Ground metal frames of portable and stationary direct-wired electrically operated equipment by connecting frames to the circuit equipment grounding conductor and to grounded metal raceway. Provide necessary electrical connections between the specified equipment and junction boxes, disconnect switches, and starters near equipment with flexible metallic conduit and matched connectors. Do not expose flexible conduit in finished areas.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 CONDUCTOR SIZING

A. Conductor sizes indicated are based on copper unless specifically indicated otherwise on single-line diagram on drawings.

B. Provide minimum #12 AWG conductor size.

C. Provide the following minimum wire sizes based on distances from panel to first device of a 15 or 20 ampere general lighting or receptacle branch circuit. In addition to upsizing conductors as required for voltage drop, provide minimum #10 AWG conductors to the last device for branch circuits more than 150 feet in length.

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<th>Distance</th>
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<td>Up to 60 feet</td>
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<tr>
<td>61 to 90 feet</td>
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<td>91 to 150 feet</td>
<td>#8</td>
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<tr>
<td>151 to 240 feet</td>
<td>#6</td>
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</table>
D. Provide the following minimum AWG conductor sizes for general branch circuiting that are not indicated on drawings, based on using copper conductors. Where applicable increase as required to accommodate voltage drop and to accommodate special conditions. Do not derate any grounded (neutral) conductors. Temperature ratings listed below pertain to both wire and terminations.

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<th>Source Breaker/Fuse</th>
<th>AWG Wire Size</th>
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</tr>
<tr>
<td>100 Ampere</td>
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<td>#8</td>
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</table>

3.7 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 “Sleeves and Sleeve Seals for Electrical Raceways and Cabling.”

3.8 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 “Penetration Firestopping.”

END OF SECTION
Submittal Form – 260519.00 – Low-Voltage Electrical Power Conductors And Cables
Provide And Complete This Sheet And Submit As A Cover Sheet For Submittals Requested Within This Section.

Electrical Contractor: _______________________ Electrical Supplier: _______________________

Electrical Contractor Rep: ________________ Electrical Supplier Rep: ________________

Electric Contractor Ph. Number: _____________ Electric Supplier Ph. Number: _____________

Electric Contractor Rep Email: _________________ Electric Supplier Rep Email: _________________

Submitted Conductor Manufacturers (List Conductor Type And Manufacturer):
__________________________________________________________________________________
__________________________________________________________________________________

Submitted Cable Manufacturers (List Cable Type And Manufacturer):
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________

Yes ☐ No ☐
Manufacturers Listed As Basis Of Design Or Listed Equivalent Manufacturers?
If No, Explain ________________________________________________________________

Yes ☐ No ☐
Manufacturers’ Qualifications Meet Or Exceed Those Required Under Quality Assurance Section
Within This Specification?
If No, Explain ________________________________________________________________

Yes ☐ No ☐
Manufacturers’ Warranty Meets Or Exceeds The Warranty Period Specified Within This Specification?
If No, Explain ________________________________________________________________

Yes ☐ No ☐
Submitted Components Meet All Requirements Listed Within This Specification?
If No, Explain ________________________________________________________________

Yes ☐ No ☐
Type Ac/Mc Cable Includes Continuous Length Of Spirally Wound, Interlocked Zinc Coated Or
Galvanized (Inside And Outside) Strip Steel?
If No, Explain ________________________________________________________________

Yes ☐ No ☐
Type Ac/Mc Cable Includes Parity-Sized Insulated Equipment Grounding Conductor?
If No, Explain ________________________________________________________________
SECTION 26 0526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Grounding systems and equipment.

1.2 RELATED DOCUMENTS

A. Division 27, Section 270526.00 “Grounding and Bonding for Communications” for communications grounding busbars and conductors.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.


PART 2 - PRODUCTS

2.1 MATERIALS

A. Except as otherwise indicated, provide copper electrical grounding and bonding systems and materials with assembly of materials including but not limited to cables/wires, connectors, solderless lug terminals, grounding electrodes and plate electrodes, bonding jumper braid, and additional accessories needed for a complete installation. Where materials or components are not indicated, provide products that comply with NEC, UL, and IEEE requirements, and with established industry standards for those applications indicated. Utilize compatible metallic materials throughout system to eliminate galvanic action.
B. Acceptable Manufacturers: Subject to being equivalent and subject to compliance with requirements, provide conductors and connectors as specified in Section 260519. Subject to being equivalent and subject to compliance with requirements, provide other grounding related materials by Erico (as a standard of quality), or other equivalent available manufacturers where not otherwise specified in Division 26.

2.2 CONDUCTORS

A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

2.3 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel (copper molecularly bonded to nickel-sealed high-strength steel core); 3/4 inch in diameter by 10 feet in length. Sectional rods may be used when rods are longer than 10 feet.

B. Copper Plates: Sheet copper plate electrodes that are 20-gage by 36" by 36", made from high-conductivity sheet, with cable attachments (minimum quantity of 2), sized for cables as necessary to fulfill project grounding requirements.

2.5 INSPECTION WELLS

A. Provide inspection well for each connection to underground grounding electrodes.
1. In paved areas provide inspection well equal to Erico Eritech Inspection Well 416D or 416F series depending on application, with the following characteristics.
   a. Constructed of polymer concrete.
   b. 10,000 lb. load rating.
   c. Bolt-down cover.
   d. Skid-resistant surface.
   e. Gray color.
   f. “Ground” embossed in the lid.
2. In unpaved areas provide inspection well equal to Erico Eritech Inspection Well 416B or 416C series depending on application, with the following characteristics:
   a. Constructed of high density polyethylene.
   b. Acid and chemical resistant.
   c. Green or black color.
   d. “Ground” embossed in the lid.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum. Where to be installed underground, bury at least 36 inches below grade.

C. Grounding Conductors in corrosive areas: Install tinned copper conductor, No. 2/0 AWG minimum. Where to be installed underground, bury at least 36 inches below grade.

D. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
   2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
   3. Connections to Ground Rods at Test Wells: Minimum two hole bolted connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors as required by NFPA 70 and as otherwise required. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
   1. All feeders.
   2. All branch circuits.
   3. Flexible raceway runs.

B. Lighting Standards Supporting Outdoor Lighting Fixtures: Provide grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

C. Grounding Requirements for Additions to Existing Structures
   1. Equalize (bond together) ground potentials associated with the electrical distribution system, separately derived systems, and steel structural related systems of new additions and existing structures. Bond together new structural steel (including re-bars) for full electrical continuity and for full potential equalization. Include the bonding of new structural steel to existing structural steel that is rendered accessible under this project.
   2. For building additions/expansions with steel structural related systems, bond every new perimeter column to adjacent existing columns of existing structures. Provide an earth ground at every other new column in the north/south direction, and every other new column in the east/west direction. Provide a minimum surface contact area of 8 square inches, bolted or welded securely to clean areas of the steel, for structural steel bonding plates. Bond new structural steel (including re-bars) to the service entrance ground for full electrical continuity and for full potential equalization.
   3. Provide a grounding electrode for each new steel column that extends down to grade level for vertical building additions/expansions that have steel structural systems. Attach ground terminals to such structural steel columns at the lowest available point.

3.4 LABELING

A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.
   1. Label Text: "GROUND SYSTEM - If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:
   1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
   2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
   3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Make tests at ground rods before any conductors are connected.

B. Measure and report measured ground resistances that exceed 3 ohms.

END OF SECTION
Grounding And Bonding For Electrical Systems

Provide And Complete This Sheet And Submit As A Cover Sheet For Submittals Requested Within This Section.

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<tr>
<th>Electrical Contractor: ___________________</th>
<th>Electrical Supplier: ___________________</th>
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<td>Electrical Contractor Rep: _______________</td>
<td>Electrical Supplier Rep: _______________</td>
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<tr>
<td>Electric Contractor Ph. Number: ____________</td>
<td>Electric Supplier Ph. Number: ____________</td>
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<tr>
<td>Electric Contractor Rep Email: _______________</td>
<td>Electric Supplier Rep Email: _______________</td>
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</table>

Submitted Manufacturers:

| Busbars: ____________________________________________________________ |
| Conductors: _________________________________________________________ |
| Connectors: _________________________________________________________ |
| Electrodes: _________________________________________________________ |
| Inspection Wells: _________________________________________________ |

Manufacturers Listed As Basis Of Design Or Listed Equivalent Manufacturers?

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If No, Explain ________________________________________________________

Managers’ Qualifications Meet Or Exceed Those Required Under Quality Assurance Section Within This Specification?

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If No, Explain ________________________________________________________

Manufacturers’ Warranty Meets Or Exceeds The Warranty Period Specified Within This Specification?

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If No, Explain ________________________________________________________

Submitted Components Meet All Requirements Listed Within This Specification?

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If No, Explain ________________________________________________________
SECTION 26 0533
RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Metal conduits, tubing, and fittings.
   2. Nonmetal conduits, tubing, and fittings.
   3. Metal wireways and auxiliary gutters.
   4. Nonmetal wireways and auxiliary gutters.
   5. Surface raceways.
   7. Handholes and boxes for exterior underground cabling.

B. Related Requirements:
   1. Section 26 05 53.00 “Identification for Electrical Systems” for raceway related identification requirements.

1.3 DEFINITIONS

A. EMT: Electric metallic tubing.

B. FMC: Flexible metallic conduit.

C. GRC: Galvanized rigid steel conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquid-tight flexible metallic conduit.

F. RNC: Rigid nonmetallic conduit.

G. Types of electrical boxes and fittings specified in this section include the following:
   1. Outlet boxes.
   2. Junction boxes.
   3. Pull boxes.
   5. Locknuts.
1.4 **ACTION SUBMITTALS**

A. Refer to Section 260503, Submittals for Electrical Systems.

B. Product Data: For surface raceways, wireways and fittings, boxes, hinged-cover enclosures, and cabinets.

C. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

D. Samples: For wireways, nonmetallic wireways, and surface raceways and for each color and texture specified, 12 inches long. Furnish samples if requested by Owner’s representative.

1.5 **INFORMATIONAL SUBMITTALS**

A. Refer to Section 260503, Submittals for Electrical Systems.

---

**PART 2 - PRODUCTS**

2.1 **METAL CONDUITS, TUBING, AND FITTINGS**

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
3. Anamet Electrical, Inc.
4. Electri-Flex Company.
5. O-Z/Gedney; a brand of EGS Electrical Group.
6. Picoma Industries, a subsidiary of Mueller Water Products, Inc.
7. Republic Conduit.
8. Robroy Industries.
10. Thomas & Betts Corporation.
11. Western Tube and Conduit Corporation.
12. Wheatland Tube Company; a division of John Maneely Company.
13. Steel city.
15. Efcor.
16. LTV.
17. Carlon.
18. Cantex.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering interior outlet box products that may be incorporated into the Work include, but are not limited to, the following:

1. Adalet.
2. Appleton Electric.
5. Eagle Electric Mfg Co., Inc.
6. Midland-Ross Corp.
7. OZ/Gedney.
8. Pass and Seymour, Inc.
9. RACO.
11. Thomas & Betts Co.
12. Thepitt.
13.

C. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. GRC: Comply with ANSI C80.1 and UL 6.
1. Provide zinc coating fused to inside and outside walls of conduit.

E. IMC: Comply with ANSI C80.6 and UL 1242.

F. EMT: Comply with FS WW-C-563, ANSI C80.3 and UL 797.

G. FMC: Comply with FS WW-C-566 and UL 1; zinc-coated steel.
1. Provide flexible metal conduit formed from continuous length of spirally wound, interlocked zinc-coated or galvanized (inside & outside) strip steel. Provide conduit fittings for use with flexible steel conduit of threadless hinged clamp type, with insulated throats. Provide Straight Terminal Connectors consisting of one piece body, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end with locknut. Do not use 45 degree or 90 degree Terminal Angle Connectors for flexible or water-tight flexible metal conduit in locations that will not be fully accessible after completion of construction. Provide full size green insulated ground wire for all applications, regardless of length.

H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
1. Provide liquid-tight flexible metal conduit formed from continuous length of spirally wound, interlocked, double-wrapped galvanized (inside & outside) strip steel. Provide liquid-tight jacket of flexible polyvinyl chloride (PVC). Provide smooth-wall type jackets (not a corrugated look) for finished area furniture whip (and similar) applications. Provide Liquid-Tight Flexible Metal Conduit Fittings compliant with FS W-F-406, Type 1, Class 3, Style G. Provide cadmium plated, malleable iron fittings with compression type steel ferrule and neoprene gasket sealing rings, with insulated throat. Provide Straight Terminal Connectors that are one piece body, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end with locknut. Provide Terminal Angle Connectors that are 45 degree or 90 degree two-piece body construction with removable upper section, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut. Do not use 45 degree or 90 degree Terminal Angle Connectors for flexible or water-tight flexible metal conduit in locations that will not be fully accessible after completion of construction. Provide full size green insulated ground wire for all applications, regardless of length.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Fittings for EMT:
   a. Material: Steel.
   b. Type: Compression or set screw.
   c. Note: Provide galvanized or zinc-coated concrete-tight fittings. Do not use die-cast fittings.
2. Fittings for GRC:
   a. Material: Steel.
   b. Type: Threaded (galvanized or zinc coated after threading.)
3. Expansion Fittings: Material to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Provide terminal conduit fittings with insulated throats, or plastic bushings for conduits 2" and larger where insulated throats may not be readily available.
5. Provide locknuts for securing conduit to metal enclosure with sharp edge for digging into metal, and ridged outside circumference for proper fastening. Provide screw type grounding terminal for metal bushings of standard or insulated type.
6. Provide miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split couplings, and plugs that are specifically designed for their particular application.
7. Provide galvanized cast-metal (steel) conduit bodies of types, shapes and sizes as required to fulfill job requirements and NFPA 70 requirements. Construct conduit bodies with threaded-conduit-entrance ends, with removable covers, either cast or of galvanized steel, and with corrosion-resistant screws.

J. Joint Compound for Threaded Conduit: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Cooper B-Line, Inc.
   2. Hoffman; a Pentair company.
   4. Square D; a brand of Schneider Electric.
   5. Steel city.
   6. T&B.
   7. Regal.
   8. Efcor
   10. Allied.
   11. LTV.
   12. Carlon.
   13. Cantex.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 for indoor applications and Type 3R for outdoor applications unless otherwise indicated, and sized according to NFPA 70.
   1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Provide electrical wireways of types, grades, sizes, and number of channels for each type of applicable service.
   3. Provide lay-in wireways with hinged covers in accordance with UL 870, and with components UL-listed, including lengths, connectors, and fittings. Provide units that allow fastening of hinged cover closed without use of parts other than standard lengths, fittings and connectors. Provide units capable of sealing cover in closed position with sealing wire. Provide wireways with knockouts.
4. Provide wireway connectors suitable for "lay-in" conductors, with connector covers permanently attached so that removal is not necessary to utilize the lay-in feature. Provide NEMA 3R units where used outdoors or in areas subject to moisture.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Screw-cover type for indoor applications and Flanged-and-gasketed type for outdoor applications unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish. Protect sheet metal parts with rust inhibiting coating and baked enamel finish. Provide plate-finished hardware to prevent corrosion. Protect screws installed toward inside of wireway, with spring nuts to prevent wire insulation damage.

2.3 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways and service poles (“tele-power poles”) shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect or Prime coated, ready for field painting, architects choice.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Mono-Systems, Inc.
   b. Panduit Corp.
   c. Wiremold / Legrand
   d. Steel city
   e. T&B
   f. Regal
   g. Efcor
   h. Wheatland
   i. Allied
   j. LTV
   k. Carlon
   l. Cantex
   m. Wiremold / Legrand

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Adalet
2. Cooper Technologies Company; Cooper Crouse-Hinds
3. EGS/Appleton Electric
4. Erickson Electrical Equipment Company
5. FSR Inc.
6. General Electric Company
7. Hoffman; a Pentair company
8. Hubbell Incorporated; Killark Division
9. Kraloy
10. Milbank Manufacturing Co.
11. Mono-Systems, Inc.
12. O-Z/Gedney; a brand of EGS Electrical Group
13. RACO; a Hubbell Company
14. Robroy Industries
15. Siemens/ITE
16. Spring City Electrical Manufacturing Company
17. Square D Company
18. Stahlin Non-Metallic Enclosures; a division of Robroy Industries
19. Tay-Mac
20. Thomas & Betts Corporation
21. Westinghouse/Cutler-Hammer
22. Wiremold / Legrand

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
   1. Provide galvanized-coated flat rolled code-gage non-gangable sheet-steel outlet/junction/pull boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations.
   2. Construct outlet boxes with mounting holes and with cable and conduit-size knockout openings in bottom and sides where applicable. Provide boxes with threaded screw holes, with corrosion-resistant cover and grounding screws for fastening surface and device type box covers, and for equipment type grounding.
   3. Provide outlet box accessories as required for each installation, including box supports, mounting ears and brackets, wallboard hangers, box extension rings, fixture studs, cable clamps, and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used to fulfill installation requirements for individual wiring situations. Provide with stainless steel nuts, bolts, screws and washers.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box and shall extend to the finished wall surface.
J. Bushings, knockout closures and locknuts:
   1. Provide corrosion-resistant box knockout closures, conduit locknuts and malleable iron conduit bushings, offset connectors, of types and sizes, to suit respective installation requirements and applications.

K. Device Box Dimensions: 4 inches square by 1-1/2 inches deep or 4 inches square by 2-1/8 inches deep, depending on device depths and wiring fill, with single-gang plaster/mud rings where only one device is being installed. Provide wider boxes for applications where more than two devices will be installed. Provide internal metal dividers where required under NFPA 70 for varying voltages, multiple circuits, etc..

L. Gangable boxes (using multiple single-gang boxes to assemble multi-gang boxes) are prohibited.

M. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 for indoor applications and Type 3R for outdoor applications with continuous-hinge cover with flush latch unless otherwise indicated.
   1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
   2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

N. Weathertight outlet boxes and covers:
   1. Provide corrosion-resistant weathertight/raintight outlet wiring boxes, of types, shapes and sizes, including depth of boxes, with threaded conduit holes for fastening electrical conduit, suitably configured for each application, including face plate gaskets and corrosion-resistant plugs and fasteners. Provide weathertight outlets for interior and exterior locations exposed to weather or moisture.
   2. Provide weatherproof covers that mount on a single gang horizontal or vertical (depending on application) junction box to ensure weather protection for a standard outlet. Provide covers that can mount on indoor or outdoor junction boxes and that include a weatherproof cover/base assembly with gasket, two universal inserts, and mounting hardware. Provide weatherproof cover that provides flexibility in installation. Provide covers that meet or exceed UL requirements for wet locations while in use, that meet requirements of NFPA 70 Article 410-57(b), and are NEMA 3R rated. Provide weatherproof cover constructed of UV stabilized high impact polycarbonate material. Provide clear cover for the part that encloses the cord set, to allow visual inspection. Provide cover that meets agency requirements for cold impact at negative 60 degrees Fahrenheit (negative 51 degrees C). Provide covers with useable inside depth to accommodate plug head. Provide assemblies for outdoor applications, unless indicated otherwise on drawings, and for indoor applications that serve permanent or extended-use cord & plug load connected equipment.
   3. Provide minimal profile assemblies that rated NEMA 3R While In Use and that employ recessed box and cover design, equal to Thomas & Betts “Red Dot” series. Provide trim color(s) as directed by Architect.
   4. Where shown indoor at switches or outlets to provide visual deterrence from being used by unauthorized personnel, provide conventional cast aluminum or cast zinc cover plate units and paint to match surrounding wall surfaces.

O. Cabinets:
   1. NEMA 250, Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
   2. Hinged door in front cover with flush latch and concealed hinge.
   3. Key latch to match panelboards.
   4. Metal barriers to separate wiring of different systems and voltage.
   5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed, Not Subject to Physical Damage: GRC or IMC or EMT .
   2. Exposed and Subject to Physical Damage: GRC. Raceway locations include the following:
      a. Loading dock
      b. Areas where driven/ridden mechanized equipment is operated
   3. Concealed Conduit, Aboveground in Dry and Noncorrosive Locations Not Subject to Physical Damage: EMT.
   4. Concealed Conduit, Aboveground in Damp Locations, Wet Locations, Corrosive Locations, Where Not Subject to Physical Damage: IMC.
   5. Concealed Conduit, Aboveground in Damp Locations, Wet Locations, Corrosive Locations, Where Subject to Physical Damage: GRC.
   6. Underground Conduit For Branch Circuit and Similar Scale Work: . See details and/or notes on drawings for applications where concrete (or other) encasement is required.
   7. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
   8. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R .

B. Indoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed, Not Subject to Physical Damage: EMT.
   2. Exposed and Subject to Minor Physical Damage: EMT.
   3. Exposed and Subject to Moderate Physical Damage: GRC or IMC. Raceway locations include the following:
      a. Loading dock
      b. Mechanical rooms
      c. Gymnasiums
   4. Exposed and Subject to Moderate or Severe Physical Damage: GRC. Raceway locations include the following:
      a. Loading dock
      b. Corridors and pathways used for traffic of mechanized carts, forklifts, and pallet-handling units
   5. Concealed in Cavities of Ceilings and Interior Walls and Partitions: EMT.
   6. Above-Grade Damp or Wet Locations: GRC or IMC.
   7. Final 72 inches from accessible outlet/junction boxes to recessed luminaires that are located in accessible ceiling systems: FMC. Type AC/MC cable may be used for such "whips"; refer to Section 260519.
   8. Final 24-72 Inches at Connections to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp, wet or otherwise corrosive locations (Leave sufficient slack in flexible conduit to permit movement from vibration without adversely affecting conduits and connections.)
   9. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Raceway Fittings: Compatible with raceways and suitable for use and location.
   1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. EMT: Comply with NEMA FB 2.10.
3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

3.2 INSTALLATION

A. General Installation.
1. Minimum Raceway Size: 3/4-inch trade size.
2. Locate junction and pull boxes so they remain accessible after all construction work is complete. Coordinate all work with all other trades prior to commencement of the work.
3. Layout and install all electrical work in strict compliance with Chapter 1, Part B, Section 110.26 of the latest adopted edition of NFPA 70. Locations and routing that may be shown on plans are schematic and diagrammatic in nature.
4. Layout all proposed raceway routing, elevations, installation methods, etc. on coordination drawings and coordinate all proposed raceway routing with all affected trades prior to commencing with work. In addition review the information with Owner and design professionals for all areas where the raceways will be visible after completion of construction, to ensure a neatly organized installation occurs. Where raceways must be exposed in finished areas install them in a manner that minimizes detrimental effects on room aesthetics. Install so raceways are as out of site as reasonably possible. For instance, where applicable and if so directed by the design professionals or the Owner, make drops near corners, window casings, door casings, etc. Likewise if a receptacle needs to be installed at the center of a wall, install the raceway down the wall in a corner of the room then transition and run horizontally to the outlet location if so directed by the Architect or the Owner. Use compression fittings for EMT applications in these areas. Do not use strut or fasteners that stand off from wall applications in these areas. Install exposed wall-mounted conduits tight to wall using one-hole straps for conduits 1-1/4 inches and smaller, and use two-hole straps for conduits 1-1/2 inches and larger.
5. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
6. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
7. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.
8. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter.
9. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
10. Do not use access doors unless special prior written permission is granted from the owner's representative. Install pull boxes, junction boxes, etc. in areas that are accessible after construction. Do not install pull boxes or junction boxes above gypsum board, plaster or similar ceiling systems, nor above ductwork or equipment that renders them inaccessible.
11. Provide knockout closures to cap unused knockout holes where blanks have been removed.
12. Install electrical boxes in those locations that ensure accessibility to enclosed electrical wiring.
13. Do not install boxes back-to-back in walls. Provide not less than 6” (150 mm) separation in general, not less than 16” separation for acoustically rated walls and not less than 24” separation for the following applications: fire walls, fire barriers, smoke barrier walls, and fire partitions. Where outlet boxes are shown back-to-back on common walls, offset accordingly when installed.
14. Neatly cut openings for boxes so that standard size (not "midway" or "jumbo") cover plates will cover all parts of the opening.
15. Position recessed outlet boxes accurately to allow for surface finish thickness. Do not use round boxes.
16. Fasten electrical boxes firmly and rigidly to substrates and structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry as applicable. Provide box supports that are independent of conduit. Refer to Sections 260529 for further supporting requirements. Protect boxes from construction debris and damage subsequent to installation of boxes.
17. Consider the outlet, junction, and pull box locations indicated on drawings approximate. Study the
general construction with relation to spaces and equipment surrounding each outlet, and neatly
install outlets accordingly.
18. Record junction and pull boxes on record drawings. Permanently mark and label (using methods
approved by owner's representative) junction/pullboxes as to which types of electrical services are
within. Refer to Section 260502 for further related requirements.
19. Install wiring for different power voltages in raceway systems separate from each other.
20. Install wiring for the various electrical systems in raceway systems that are separate from each
other.
21. Install normal system power wiring, emergency system wiring and standby system wiring all in
separate raceways from each other. Install normal system power wiring, emergency/life safety
system wiring, critical system wiring and standby system wiring all in separate raceways from
each other.
22. Do not install or embed conduits within slabs.
23. Provide steel conduit and steel fittings for indoor above-slab applications, as specified in this
section.
24. Provide conduit fittings with insulated throats. Plastic bushings may be used for conduits 2" and
larger where insulated throats may not be readily available.
25. Provide pullboxes for conduit runs exceeding 100 feet in length, or having in excess of 270
degrees of offset.
26. Provide maximum of 40 percent fill for raceways, or a threshold of less if required by NFPA 70.
27. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes.
Install horizontal raceway runs above liquid and steam piping. Level and square raceway runs, and
install at proper elevations and heights.
28. Do not begin installation of conductors and cables until electrical raceways are complete and until
installation locations (end to end) are in a weatherproof environment.
29. Clean inside of conduit before wiring is pulled. Cap and plug conduit ends with standard
accessories as soon as conduit has been permanently installed.
30. Comply with requirements in Section 260529 for hangers and supports.
31. Arrange stub-ups so curved portions of bends are not visible above finished grade or slab.
32. Install no more than the equivalent of three 90-degree bends in any conduit run. Support within
12 inches of changes in direction.
33. Conceal conduit and tubing within finished walls, ceilings, and floor cavities unless otherwise
indicated. Install conduits parallel or perpendicular to building lines.
34. Support conduit within 12 inches of enclosures to which attached. Properly support and anchor
raceways for their entire length using structural materials. Do not span any space unsupported.
35. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to
protect conduits including conductors smaller than No. 4 AWG.
36. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or
cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal
bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated
throat metal grounding bushings on service conduits. Fasten conduit terminations in sheet metal
enclosures with two locknuts. Install locknuts inside and outside enclosure.
37. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install
locknuts hand tight plus 1/4 turn more.
38. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in
the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
39. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter
or a guide to make cut straight and perpendicular to the length. Cut conduits straight, properly
ream, and cut threads for heavy wall conduit deep and clean. Field-bend conduits with benders
designed for purpose so as not to distort, nor vary, internal diameters. Bring joints to a shoulder.
Provide suitable supports and fasteners for conduit.
40. Install exposed conduit parallel to walls, and plumb on walls. Secure to walls and ceiling with pipe
straps at intervals not exceeding six feet. Support conduit by approved straps, fasteners and
hangers. Provide hangers suspended from rods. Do not use perforated strap.
41. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use, using properly selected and attached manufactured cap (tape of any sort is not permissible).

42. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

43. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated. In cases where using center of box for measurement would result in a switch-height device having an operable component higher than 48 inches above finished floor, install boxes lower as needed so that uppermost part of operable component is no higher than 48 inches.

44. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

45. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel. Coordinate all such separations with Architect in advance to ensure boxes are located properly for each application.

46. Locate boxes so that cover or plate will not span different building finishes.

47. Support boxes from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

48. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.

49. Provide properly wired electrical connections within enclosures. Anchor enclosures ensuring that they are level, and permanently and mechanically secure.

50. Provide conduit, tubing and fittings of types, grades, sizes and weights (wall thicknesses) for applications as needed to render electrical work fully operational.

51. Mechanically fasten together metal conduits, enclosures, and raceways to form continuous electrically conducting equipment grounding path. Connect to electrical boxes, fittings and cabinets to provide electrical continuity and firm mechanical assembly. Conduit shall be continuous between outlets to make a complete installation and to provide a continuous ground.

52. Do not use dissimilar metals throughout the systems to eliminate possibility of electrolysis. Where dissimilar metals will be unavoidably in contact, coat surfaces with corrosion inhibiting compound before assembling.

53. Use rough-in dimensions of electrically operated equipment furnished by equipment installer. Install conduit and boxes for connection to equipment only after reviewing respective equipment and clearance dimensions, and after coordinating with other trades.

54. Do not use electrical "handee" boxes with surface raceway installations.

55. Do not cross shafts, or ventilating duct openings, with raceways. Keep raceways a minimum distance of 12" from parallel runs of flues, hot water pipes or other sources of heat. Support risers at each floor level with suitable hangers.

56. Do not use running threads at conduit joints and terminations - use 3-piece union, or split coupling.

57. Provide joints made tight with water-tight couplings matching conduit. Install corners with long radius sweep bends, except conduit sizes 1 inch and over where standard elbows may be used.

58. Provide fasteners that are lead expansion shields in block and concrete, toggle bolts in hollow walls, machine screws on metal surfaces, and wood screws on wood construction.

59. Provide sleeves in member for conduits passing through structural members.

60. Where moisture conditions within conduits are encountered above grade, drill a hole at the lowest point in the conduit run so that drainage will not interfere with conditions below.

61. Where conduit is capped at wall for future additions, do not extend more than threads-length past wall (maximum of 3/4 inch past wall for EMT).
62. Install exposed conduits and extensions from concealed conduit systems neatly, parallel with, or at right angles to, walls of building.

63. Install exposed conduit work so there is no interference with ceiling inserts, lights, or ventilation ducts or outlets.

64. Where conduits for outlets on waterproof walls must be installed exposed, set anchors for supporting conduit on waterproof wall in waterproof cement.

65. Requirements for exposed conduits also apply to conduits installed in space above hung ceilings, and in crawl spaces.

66. Provide a 4 inch reinforced casing of concrete (3000-PSI minimum) around conduits that are installed in cinders or cinder concrete, to protect them.

67. Install raceways concealed, except in unfinished electrical and mechanical type rooms where raceways may be exposed.

B. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

C. Exposed Conduits and Raceways:

1. Review proposed installation materials, methods, routing, etc. case-by-case and area-by-area for each application with the Architect and Owner prior to installation. Accordingly, prepare installation drawings and submit to design professionals for review and comment. Revise and resubmit as required based on comments from design professionals. Coordinate with all trades while preparing the installation drawings. Show elevations and routes relative to adjacent work of all trades.

2. Group conduits together in tight banks when routed in the same direction in a given space. Coordinate with mechanical trades and route the conduit banks along common paths wherever possible, and at common elevations unless the conduit banks can be installed directly above or below the mechanical work. Review proposed routes and elevations with design professionals prior to installation.

3. Install conduits that peel off from banks in a manner that results in the conduits being progressively taken off from the sides of the banks, one at a time without crossing over or under other conduits in the bank. Rise and drop conduits at the same elevation in areas with common visibility.

4. Provide clean, tight and uniform bends and offsets for all conduits and conduit banks.

5. Route overhead work perpendicular and parallel to architectural and structural building lines. Do not install work below skylight assemblies or in front of clerestory window assemblies.

6. Provide surface conduit and raceway for wall-mounted applications only where it is impossible to fish or cut/patch, or only where specifically indicated on drawings, or only where specifically directed by Architect. Improper sequencing of work at walls shall not be used as a reason to surface-mount conduit, boxes or raceways; install all such work concealed as the walls are constructed. Provide conduit in areas that are exclusively utilitarian, such as dedicated mechanical or electrical rooms. Provide finished surface raceway systems for applications in all other areas. Consult with design professionals in advance of any installation for final direction on where to use conduit versus surface raceway systems.

7. Install conduits and raceways in a manner that minimizes detrimental effects on room aesthetics. For instance, as applicable, rise from below for wall switches, general receptacle outlets and communications wall outlets; drop from above for wall mounted lights, and other system outlets that are installed high on wall; make drops near corners, window casings, door casings, etc.).

8. Install conduits and raceways as out-of-site as reasonably possible. For instance if an receptacle outlet needs to be installed at the center of a wall and there is no possibility of feeding from below the floor, route the drop in a corner of the room then transition and run horizontally to the outlet location.

9. Install conduit and raceway with a minimum 2-inch radius control at bend points.
10. Secure conduit and raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight section. Support according to manufacturer's written instructions.

11. Utilize supports for wall-mounted applications that cleanly conform to the shape of the conduit or raceway and do not in any way protrude out past the outer contours of the conduit or raceway. As an example, install wall-mounted conduit using two-hole straps instead of conduit hangers. Tape, glue, tie-wraps, clips, wedges, etc. are not acceptable support methods.

12. Review all proposed mounting means and methods with design professionals for luminaires, devices, outlets, equipment, etc. that will be suspended overhead.

13. Do not use “trapeze” mounting methods for suspensions unless case-by-case permission is granted by design professionals.

D. Seals for Common Conduit and Raceways in Dissimilar Environments: Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   2. Where an underground service raceway enters a building or structure.
   3. Where otherwise required by NFPA 70.

E. Insulation for Common Conduit and Raceways in Dissimilar Environments: Provide insulation on the exterior of conduit on the warm side of penetrations between dissimilar environments to prevent condensation from forming. Insulate with 1.5-inch polyisocyanurate closed cell pipe insulation with an overall PVC jacket for a minimum distance of 48” from the penetration. Applications include, but are not limited to, the following:
   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   2. Where otherwise required by NFPA 70.

F. Expansion-Joint Fittings:
   1. Provide expansion fittings at all locations where conduits cross building or structure expansion joints, wherever deflection is expected and as otherwise required to accommodate similar movement.
   2. Provide expansion fittings with ground bonding jumpers that are long enough to accommodate respective expansions and movement.
   3. Install in each run of aboveground EMT, GRC and IMC conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
   4. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits.
   5. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
   6. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

G. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi-recessed luminaires, for equipment subject to vibration, noise transmission, or movement, and for transformers and motors. Use LFMC in damp or wet locations.

3.3 INSTALLATION OF EXPOSED CONDUIT OUTDOORS

A. Only install conduit exposed outdoors when it is impossible to do otherwise, or only if specifically indicated for such installation case-by-case elsewhere in documents. Installation convenience, financial
considerations, lack of coordination with other trades and similar rationale are not sufficient reasons for doing so. In cases where conduits must be installed at outdoor locations, de-rate conductors and modify conduit sizes per NFPA 70 (National Electrical Code, NEC). Provide expansion fittings, which are UL listed and labeled for the respective applications, at all building expansion joints and at maximum distances of 100 feet. Paint all such conduits with at least two coats of UV-resistant weatherproof paint. Provide colors to match respective surrounding surfaces; submit colors to Architect for review in advance of procuring paint.

3.4 INSTALLATION OF EXPOSED CONDUIT ON ROOFS

A. Only install conduit exposed on rooftops when it is impossible to do otherwise, or only if specifically indicated for such installation case-by-case elsewhere in documents. Installation convenience, financial considerations, lack of coordination with other trades and similar rationale are not sufficient reasons for doing so. In cases where conduits must be installed on rooftops, de-rate conductors and modify conduit sizes per NFPA 70 (National Electrical Code, NEC). Provide expansion fittings, which are UL listed and labeled for the respective applications, at all building expansion joints and at maximum distances of 100 feet. Paint all such conduits with at least two coats of UV-resistant weatherproof paint. Provide colors to match respective surrounding surfaces; submit colors to Architect for review in advance of procuring paint.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies, at penetrations of abutted perimeter walls for building expansions/additions, and where expansion joints are used at walls. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Fire walls, fire barriers, smoke barrier walls and fire partitions:
1. Steel outlet boxes that do not exceed 16 square inches in area may be used in fire walls, fire barriers, smoke barrier walls, and fire partitions only if the total area of such openings does not exceed 100 square inches for any 100 square feet of wall area. Verify with local authorities having jurisdiction prior to commencing with related rough-in work.
2. Provide a minimum of 24 inches of separation between outlet boxes on opposite sides of a common wall.
3. Provide outlet boxes, equipment back-boxes, etc. in fire walls, fire barriers, smoke barrier walls, and fire partitions that are of the type tested for use in fire-resistance-rated assemblies. Install in accordance with the tested assembly, and with the instructions included in the listing.

B. Install firestopping at penetrations of fire-rated floor and wall assemblies. Refer to Section 260502 “Common Electric Materials and Methods”.

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.
## Submittal Form – 260533.00 – Raceways And Boxes For Electrical Systems

Provide And Complete This Sheet And Submit As A Cover Sheet For Submittals Requested Within This Section.

- **Electrical Contractor:** _____________________  **Electrical Supplier:** _____________________  
- **Electrical Contractor Rep:** __________________  **Electrical Supplier Rep:** __________________  
- **Electric Contractor Ph. Number:** ______________  **Electric Supplier Ph. Number:** ______________  
- **Electric Contractor Rep Email:** _________________  **Electric Supplier Rep Email:** _________________  

### Submitted Raceway Manufacturers (List Conduit/Raceway Type And Manufacturer):

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| Manufacturers Listed As Basis Of Design Or Listed Equivalent Manufacturers?
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<th>Manufacturers’ Qualifications Meet Or Exceed Those Required Under Quality Assurance Section Within This Specification?</th>
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<th>Will Rnc Conduits Rising From Below Grade/Slab-On-Grade Be Transitioned To Grc Conduits As Specified?</th>
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<th>Confirm Yes That No Conduits Will Be Embedded In Or “Scratched-In” Just Below Slabs.</th>
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SECTION 26 0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Identification for raceways.
   2. Identification of power and control cables.
   3. Identification for conductors.
   5. Warning labels and signs.
   6. Instruction signs.
   7. Equipment identification labels.
   8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

A. Refer to Section 260503, Submittals for Electrical Systems.

B. Product Data: For each electrical identification product indicated.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70


D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams,
and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways:
   1. Black letters on an orange field.
   2. Legend: Indicate voltage.

C. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less
   1. Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

D. Identify medium and high voltage conduits within buildings as follows.
   1. Stencil in 2-inch high black letters, with stencils placed at least once in each room and at maximum spacing of fifty feet. Locate where convenient for application and viewing. Include the following on stencils: name of source equipment, voltage and name of load being fed.
   2. Paint normal utility-power system medium voltage conduits bright yellow along their entire length.

E. Vinyl Labels for Empty “Spare” conduits
   1. Provide labels with description of purpose, and location of opposite end, on each end of conduits provided for future.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

B. Colors for Cables Carrying Circuits at 600 V and Less:
   1. Black letters on an orange field.
   2. Legend: Indicate voltage.

C. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.
1. Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

2.3 CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide (where permitted by NEC for large feeder and sub-feeder conductors).

2.5 WARNING LABELS AND SIGNS


B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Warning label and sign shall include, but are not limited to, the following legends:
   1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
   2. Workspace Clearance Warning for 0-150 volts to ground equipment: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.6 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
   1. Engraved legend with black letters on white face.
   2. Punched or drilled for mechanical fasteners.
   3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. Black letters on a white background for normal applications. Minimum letter height shall be 3/8 inch.

B. Provide white letters on a black background for normal power distribution system equipment.

C. Provide white letters on a red background for power distribution system equipment that is part of an emergency/life safety backup power system.

D. Provide white letters on a dark gray background for power distribution system equipment that is part of a standby backup power system.
E. Provide 1/16" thickness for units up to 20 sq. in. or 8" length; provide 1/8" thickness for larger units.

2.8 CABLE TIES

A. UV-Stabilized Cable Ties
   1. Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking. Type 6/6 nylon.
   3. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
   4. Temperature Range: Minus 40 to plus 185 deg F.
   5. Color: Black.

B. Plenum-Rated Cable Ties
   1. Self -extinguishing, UV stabilized, one piece, self locking.
   3. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
   4. UL 94 Flame Rating: 94V-0.
   5. Temperature Range: Minus 50 to plus 284 deg F.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. All equipment & system identification nomenclature shown on drawings and listed herein is shown for general design and installation reference only. Field-verify the actual nameplate, etc. nomenclature prior to fabrication. Prepare record documents accordingly. Unless determined otherwise in field, provide text matching terminology and numbering of the contract documents and submittals.

C. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

D. No labeling is required for raceways with readily identifiable terminations within the same room.

E. In accessible ceiling spaces and exposed in unfinished areas, label conduit with panel and circuit numbers of conductors routed through the conduit. Label conduit at all wall penetrations and connections to all panels, junction boxes, and equipment served.

F. Apply identification devices to surfaces that require finish after finish work is complete.
G. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

H. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

I. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.

J. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

K. Cable Ties: For attaching tags. Cut off excess lengths after installing ties. Use general-purpose type, except as listed below:
   1. Outdoors: UV-stabilized nylon.
   2. Indoors: Plenum rated.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less: Identify with self-adhesive vinyl label. Locate at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas. Do not install in finished occupied areas.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
   1. Power
   2. Emergency Power
   3. UPS

C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in pull and junction boxes, and handholes, use color-coding to identify the phase. Color shall be factory applied to conductor insulation or field applied for sizes No. 4 AWG and larger, if authorities having jurisdiction permit. These colors apply for factory-assembled cables as well as for individual insulated conductors.
   1. Color-Coding for Phase Identification, 600 V or Less: Use colors listed below for conductors.
      a. Colors for 208/120-V Circuits:
         1) Phase A: Black
         2) Phase B: Red
         3) Phase C: Blue
         4) Neutral: White
      b. Colors for 480/277-V Circuits:
         1) Phase A: Brown
         2) Phase B: Orange
         3) Phase C: Yellow
         4) Neutral: Gray
      c. Color for Equipment Grounding:
         1) Green
d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

E. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive, self-laminating polyester labels or self-adhesive vinyl labels with the conductor or cable designation, origin, and destination.

F. Control-Circuit Conductor Termination Identification: For identification at terminations provide heat-shrink preprinted tubes, or self-adhesive, self-laminating polyester labels or self-adhesive vinyl labels with the conductor designation.

G. Conductors to Be Extended in the Future: Attach write-on tags or marker tape to conductors and list source.

   1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
   2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

I. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
   1. Install underground-line warning tape for both direct-buried cables and cables in raceway.

J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
   2. Identify system voltage with black letters on an orange background.
   3. Apply to exterior of door, cover, or other access.
   4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
      a. Power transfer switches.
      b. Controls with external control power connections.
      c. Other equipment and components with multiple power or control sources.

K. Operating and Warning Instruction Signs: Provide pre-manufactured operating and warning signage if indicated on drawings and where required by NEC or local authority having jurisdiction. Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:
   a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label for normal conditioned areas, and mechanically-fastened engraved, laminated acrylic or melamine label for areas with adverse environments (unconditioned, high humidity, detrimental vapors, etc.). Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high.
   b. Outdoor Equipment: Engraved, laminated acrylic or melamine label, mechanically fastened.
   c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
   d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure. Secure to substrate with stainless steel fasteners on main switchboards and switchgear and in locations where adhesives cannot be expected to work long-term due to environmental conditions

2. Equipment to Be Labeled: (Project may not include all pieces of equipment.)
   a. Panelboards (also including typewritten directory of circuits in the location provided by panelboard manufacturer).
   b. Enclosures and electrical cabinets.
   c. Access doors and panels for concealed electrical items.
   d. Switchgear (also include descriptive labels for each section, switch, overcurrent protection device, etc.).
   e. Switchboards (also include descriptive labels for each section, switch, overcurrent protection device, etc.; additionally include name of engineering firm, name of installing contractor and year of installation for service-entrance switchboards).
   f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
   g. Substations (also include descriptive labels for each section, switch, overcurrent protection device, etc.).
   h. Emergency system boxes and enclosures.
   i. Motor-control centers (also include descriptive labels for each section, switch, overcurrent protection device, etc.).
   j. Enclosed switches.
   k. Enclosed circuit breakers.
   l. Enclosed controllers/starters.
   m. Variable-speed controllers.
   n. Push-button stations.
   o. Power transfer equipment.
   p. Contactors.
   q. Remote-controlled switches, dimmer modules, and control devices, via engraved wall plates.
   r. Miscellaneous Control Stations.
   s. Battery-inverter units.
   t. Battery racks.
   u. Power-generating units (also include descriptive labels for each output overcurrent protection device, etc.).
   v. Frequency changers.
   w. Monitoring and control equipment.
x. UPS equipment (also include descriptive labels for each major component section, switch, overcurrent protective device, etc. if not provided by factory).
y. Other similar equipment designated by owner's representative, architect or engineer in field.

M. Emergency Systems: Provide permanent identification for boxes, enclosures, etc. that are associated with emergency system work. Paint and identify emergency system pull boxes, junction boxes, and other access/pull points (boxes and covers) in accordance with NEC. Provide emergency system equipment panelboards, cabinets, enclosures, etc. with engraved nameplates (white letters on red background) with the first line of text to read "EMERGENCY CIRCUITS" and the remaining lines to include the necessary descriptive text.

N. Fire Alarm Systems: Provide permanent identification for boxes, enclosures, etc. that are associated with fire alarm system work. Paint and identify fire alarm system pull boxes, junction boxes, and other access/pull points (boxes and covers) in accordance with NEC/NFPA. Provide fire alarm system control panel equipment cabinets, enclosures, etc. with engraved nameplates (white letters on red background) with the first line of text to read "FIRE ALARM" and the remaining lines to include the necessary descriptive text.

END OF SECTION
SUBMITTAL FORM - 260553.00 – IDENTIFICATION FOR ELECTRICAL SYSTEMS
PROVIDE AND COMPLETE THIS SHEET AND SUBMIT AS A COVER SHEET FOR SUBMITTALS REQUESTED WITHIN THIS SECTION.

ELECTRICAL CONTRACTOR: ________________________  ELECTRICAL SUPPLIER: ________________________

ELECTRICAL CONTRACTOR REP.: ________________________  ELECTRICAL SUPPLIER REP.: ________________________

ELECTRIC CONTRACTOR PH. NUMBER: ____________  ELECTRIC SUPPLIER PH. NUMBER: ____________

ELECTRIC CONTRACTOR REP. EMAIL: ____________  ELECTRIC SUPPLIER REP. EMAIL: ____________

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<th>SUBMITTED INFORMATION MEETS ALL REQUIREMENTS LISTED WITHIN THIS SPECIFICATION?</th>
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SECTION 26 0584
MECHANICAL EQUIPMENT

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the following apply to this section:
   1. General and Supplementary Conditions
   2. Division 01 Specification Sections
   3. Division 23 Specification Sections

1.2 SUMMARY

A. Section Includes:
   1. Supplemental information related to electrical work associated with mechanical equipment and other equipment furnished and/or installed under all other divisions or by others.

1.3 ACTION SUBMITTALS

A. No submittal actions are required under this specification section. Refer to applicable specification sections for related submittal requirements.

PART 2 - PRODUCTS

2.1 REFER TO APPLICABLE SPECIFICATION SECTIONS

PART 3 - EXECUTION

3.1 GENERAL

A. Common Requirements
   1. Provide all necessary electrically related work as required to render all mechanical equipment (including plumbing, heating, ventilating and air conditioning equipment) fully operational and fully compliant with NEC. This includes, prior to ordering materials or commencing with rough-in, reviewing equipment submittal data and coordinating with installing contractors to ensure the correct size, rating and quantity of conductors are provided.
   2. Drawn locations of equipment and devices are shown only for schematic indication of wiring requirements. Coordinate with locations and rough-in requirements as required to determine actual locations and termination requirements. Refer to all contract documents for additional electrical requirements and concerns, and for further representation of this work.
   3. Provide raceway, wiring, connections, and terminations for power and interlocks for electrically operated equipment. Provide starters and disconnect switches for mechanical equipment unless specifically indicated otherwise herein or on the drawings.
   4. Provide disconnect switch ahead of all equipment, including controls, unless the mechanical equipment comes with integral NEC-compliant disconnect(s). Provide NEMA 3R enclosures where installed outdoors and where installed indoors in areas subject to moisture. Ground metal frames of equipment by connecting frames to the grounded metal raceway or to a full size green ground conductor or both. Provide the necessary electrical connections between the specified
equipment and the junction box near equipment with flexible metallic conduit (liquid-tight outdoors) and matched connectors (see Section 26 05 33). Where mechanical equipment lugs cannot accommodate conductor sizes shown on drawings, provide ILSCO ClearTap Insulated Multi-Tap Connectors.

5. Sizes, electrical ratings, etc. of equipment and wiring shown on drawings are based on the respective equipment design base manufacturers. If different manufacturer(s) or model(s) are actually supplied, provide necessary coordination in field (prior to ordering materials and prior to rough-in) and provide the necessary size of related electrical equipment, wiring, conduit, etc.

6. Prior to furnishing submittals and prior to rough-in, determine exact electrically related characteristics, loads, voltages, disconnect and starter requirements, locations, mounting heights, connection points, etc. of mechanical equipment.

7. Provide lugs, lug kits and related accessory work as required to accommodate the conductor sizes and quantities needed for each application. Coordinate with single-line diagram, field conditions, etc.

B. HACR Breakers
1. Coordinate in field with the respective trades and determine case by case, which equipment is factory listed for use with Heating and Air Conditioning Rated (HACR) breakers. In an effort to minimize requirements for stocking of fuses by the owner, utilize HACR breakers at the source panelboards as the NEC required overcurrent protection wherever possible (in lieu of fusing local disconnect switches).

C. Disconnect Switch and/or Starter Locations
1. Locations shown on drawings are indicated for schematic purposes only. Determine exact locations in field so that they are compliant with NEC Article 110.26.

D. Heating, Ventilating and Air Conditioning (HVAC) Equipment
1. Refer to HVAC / Electrical Coordination Schedule (HECS) on drawings. Provide disconnects, starters, accessories, wiring, connections, services, etc. where defined as “EC” in the schedule. Information in this section supplements the information in the HECS.
2. Provide power wiring and connections for all equipment (including motor dampers and accessories where applicable) as required to render equipment fully operational.
3. Provide engraved plates at all local disconnects and starters with equipment identification and mark indicated.
4. Install local disconnects and starters at 48 inches to top of outlet box or enclosure as applicable above finished floor/slab/grade; provide flush mounted units in finished areas. Provide key operated manual starters where accessible to general staff and general public.

E. Heating, Ventilating and Air Conditioning (HVAC) Control Wiring
1. General
   a. Unless specifically indicated as empty conduit on drawings or herein, provide electrical control and interlock work as shown on drawings. Provide additional control work as specifically indicated herein.
   b. Coordinate HVAC thermostat and sensor locations in field (case by case) with Architect, Owner’s Representative and equipment installer to ensure that they are placed in locations that will not interfere with furniture, equipment, artwork, wall-hung specialties, room finishes, etc. Field-verify these wall locations case by case, prior to rough-in, since locations shown on drawings are schematic only.
2. Schematic Thermostat and Sensor Locations
   a. Refer to HVAC drawings and documents.
3. Low Voltage Thermostats and Sensors
   a. Provide 4 inch square by 2-1/8 inch deep wall outlet boxes at 46 inches above finished floor to center of outlet box (with single-gang rings) for each unit. Provide one 3/4 inch
empty conduit from each location, turned out above accessible ceilings (in joist space or against overhead slab/deck). Identify conduit in ceiling cavity; provide sweep bends, bushings and drag line.

4. **Line Voltage Thermostats and Sensors**
   a. Provide 4 inch square by 2-1/8 inch deep wall outlet boxes at 46 inches above finished floor to center of outlet box (with single-gang rings) for each unit. Provide line voltage power wiring, in 3/4 inch conduit, and connections from thermostats and sensors to respective equipment that is to be controlled by same. Install thermostats and sensors.

**END OF SECTION**
SECTION 26 0923
LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. RELATED SECTIONS
   1. See Section 26 05 53.00 for special identification-related requirements.
   2. See Section 26 05 33.00 for damp and wet location box and cover plate requirements.
   3. See Section 26 27 26.00 for cover plates and related specialties.

1.2 SUMMARY

A. Section includes:
   1. Manual lighting control devices
   2. Automated Lighting Control
   3. Occupancy sensors
   4. Emergency shunt relays

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for all manual lighting control devices, occupancy sensors and time/light-based lighting controls.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:
   1. Include plans, elevations, sections, and details.
   2. Include diagrams for power, signal, and control wiring for occupancy sensors and time/light-based lighting controls.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain lighting controls (including sensors, etc.) and lighting-control power distribution components from single manufacturer.
2.2 MANUAL LIGHTING CONTROL DEVICES

A. See Section 262726 “Wiring Devices”.

2.3 AUTOMATED LIGHTING CONTROL

A. Photocells
   1. Provide Tork #2107 (for 120/277 volt applications) and Tork #2104 (for 208/277 volt applications) photocells or equal by Intermatic, 2000W tungsten rated, 1800VA ballast rated, -40 to 140 degree F rated, fail-on, with contacts that remain closed from dusk to dawn (on at 1 to 5fc, off at 3 to 15fc). Provide delay of up to two minutes to prevent false switching due to vehicular lights or lightning. Provide mobile light level selector. Provide gasketed heavy duty die cast zinc housing and base. Determine exact mounting locations and adjustment requirements in field relative to structural and site conditions. Aim northward wherever not conflicting with artificial light sources.

B. Timer Switches
   1. Provide Tork #A500 series timer switches without hold (or equal by Intermatic). Provide switches rated at 20A at 125VAC, 10A at 277VAC, 7A @ 125VAC tungsten, 1HP at 125VAC, 2HP @ 250VAC, 10A @277VAC.
   2. Time Range: As indicated on drawings or as directed in field based on specific applications.
   3. Wall Plates and Finish Colors: Match color and style specified in section 262726 “Wiring Devices.”

C. Digital Timer Switches
   1. Provide Standard of Quality equal to WattStopper: TS-400.
   2. Time Range: As indicated on drawings or as directed in field based on specific applications.
   3. Wall Plates and Finish Colors: Match color and style specified in section 262726 “Wiring Devices.”

PART 3 - EXECUTION

3.1 GENERAL

A. Installation
   1. Provide grounded (“neutral”) conductor in all lighting control device (switch, dimmer, occupancy sensor, etc.) wall outlet boxes, even if not immediately used.
   2. Install equipment and devices only in electrical boxes that are clean, free from building materials, dirt, and debris, and after wiring work is completed. Install wall plates only after respective wall surfaces have received their final finish.
   3. Prior to energizing circuits, test wiring for electrical continuity and for short-circuits. Subsequent to energizing, test wiring devices and demonstrate compliance with requirements, operating each operable device at least six times.

END OF SECTION
Submittal Form – 260923.00 – Lighting Control Devices
Provide And Complete This Sheet And Submit As A Cover Sheet For Submittals Requested Within This Section.

Electrical Contractor: ___________________ Electrical Supplier: ___________________

Electrical Contractor Rep: ___________________ Electrical Supplier Rep: ___________________

Electric Contractor Ph. Number: ___________ Electric Supplier Ph. Number: ___________

Electric Contractor Rep Email: ________________ Electric Supplier Rep Email: ________________

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<tr>
<th>Submitted Lighting Control Manufacturers (List Type And Manufacturer):</th>
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Yes  No

Manufacturers Listed As Basis Of Design Or Listed Equivalent Manufacturers? □ □

If No, Explain ____________________________________________________________

Manufacturers’ Qualifications Meet Or Exceed Those Required Under Quality Assurance Section Within This Specification? □ □

If No, Explain ____________________________________________________________

Manufacturers’ Warranty Meets Or Exceeds The Warranty Period Specified Within This Specification? □ □

If No, Explain ____________________________________________________________

Submitted Components Meet All Requirements Listed Within This Specification? □ □

If No, Explain ____________________________________________________________

Product Data Is Included For Each Lighting Control Device? □ □

If No, Explain ____________________________________________________________

Shop Drawings Are Included For Each Lighting Control Device That Is Part Of A System? □ □

If No, Explain ____________________________________________________________

If No, Explain ____________________________________________________________
SECTION 26 2726
WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. See Section 26 05 33.00 for weatherproof cover plate requirements.

C. See Section 26 05 53.00 for special identification-related requirements.

1.2 SUMMARY

A. Provide wiring devices, in types, characteristics, grades, colors, and electrical ratings for applications indicated which are UL listed and which comply with NEMA WD 1 and other applicable UL and NEMA standards. Verify color selections with Owner's representative.

B. Section Includes:
   1. Receptacles
   2. Switches
   3. Wall-box dimmers
   4. Communications outlets
   5. Device wall plates

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. SPD: Surge protection device.

F. Tamper-resistant: This term and “safety type” shall be taken to mean the same thing for receptacles.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
   1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper)
   2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell)
   3. Hubbell Incorporated; Wiring Device-Bryant (Hubbell)
   4. Leviton Mfg. Company Inc. (Leviton)
   5. Pass & Seymour/Legrand (Pass & Seymour)
   6. Lutron Electronics, Inc. (Lutron)
   7. Hubbell Incorporated (Hubbell)
   8. Wiremold/Legrand (Wiremold)
   9. FSR Inc. (FSR)

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
B. Comply with NFPA 70.

C. For receptacle circuits protected with 15A breakers, provide NEMA 5-15R equivalents for the devices shown below.

D. Provide Weather-Resistant Receptacles with UL “WR” marking, compliant with NEC 406.8, for all applications in wet or damp locations.

E. Where GFI protected receptacles are shown on drawings, provide a separate GFI receptacle for each one shown. Do not feed downstream receptacles from load-side (GFI-protected) terminals of upstream receptacles.

2.3 STRAIGHT-BLADE RECEPTACLES

2.4 GFCI RECEPTACLES

A. General Description:
1. Straight blade, feed-through or non-feed-through type depending on application.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:
   a. Cooper; VGF20.
   b. Hubbell; GFR5352L.
   c. Bryant; GF20LA.
   d. Pass & Seymour; 2095.
   e. Leviton; 6490
2. Products: Subject to compliance with requirements, provide product equivalent to the following:
   a. Hubbell; HBL2610.
   b. Bryant; 70530FR

2.5 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:
   a. Single Pole:
      1) Cooper; AH1221.
      2) Hubbell; HBL1221.
      3) Bryant; 1121
      4) Leviton; 1221-2.
      5) Pass & Seymour; CSB20AC1.
   b. Two Pole:
      1) Cooper; AH1222.
      2) Hubbell; HBL1222.
      3) Bryant; 4902
4) Leviton; 1222-2.

5) Pass & Seymour; CSB20AC2.

c. Three Way:
   1) Cooper; AH1223.
   2) Hubbell; HBL1223.
   3) Bryant; 4903
   4) Leviton; 1223-2.
   5) Pass & Seymour; CSB20AC3.

d. Four Way:
   1) Cooper; AH1224.
   2) Hubbell; HBL1224.
   3) Bryant; 4804
   4) Leviton; 1224-2.
   5) Pass & Seymour; CSB20AC4.

C. Key-Operated Switches, 120/277 V, 20 A:
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Cooper; AH1221L
      b. Hubbell; HBL1221L
      c. Bryant; 4901L
      d. Leviton; 1221-2L
      e. Pass & Seymour; PS20AC1-L
   2. Description: Single pole, with factory-supplied key in lieu of switch handle.

D. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors or other applications.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Cooper; 1995
      b. Hubbell; HBL1557
      c. Bryant; 4921
      d. Leviton; 1257
      e. Pass & Seymour; 1251

E. Key-Operated, Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors, or other applications, with factory-supplied key in lieu of switch handle.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Cooper; 1995L
      b. Hubbell; HBL1557L
      c. Bryant; 4921L
      d. Leviton; 1257L
      e. Pass & Seymour; 1251L

2.6 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Manufacturers’ Names:
   1. Cooper
   2. Hubbell
   3. Leviton
4. Lutron
5. Wattstopper

C. Control: Continuously adjustable slider toggle switch; with single-pole or three-way switching equal to Lutron “Nova T”. Comply with UL 1472.

D. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.
1. 600 W; dimmers shall require no derating when ganged with other devices.
2. Provide dimmers in wattage ratings that exceed controlled load by 25 percent.
3. Incandescent Lamp Dimmer Controls: Specification grade, equal to Lutron "Nova T" (NT) series with thin profile, solid state type, conforming to NEMA WD 1, modular dimmer switches for incandescent fixtures; switch poles and wattage as required to serve respective load, 120-volts, 60-Hz, with continuously adjustable slide control (down to off).
4. Equip with filter to eliminate noise, RF and TV interference, and minimum 5 inch wire connecting leads.
5. Provide lamp de-buzzing coils for incandescent lamp applications; install coils outside of rooms that are acoustically sensitive.

E. Fluorescent Lamp Dimmer Switches: Specification grade; modular; thin profile; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

F. Do not break off side heat-sink sections when ganging.

G. Provide dimmer and wall plate colors that match other wiring devices in the respective room.

H. Multiple wallbox dimmers may be used sporadically throughout the project on common circuits; provide compatible dimmers accordingly.

I. Provide dedicated neutrals for circuits serving loads controlled by dimmers.

2.7 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.
1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: satin finish stainless steel, equal to Leviton Type 430 series
3. Material for Unfinished Spaces with surface-mounted outlet boxes: Galvanized steel
4. Material for Indoor Damp Locations: satin finish stainless steel, equal to Leviton Type 430 series
5. with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant. Refer to Section 26 05 33.00.

C. Engraved cover plates: See Section 26 05 53.00.
2.8 FINISHES

A. Device Color:
   1. Wiring Devices Connected to Normal Power System: Gray unless otherwise indicated or required by NFPA 70 or device listing.
   2. Wiring Devices Connected to Emergency Standby Power System: Gray

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:
   1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
   2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
   4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
   1. Provide grounded (“neutral”) conductor in all lighting control device (switch, dimmer, occupancy sensor, etc.) wall outlet boxes, even if not immediately used.
   2. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
   3. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
   4. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
   5. Existing Conductors:
      a. Cut back and pigtail, or replace all damaged conductors.
      b. Straighten conductors that remain and remove corrosion and foreign matter.
      c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:
   1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
   2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
   3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
   4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
   5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
   6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
10. Install wiring devices only in electrical boxes that are clean; free from building materials, dirt, and debris. Install wiring devices after wiring work is completed. Install wall plates only after respective wall surfaces have received their final finish.
11. Consider locations indicated on the drawings to be approximate (unless specifically dimensioned on drawings). Determine exact locations of each floor outlet, case by case, after consulting with Owner and Architect, and after reviewing architectural documents so outlets are properly located to accommodate the final furniture and equipment layouts. Study the general construction with relation to spaces and equipment surrounding each outlet.
12. Do not use aluminum products in concrete.
13. Fasten electrical boxes firmly and rigidly to substrates, or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry. Support boxes independent of conduit.

E. Receptacle Orientation: Install receptacles so that the ground pin is oriented in a consistent manner throughout the facility, so that the orientation is compliant with all prevailing codes and regulations, and so that the orientation is acceptable to the electrical inspector. Where no existing building standard or owner project requirement, install receptacles with ground pin down. Where receptacles are installed horizontally, install such that neutral connection faces up.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:
   1. Install dimmers within terms of their listing.
   2. Verify that dimmers used for fan speed control are listed for that application.
   3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install feed-through-type GFCI receptacles where downstream receptacles are fed from the line side of the GFCI receptacle.

3.3 IDENTIFICATION

A. Comply with Section 26 05 53.00 "Identification for Electrical Systems."
B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

B. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
   1. Test Instruments: Use instruments that comply with UL 1436.
   2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

C. Tests for Convenience Receptacles:
   1. Line Voltage: Acceptable range is 105 to 132 V.
   2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
   3. Ground Impedance: Values of up to 2 ohms are acceptable.
   4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
   5. Using the test plug, verify that the device and its outlet box are securely mounted.
   6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

D. Wiring device will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION
Submittal Form – 262726.00 – Wiring Devices

Provide And Complete This Sheet And Submit As A Cover Sheet For Submittals Requested Within This Section.

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SECTION 26 4113
LIGHTNING PROTECTION FOR STRUCTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Specific lightning protection system components related to this specification may not be shown in plan-view on drawings. Work indicated in this section, along with details on drawings, is intended to schematically describe all related work.

1.2 SUMMARY

A. Section includes lightning protection for but is not limited to structures, structure elements and building site components as applicable.

B. Related Components:
   1. Related lightning protection systems components and work including, but not limited to, the following:
      a. Air terminals.
      b. Bonding plates.
      c. Conductors.
      d. Connectors.
      e. Counterpoise
      f. Fasteners
      g. Grounding plates.
      h. Grounding rods.
      i. Rod clamps.
      j. Splicers.
      k. Custom mounting modifications to roofing systems.

1.3 ACTION SUBMITTALS

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

B. Shop Drawings:
   1. Working-drawings submittal of the complete lightning protection system, along with details of the components to be used in the installation. System equipment and components include, but are not limited to, air terminal locations, conductor routing, connections, bonding, custom modifications to roofing systems, grounding, counterpoise, adhesives where used, etc.
   2. Where additions or physical connections are to be made to existing structures under this contract, include in scope and in submittal drawings any required remedial, replacement or supplemental
lightning protection system work to the existing facility and/or the existing lightning protection system as applicable.

3. Include indications for use of raceway, data on how concealment requirements will be met, and calculations required by NFPA 780 for bonding of grounded and isolated metal bodies.

4. Refer to drawings and project manual sections of affected trades for roofing system details, structural system details, roof penetrations and rooftop equipment that requires bonding, site elements that need bonding, etc. Coordinate with roofing installer prior to furnishing submittals.

5. Provide Owner with UL Master Label for overall system which is suitable for fastening to building for display purposes. Comply with UL 96A, "Master Labeled Lightning Protection Systems". Where additions or physical connections are to be made to existing structures under this contract, provide the UL Label for the resulting collective system.

C. Certifications:

1. Certification, signed by affected Contractors, that roof adhesive is approved by manufacturer of roofing material.

2. Certification, signed by affected Contractor, rooftop installation methods are approved by manufacturer of roofing material and installer of roof.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and manufacturer. Include data on listing or certification by UL.

B. Field quality-control reports.


D. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features, including the following:

   1. Ground rods.
   2. Ground loop conductor.

1.5 QUALITY ASSURANCE

A. Provide lightning protection equipment products of a manufacturer of established reputation and experience who has been in operation of sufficient length of time to establish proof of high quality.

B. Installer Qualifications: Certified by UL, trained and approved for installation of units required for this Project.

C. System Certificate:

   1. UL Master Label
D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 780, "Definitions" Article.

E. Provide work under the complete supervision of an accredited factory expert, who is locally available at all times during installation of the lightning protection system, and who supervises all unit locations and connections, and who completely tests the system after completion for strict conformance with U.L. master label requirements.

1.6 COORDINATION

A. Coordinate installation of lightning protection with the installation of other building systems and components, including electrical wiring, supporting structures and building materials, metal bodies requiring bonding to lightning protection components, building finishes and other trades.

B. Coordinate installation of air terminals attached to roof systems with roofing manufacturer and Installer prior to installation to ensure that roof warranty will be maintained.

C. Flashings of through-roof assemblies shall comply with roofing manufacturers' specifications.

PART 2 - PRODUCTS

2.1 LIGHTNING PROTECTION SYSTEM COMPONENTS

A. Provide lightning protection system materials and components that comply with manufacturer's standard design, in accordance with published product information. Provide air terminals, bonding plates, conductors, connectors, conductor straps, fasteners, grounding plates, grounding rods, rod clamps, splicers and other components required for a complete system.

B. Manufacturers: Subject to being equivalent and subject to compliance with requirements, provide product by one of the manufacturers listed below. If not listed, submit as substitution.
   1. East Coast Lightning Equipment Inc.
   2. ERICO International Corporation.
   3. Harger.
   5. Independent Protection Co.
   6. Preferred Lightning Protection.
   7. Robbins Lightning, Inc.
   8. Thompson Lightning Protection, Inc.
   9. Approved Lightning Protection Co., Inc.
  10. Carl Bajohr Co., Inc.
  11. NLP
  12. Sewell Manufacturing Co., Inc.
  13. West Dodd Lightning Conductor Corp.

C. Roof-Mounted Air Terminals: NFPA 780, Class I or Class II as applicable, copper unless otherwise indicated.
   1. Provide Air Terminals that are 12”
3. Provide air terminals with bases specially designed for the type of roofing system component on which they will be mounted.

D. Provide aluminum solid air terminals only where required to avoid contact of dissimilar metals. Elsewhere provide 3/8-inch diameter copper solid metal for air terminals.

E. Main and Bonding Conductors:
1. Provide lightning protection cable (for grounding, counterpoise, cross-runs, etc.) that is minimum 29-17 (29 strand, #17AWG - each strand) bare copper for buildings and structures less than 75 feet high.
2. Provide Class 2 Lightning protection cable (for grounding, counterpoise, cross-runs, etc.) that is minimum 28-14 (28 strand #14AWG - each strand) bare copper for buildings and structures 75 feet high and higher.
3. Provide equivalent aluminum cables only where required to avoid contact of dissimilar metals. Elsewhere provide copper for cables.

F. Ground Loop Conductor: The same size and type as the main conductor except tinned.

G. Ground Rods: Copper-clad steel; 3/4 inch in diameter by 10 feet long.

H. Inspection Wells: Provide inspection well for each connection to underground grounding electrodes.

1. In paved areas provide inspection well equal to Erico Eritech Inspection Well 416D or 416F series depending on application, with the following characteristics.
   a. Constructed of polymer concrete.
   b. 10,000 lb. load rating.
   c. Bolt-down cover.
   d. Skid-resistant surface.
   e. Gray color.
   f. “Ground” embossed in the lid.

2. In unpaved areas provide inspection well equal to Erico Eritech Inspection Well 416B or 416C series depending on application, with the following characteristics.
   a. Constructed of high density polyethylene.
   b. Acid and chemical resistant.
   c. Green or black color.
   d. “Ground” embossed in the lid.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lightning protection components and systems according to UL 96A and NFPA 780.

B. Comply with NEC Article 250 as a minimum for the grounding system Coordinate with other work, including electrical wiring and roofing work, as necessary to interface installation of lightning protection system with other work. Provide pitch pockets for penetrations of the roofing material at each air terminal or other connection.
C. Bond all roof mounted fans, exhausters and other equipment, etc. to the lightning protection system/cables. Bond and interface new system with all applicable rooftop and/or site equipment/structures (re-bars, parking lot lighting standards, condensing units, exhaust fans, plumbing stack vents, metal coping, flagpoles, towers, emergency generator system, utility transformer/services, etc.) requiring same and provide a resulting single UL master label. Bond and equalize all ground potentials associated with the structure and site.

D. Carefully coordinate work with drawings of other trades, and with other trades (including roofing contractor), in advance and during installation so that no roofing warranties are rendered void. Do not use adhesives for mounting devices, cables, etc., except for special applications for special roofing materials, and for mounting of cross connector runs/devices on the roof (when away from parapets). Provide mechanical mounting for other applications.

E. Mechanically bond the new lightning protection system to the existing system to form a single UL Master Label for extensions of existing systems (i.e. for building additions, etc.). Accordingly, replace, supplement, rework, etc. existing lightning protection work as required to obtain a single UL Master Label.

F. Install conductors with direct paths from air terminals to ground connections. Avoid sharp bends and narrow loops.

G. Conceal the following conductors:
   1. System conductors.
   2. Down conductors.
   3. Interior conductors.
   4. Conductors within normal view of exterior locations at grade within 200 feet of building.

H. Raceway, where required, shall not be exposed unless approved in writing by the Architect. Schedule 40 PVC raceway or elbows shall not be used where; exposed below 9 feet, in return air plenums, or other spaces used for environmental air.

I. Cable Connections: Use exothermic-welded, crimped or bolted connections for all conductor splices and connections between conductors and other components. Use exothermic-welded connections in underground portions of the system and for connections to structural steel.

J. Air Terminals on Single-Ply Membrane Roofing: Comply with roofing membrane and adhesive manufacturer's written instructions. Provide 6 Inch x 6 Inch pad under air terminals if required to maintain roof warranty.

K. Air terminals on parapets shall be installed so they project at least 12 inches above parapet walls. Space terminals a maximum of 20 feet on center around perimeter of each roof level. Mechanically attach air terminals to the inside of the parapets. Provide air terminals within 24 Inches of outside edge of perimeter corners.

L. Ground Loop: Install ground-level, potential equalization conductor and extend around the perimeter of structure as a full-perimeter counterpoise.
   1. Bury ground ring not less than 24 inches deep and no less than 12 inches from building foundation.
   2. Bond ground terminals to the ground loop.
   3. Bond grounded building systems to the ground loop conductor within 12 feet of grade level.
4. Bond to water service, building steel (including re-bar), utility service entrance, etc. per latest edition of NFPA 70.

M. Inspection wells: Install inspection wells so they are flush with final (and settled if applicable) finish of surrounding surfaces. Install in a manner that results in the wells being, and remaining, free of dirt and debris. Provide insulated (type XHHW-2) grounding conductors, in conduit, from building interior to grounding electrode in inspection wells. Train conductors in wells so that at least four horizontal inches of exposed insulated conductor exists in the wells to accommodate connection of portable metering equipment.

N. Provide cable risers at maximum one hundred foot spacings. Bond riser cables to structural steel, to air terminals and to ground rods. Bond metal objects on roof as required by UL and applicable codes. Ground to counterpoise at maximum one hundred foot spacings with specified ground rod. Conceal risers within building chases or raceways. Bond to each structural column, and to each driven electrode.

O. Bond extremities of vertical metal bodies exceeding 60 feet in length to lightning protection components.

P. Provide cross connecting runs of cable at a maximum spacing of every 50 feet on roof. Where such cross connecting runs would occur on pitched roofing visible from below, contact engineer prior to completing working drawings. Conceal wiring from normal view from all exterior locations at grade within two hundred feet of structure.

Q. Do not install aluminum conductors or components in concrete or below grade.

R. Work on Membrane or other Special Roofing Systems:
   1. Provide special preparation of the roofing systems as required by the roofing manufacturer for mounting air terminals, cables, etc. Provide this preparation work under the direct supervision of, or via procured services from, the roofing installer who is responsible for providing the roofing warranty.
   2. Coordinate all work in advance with the general contractor and the roofing contractor.
   3. This work includes, but is not limited to, providing special fusion spliced (continuous heat welded) membrane caps and straps, and providing special sealants, special solvents, and special adhesives. Provide mounting methods as recommended by air terminal manufacturer, and as approved by manufacturer of roofing material. Comply with air terminal and roofing manufacturers' installation instructions.
   4. These special roofing related requirements apply for existing roofing systems, as well as new ones.

3.2 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.3 CORROSION PROTECTION

A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.

B. Use conductors with protective coatings where conditions cause deterioration or corrosion of conductors.
3.4 FIELD QUALITY CONTROL

A. Notify Architect at least 72 hours in advance of inspection before concealing lightning protection components.

B. UL Inspection: Meet requirements to obtain a UL Master Label for system.
   1. Provide UL inspection and delivery of UL Master Label "C" to the Owner's representative (framed behind glass for mounting as directed in field by owner's representative).

END OF SECTION
Submittal Form – 264113.00 – Lightning Protection For Structures
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<tr>
<td>Submitted Components Meet All Requirements Listed Within This Specification?</td>
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<td>If No, Explain __________________________________________________________________________</td>
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<tr>
<td>Coordination With Roofing Installer Occurred Prior To Preparation Of Submittals?</td>
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<td>If No, Explain __________________________________________________________________________</td>
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<tr>
<td>Submittals Include Proposed Concealment And Physical-Protection Methods For Cables?</td>
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<tr>
<td>Shop Drawings Include Full-Perimeter Counterpoise, Rooftop Cross-Connect Runs, And Bonding Of Rooftop Protrusions And Equipment?</td>
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<tr>
<td>Submittals Include Air Terminal, Conductor And Attachment Adhesives, Materials And Installation Methods That Have Been Coordinated With Roofing Installer Relative To Types Of Roofing Materials/Systems Employed, And Associated Certifications Are Attached?</td>
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<td>If No, Explain __________________________________________________________________________</td>
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<tr>
<td>Is Ul Master Label Included For The Collective Lightning Protection System?</td>
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<td>If No, Explain __________________________________________________________________________</td>
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SECTION 26 5100
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. Interior luminaires, lamps, and ballasts
   2. Exit signs
   3. Emergency lighting units
   4. Emergency fluorescent power unit
   5. Luminaire supports

B. Related Sections:
   1. Section 26 09 23.00 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multi-pole lighting relays and contactors.

1.3 DEFINITIONS

A. BF: Ballast factor.

B. CCT: Correlated color temperature.

C. CRI: Color-rendering index.

D. HID: High-intensity discharge.

E. LER: Luminaire efficacy rating.

F. Lumen: Measured output of lamp, luminaire, or both.

G. Luminaire: Complete lighting unit consisting of lamps or sources, and some or all of the following components: optical control devices, sockets, mechanical components to support or attach the luminaire, and electrical and electronic components to start, operate, dim or control and maintain the operation of the lamps or LEDs.
1.4 ACTION SUBMITTALS

A. Product Data: Arrange luminaire submittals in booklet form with separate sheets for each luminaire, assembled by luminaire "type" in alphabetical order. Submit details indicating compatibility with ceiling grid system. Provide lamp or source and ballast/low voltage transformer/LED driver schedules (by luminaire type). Provide technical submittal data in separately tabbed sections for lamp or source submittals and for ballast, low voltage transformer or LED driver submittals.

B. Only fully complete submittals will be reviewed. Failure to provide lamp/source and ballast/low voltage transformer/LED driver submittals at time of luminaire submittal will result in immediate return of submittal package without review.

C. Include data sheets for the following:

1. Luminaire
   a. Original manufacturer datasheets or first generation printed copies of manufacturer’s electronic datasheet (i.e. printed copy of a PDF file).
   b. Datasheets shall include dimensions, finishes and technical support data including energy efficiency data. Provide data sheets for applicable luminaire support and accessories.
   c. Each datasheet to be labeled with the project name, luminaire “type” and exact catalog number. Affix to same location on each sheet.
   d. Where datasheets depict multiple products, versions or options, the Contractor shall highlight (indicate with an arrow) all applicable model(s), version(s) and option(s) applying to the specific product the Contactor will be providing. The submitted items must be from “approved materials”.

2. Lamps
   a. Original manufacturer datasheets or first generation printed copies of manufacturer’s electronic datasheet (i.e. printed copy of a PDF file).
   b. Datasheets shall include all technical data described in this section and data including, but not limited to, life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
   c. Each datasheet to be labeled with the project name, luminaire “type” and exact catalog number. Affix to same location on each sheet.

3. Ballasts
   a. Original manufacturer datasheets or first generation printed copies of manufacturer’s electronic datasheet (i.e. printed copy of a PDF file).
   b. Datasheets shall include all technical data described in this section and energy-efficiency data.
   c. Each datasheet to be labeled with the project name, luminaire “type” and exact catalog number. Affix to same location on each sheet.

4. LED Source and Driver System
   a. Original manufacturer datasheets or first generation printed copies of manufacturer’s electronic datasheet (i.e. printed copy of a PDF file).
   b. Datasheets shall include:
      c. Voltage
      d. Input watts
      e. Energy efficiency data
      f. Initial Lumen output
      g. Source correlated color temperature (CCT)
      h. Source color rendering index (CRI) value
      i. Provide verification the system has been tested to IES LM-79-2008 standards
      j. The system is RoHS compliant, lead free and mercury free
      k. Name the LED manufacturer
1. Provide verification the LED’s have been tested to IES LM-80-2008 standards and the rated life of the system in hours
m. Warranty for LED’s and driver
n. Each datasheet to be labeled with the project name, luminaire “type” and exact catalog number. Affix to same location on each sheet

5. Exit signs.
6. Emergency lighting units, including battery and charger.
7. Emergency fluorescent lamp power unit, including battery and charger.
8. Ballast load transfer control relay system.
10. Scaled drawings and schematics of custom fabricated items. Drawings shall include dimensions, materials, weights, loads required clearances, method of field assembly, components, location and size of each field connection, and finish. These drawings shall be suitable for shop fabrication.
11. Scaled reflected ceiling plans and pertinent elevation drawings clearly depicting the intended location of custom fabricated equipment to be supplied. Equipment shall be presented to scale and dimensioned where necessary.
12. Supplemental information as necessary and/or required by the Designer to demonstrate full compliance with the contract documents.
13. Wiring Diagrams: For power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting equipment and luminaires to include in emergency, operation, and maintenance manuals.
   1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes. List by luminaire “type”.
   2. Provide a list of all ballast types used on Project; use ANSI and manufacturers’ codes. List by “type”.
   3. Provide a list of all LED sources and driver types used on Project; use ANSI and manufacturers' codes. List by luminaire “type”.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Lamps: 15 for every 100 of each type and rating installed. Furnish at least four of each type.
   2. Ballasts: One for every 100 of each type and rating installed. Furnish at least one of each type.
   3. Fluorescent-luminaire-mounted, emergency battery pack: One for every 20 emergency lighting unit.
   4. Plastic Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
   5. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.
1.8 COORDINATION

A. Coordinate layout and installation of luminaires and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.9 WARRANTY

A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
   1. Warranty Period for Emergency Lighting Unit Batteries: five years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining years.
   2. Warranty Period for Emergency Fluorescent Ballast Batteries: five years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining years.
   3. Warranty Period for Self-Powered Exit Sign Batteries: five years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide products indicated on Drawings. Provide products of one of the manufacturers listed in this section for products that are not defined on the Luminaire Schedule. Provide specification grade luminaires that comply with minimum requirements as stated therein. If a particular “type” does not include basis of design manufacturer or model number, provide “pre-approved equivalent” manufacturer’s and model numbers compliant with, and equivalent to: quality, performance, dimensions, and aesthetics as the respective basis of design for Designers review no less than five business days prior to bid due date.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRE AND COMPONENTS

A. Luminaires designated by letters are defined as indicated on the Luminaire Schedule.

B. Provide luminaires, of sizes, types and ratings indicated; complete with, but not limited to, housings, energy-efficient lamps, lampholders, reflectors, energy efficient ballasts, starters and wiring. Ship luminaires factory-assembled, with components required for a complete operating installation.

C. Surface Luminaires: Install surface mounted ballasted luminaires with air spaces between luminaire and surface per latest edition of NFPA/NEC. Provide factory luminaire wiring that is per NEC, #16 AWG minimum. Wire luminaires having medium base and mogul base sockets with not smaller than No. 16 or No. 14 wire respectively in accordance with the latest requirements of the National Electric Code.

D. Review drawings and specifications of other trades to verify ceiling types, modules, and suspension systems appropriate to installation.
E. Incandescent Luminaires: Comply with UL 1598.

F. Fluorescent Luminaires: Comply with UL 1598.

G. HID Luminaires: Comply with UL 1598.

H. Metal Parts: Free of burrs and sharp corners and edges.

I. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

J. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Fabricate luminaires with concealed hinges and catches, with metal parts grounded as common unit, and so constructed as to dampen ballast generated noise.

K. Diffusers and Globes:
   1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
      a. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
      b. UV stabilized.
   2. Glass: Annealed crystal glass unless otherwise indicated.

L. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
   1. Label shall include the following lamp and ballast characteristics:
      a. "USE ONLY" and include specific lamp type.
      b. Lamp diameter code (T-4, T-5, T-8, T-12, etc.), tube configuration (twin, quad, triple, etc.), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
      c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
      d. Start type (preheat, rapid start, instant start, etc.) for fluorescent and compact fluorescent luminaires.
      e. ANSI ballast type (M98, M57, etc.) for HID luminaires.

M. Provide fusing for high intensity discharge (HID/H.I.D.) luminaires.

N. Provide open Metal-Halide luminaires with open-rated sockets and open-rated lamps. Provide Metal-Halide luminaires with clear tempered glass lenses to protect persons from possible violent end of lamp life. This applies throughout the project though this may not be written into the Luminaire Schedule.

2.3 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. General Requirements for Electronic Ballasts:
   1. Provide same manufacturer and catalog number for ballasts of the same type. Refer to the drawings for input voltage requirements. If fusing requirements are indicated herein or on the Luminaire Schedule, fuse each ballast separately with a replaceable fuse external to the ballast.
2. Provide ballasts that are compatible with power line carrier systems, and that do not adversely impact such systems.

3. Provide luminaires shown on drawings with multi-level switching or similar special circuiting with multiple ballasts. Provide single ballasts wherever possible for other applications.

4. Provide outdoor ballasts (or ballasts indoors, but in unconditioned areas) that are cold weather low starting temperature type (-20 degrees Fahrenheit).

5. Comply with UL 935 and with ANSI C82.11.

6. Designed for type and quantity of lamps served.

7. Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.

8. Sound Rating: Class A.


10. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.

11. Operating Frequency: 42 kHz or higher.

12. Lamp Current Crest Factor: 1.7 or less.

13. BF: 0.88 or higher.

14. Power Factor: 0.95 or higher.

B. Luminaires controlled by occupancy sensors shall have programmed-start ballasts.

C. Electronic Programmed-Start Ballasts for T8, T5 and T5HO Lamps: Comply with ANSI C82.11 and the following:
   1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
   2. Automatic lamp starting after lamp replacement.

D. Electromagnetic Ballasts: Comply with ANSI C82.1; energy saving, high-power factor, Class P, and having automatic-reset thermal protection.

E. Ballasts for Low-Temperature Environments:
   1. Temperatures 0 Deg F and Higher: Electronic type rated for 0 deg F starting and operating temperature with indicated lamp types.

F. Ballasts for Dimmer-Controlled Luminaires: Electronic type.
   1. Dimming Range: 100 to 5 percent of rated lamp lumens.
   2. Ballast Input Watts: Can be reduced to 20 percent of normal.
   3. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.
   4. Control: Coordinate wiring from ballast to control device to ensure that the ballast, controller, and connecting wiring are compatible.

2.4 BALLASTS FOR COMPACT FLUORESCENT LAMPS

A. Description: Electronic-programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated: Solid State Rapid Start Electronic Fluorescent Lamp Ballasts - Compact Fluorescent Lamps.
   1. Lamp end-of-life detection and shutdown circuit.
   2. Automatic lamp starting after lamp replacement.
   3. Sound Rating: Class A.
   4. Total Harmonic Distortion Rating: Less than 20 percent.
5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.

6. Operating Frequency: 20 kHz or higher.

7. Lamp Current Crest Factor: 1.7 or less.

8. BF: 0.95 or higher unless otherwise indicated.

9. Power Factor: 0.95 or higher.

10. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

2.5 EMERGENCY FLUORESCENT POWER UNIT

A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body and compatible with ballast. Comply with UL 924.

1. Emergency Connection: Unless noted otherwise, operate onetwo fluorescent lamp(s) continuously at an output of 1100 lumens each. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.

2. Test Push Button and Indicator Light: Visible and accessible without opening luminaire or entering ceiling space.
   a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
   b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.


5. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

6. “EMCP” designation: Provide Bodine B50Cold-Pak or approved equivalent. Provide emergency ballast with temperature-control circuitry to fulfill both low-temperature and high-temperature operation. Provide emergency ballast with high-temperature, maintenance-free nickel cadmium battery, charger, and electronic circuitry contained in one nominal 13-3/8" x 2-3/8" x 1-1/2" red metal case. Provide solid-state charging indicator light to monitor the charger and battery, a single-pole test switch, and installation hardware. Provide emergency ballast capable of operating two 32 watt linear fluorescent lamps at 1200 lumens initial light output in the emergency mode for a minimum of 90 minutes. Provide unit that is suitable for use in damp locations and suitable for use in sealed & gasketed luminaires. Provide unit with storage and operating temperature range for the B50Cold-Pak of -20 degrees C to +55 degrees C. Provide emergency ballast UL listed for installation inside, on top of, or remote from the luminaire. Provide unit with full five year warranty from the date of purchase.

7. “EM11” designation: Provide Bodine B84CG or approved equivalent. Provide emergency ballast capable of operating one (26W-DTT), (26W-TRT), (32W-DTT), (32W-TRT), (42W-DTT), (42W-TRT), (or select lamps from Bodine cut sheet if different from those listed) normal or reduced mercury compact fluorescent lamp at (700), (1100), (850), (select lumen output based on table 2 in Bodine Catalog) lumens initial light output in the emergency mode for a minimum of 90 minutes. Provide emergency ballast circuit that delays AC ballast operation for five seconds upon restoration of normal power to prevent false-tripping of AC ballast end-of-life shutdown circuit. Provide unit with high-temperature, maintenance-free nickel cadmium battery, charger, and electronic circuitry contained in one nominal 21.5” x 1.18” x 1.18” galvanized steel case. Provide solid-state charging indicator light to monitor the charger and battery. Provide single-pole test switch. Provide installation hardware. Provide emergency ballast that is UL listed for installation inside, or on top of the luminaire. Provide full five year warranty from date of purchase.

8. “EM13” designation: Provide Bodine LP600 or approved equivalent. Provide emergency ballast capable of operating one 28 watt, T5 fluorescent lamp at 1245 lumens initial light output in the emergency mode for a minimum of 90 minutes. Provide emergency ballast circuit that delays AC ballast operation for five seconds upon restoration of normal power to prevent false-tripping of AC ballast end-of-life shutdown circuit.
AC ballast end-of-life shutdown circuit. Provide unit with high-temperature, maintenance-free nickel cadmium battery, charger and electronic circuitry contained in one nominal 21.5” x 1.18” x 1.18” galvanized steel case. Provide solid-state charging indicator light to monitor the charger and battery. Provide single-pole test switch. Provide installation hardware. Provide emergency ballast that is UL listed for installation inside, or on top of the luminaire. Provide full five year warranty from date of purchase.

9. “EM14” designation: Provide Bodine B50U or approved equivalent. Provide emergency ballast with high-temperature, maintenance-free nickel cadmium battery, charger and electronic circuitry contained in one nominal 13-3/8” x 2-3/8” x 1-1/2” metal case. Provide solid-state charging indicator light to monitor the charger and battery. Provide double-pole test switch. Provide installation hardware. Provide emergency ballast capable of operating two 32 watt, T-8 fluorescent lamps at 1350 lumens initial light output in the emergency mode for a minimum of 90 minutes. Provide unit with universal input that operates at any line voltage from 120 through 277 VAC at frequencies of 50 or 60 Hz. Provide emergency ballast UL listed for installation inside, on top of, or remote from the luminaire. Provide full five year warranty from date of purchase.

B. External Type: Self-contained, modular, battery-inverter unit, suitable for powering one or more fluorescent lamps, remote mounted from luminaire. Comply with UL 924.

1. Emergency Connection: Operate one fluorescent lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.
2. Battery: Sealed, maintenance-free, nickel-cadmium type.
4. Housing: NEMA 250, Type 1 enclosure.
5. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
6. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
7. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

### 2.6 BALLAST LOAD TRANSFER CONTROL RELAY SYSTEM (IN LUMINAIRE GENERATOR TRANSFER DEVICE)

1. Provide emergency ballast load transfer control relay system manufactured by Bodine, Nine 24, Surelites, Lithonia, McPhilben or Side-Lite.
2. Provide ballast load transfer control that operates automatically on a continuous standby mode. Provide unit that bypasses electrical control devices when normal power fails and emergency generator power is needed for egress lighting - regardless of switching device (standard toggle switch, photo electric cell, time clock, energy management equipment) on/off position.
3. Provide Generator Transfer Device with the following components and features to comply with article 700 of the National Electrical Code (NEC) and UL 924.
   a. Provide failsafe continuously monitored relay with 20 ampere contacts instantaneous or time delay electrically operated mechanically latched operation relays opens and closes emergency power with no possibility of current cross over (NEC Section 700-6 a, b, c, d, NFPA 110 4-2.4.1, 4-2.4.3).
   b. Provide test switch to test under load (NEC 700-4 b, e; UL 924 Specification 29.1).
   c. Provide Indication LED’s with red LED signal lamp that indicates fixture is on emergency power and that indicates there is power (normal or emergency) connected to device (NEC 700-6a and 700-9a 2, 3).
   d. Provide sign to read “Caution: two electrical power sources in this unit” per UL 924 and NEC 700-8.
   e. Provide unit with power link to isolate catastrophic faults per NEC 700-5a. Provide unit able to withstand direct short to load with no adverse effect to switching device NEC 700-5a and 700-9c.
f. Provide surge protection per NFPA 110 4-2.2 and A4-5.1.
4. Provide emergency bypass relay that is factory installed in ballast channel.
5. Provide test switch and LED’s that are visible through lens or louver.
6. Interpret “failsafe” to mean that emergency relay contacts go to mechanically latched position whenever normal power is interrupted or electronics of specified device fail.
7. Contractor is responsible for both normal and emergency circuits to device even if both circuits are not specifically called out on floor plans.

2.7 EMERGENCY LIGHTING RELAY CONTROL DEVICE (BRANCH CIRCUIT 20A RATED)
1. Provide emergency load transfer relay control device manufactured by Bodine.
2. Provide relay control device that can be used to (1) transfer a lighting load from normal power to generator or central inverter system power when normal power is lost (2)bypass a wall switch to allow generator or central inverter system supplied lighting loads to energize when normal power is lost (3)bypass a dimming panel and prevent backfeed to allow lighting to energize at full brightness (4)bypass most dimming controls using an auxiliary relay contact.
3. Provide Generator Transfer Device with the following components and features to comply with article 700 of the National Electrical Code (NEC), UL 1008 and UL 924.
   a. Provide test switch to test under load (NEC 700-4 b, e; UL 924 Specification 29.1).
   b. Provide Indication LED’s with red LED signal lamp that indicates fixture is on emergency power and that indicates there is power (normal or emergency) connected to device (NEC 700-6a and 700-9a 2, 3).
   c. Provide sign to read “Caution: two electrical power sources in this unit” per UL 924 and NEC 700-8.
   d. Provide surge protection per NFPA 110 4-2.2 and A4-5.1.
4. Provide with a minimum three dry form C contacts to allow use a wide variety of wiring options.
5. Mounting for unit shall be surface mounted on wall or above ceiling. Provide with ingraved laminate plaque indicating lighting to be controlled.
6. Interpret “failsafe” to mean that emergency relay contacts go to mechanically latched position whenever normal power is interrupted or electronics of specified device fail.
7. Contractor is responsible for both normal and emergency circuits to device even if both circuits are not specifically called out on floor plans.

2.8 BALLASTS FOR HID LAMPS

A. Electromagnetic Ballast for Metal-Halide Lamps: Comply with ANSI C82.4 and UL 1029. Include the following features unless otherwise indicated:
   Provide HID lamp ballasts manufactured by Advance, Valmont, Magnetek or Venture.
   1. Ballasts shall be pulse start and meet all federal or state energy legislation.
   2. Ballasts shall be electronic when available.
   3. Provide HID lamp ballasts, capable of operating lamp types and ratings indicated; constant wattage type, high power factor, fused (one per ungrounded power conductor) extra-quiet core and coil assembly encapsulated in non-melt resin; install capacitor outside ballast encapsulation for easy field replacement; and enclose assembly in drawn aluminum alloy housing(s) unless otherwise specified.
   4. Provide H.I.D. lamp ballasts, of ratings, types and makes as recommended by lamp manufacturer, which properly matches lamps to power line by providing appropriate voltages and impedances for which lamps are designed.
   5. Provide ballast designed such that it operates lamps within the lamp's power trapezoid requirements. Provide ballasts that are low noise.
   6. Where re-strike, or quartz re-strike, or emergency re-strike, or similar terms are specified on the Luminaire Schedule, provide system with time-delay relay for use with generators (for both hot re-strikes and cold starts) unless noted otherwise. Do not provide “auxiliary sockets”.

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7. Provide dedicated parity sized neutral conductor for each branch circuit phase conductor that serves H.I.D. luminaires.
8. Ballast Circuit: Constant-wattage autotransformer or regulating high-power-factor type.
10. Rated Ambient Operating Temperature: 104 deg F.
11. Open-circuit operation that will not reduce average life.
12. Low-Noise Ballasts: Manufacturers' standard epoxy-encapsulated models designed to minimize audible luminaire noise.

B. Electronic Ballast for Metal-Halide Lamps: Include the following features unless otherwise indicated:
1. Minimum Starting Temperature: Minus 20 deg F for single-lamp ballasts.
2. Rated Ambient Operating Temperature: 130 deg F.
3. Lamp end-of-life detection and shutdown circuit.
4. Sound Rating: Class A.
5. Total Harmonic Distortion Rating: Less than 20 percent.
6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
7. Lamp Current Crest Factor: 1.5 or less.
8. Power Factor: 0.90 or higher.
9. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

2.9 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.

2.10 EMERGENCY LIGHTING UNITS

A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
1. Battery: Sealed, maintenance-free, lead-acid type.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or luminaires.

2.11 FLUORESCENT LAMPS

A. Lamps shall be manufactured by G.E., Osram Sylvania or Philips.
B. T8 rapid-start lamps, CRI 82 (minimum), and average rated life 20,000 hours unless otherwise indicated. Refer to Luminaire Schedule for wattage and color temperature.

C. T5 rapid-start lamps, CRI 85 (minimum), and average rated life 20,000 hours unless otherwise indicated. Refer to Luminaire Schedule for wattage and color temperature.

D. T5HO rapid-start, high-output lamps, CRI 85 (minimum), and average rated life 20,000 hours unless otherwise indicated. Refer to Luminaire Schedule for wattage and color temperature.

E. Compact Fluorescent Lamps, Twin-Tube/Dual Twin-Tube and Triple-Tube, CRI 80 (minimum), color temperature as indicated in Luminaire Schedule, average rated life of 10,000 hours at three hours operation per start, and suitable for use with dimming ballasts unless otherwise indicated.

2.12 HID LAMPS

A. High-Pressure Sodium Lamps: ANSI C78.42, CRI 21 (minimum), color temperature 1900 K, and average rated life of 24,000 hours, minimum.
   1. Provide Outdoor High Pressure Sodium lamps manufactured by Sylvania, General Electric, or Philips. Provide clear lamps (unless specifically directed otherwise) that are universal mounting type, equal to G.E. "LU" series, minimum 24,000 hours rated.

2.13 INCANDESCENT LAMPS

A. Incandescent Lamps
   1. Provide incandescent lamps manufactured by General Electric, Osram Sylvania or Philips. Provide incandescent lamps that are long-life type (3000 hours). Provide incandescent lamps that are soft white finish unless specifically directed otherwise. Provide socket adapters/extenders if required for accommodating the specified lamp.

2.14 LIGHT EMITTING DIODE (LED) SYSTEMS

A. Light Emitting Diode (LED) Systems
   1. LED Source
      a. Provide factory installed LED modules that are specifically designed for, and matched and mated to, the respective luminaire in which they are used.
      b. Provide LED modules that can easily be replaced in the field and are readily accessible for replacement.
      c. Provide color temperature as indicated in Luminaire Schedule.
   2. LED Driver
      a. Provide factory installed driver(s) for the LED source utilized that are specifically coordinated to the LED source and luminaire in which they are used.
      b. Provide driver(s) having specific operating characteristics defined in the Luminaire Schedule.
      c. Provide driver(s) that can easily be replaced in the field and are readily accessible for replacement.
      d. Provide specification sheet for the specific driver as part of the Luminaire Submittal.
2.15 LUMINAIRE SUPPORT COMPONENTS

A. Support fixtures in compliance with NEC.

B. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

C. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

D. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single luminaire. Finish same as luminaire.


F. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.

G. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

H. Hook Hangers: Integrated assembly matched to luminaire and line voltage and equipped with threaded attachment, cord, and locking-type plug.

I. Provide additional supports as required in seismic areas.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Luminaires:
   1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
   2. Install lamps in each luminaire.

B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.

C. Remote Mounting of Ballasts: Distance between the ballast and luminaire shall not exceed that recommended by ballast manufacturer. Verify, with ballast manufacturers, maximum distance between ballast and luminaire.

D. Lay-in Ceiling Luminaires Supports: Use grid as a support element.
   1. Install ceiling support system rods or wires for each luminaire. Locate not more than 6 inches from luminaire corners.
2. Support Clips: Fasten to luminaires and to ceiling grid members at or near each luminaire corner with clips that are UL listed for the application.

3. Luminaires of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support luminaires independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

E. Suspended Luminaire Support:
1. Pendants and Rods: Where longer than 48 inches brace to limit swinging.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

F. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

G. Install surface and recessed ceiling luminaires on grid and tile ceilings to agree with module of ceiling either displacing a tile, or unit on center of tile, or centered on grid lines.

H. Install flush mounted luminaires properly to eliminate light leakage between luminaire frame and finished surface.

I. Do not locate splice or tap within an arm, stem, or chain. Provide wiring continuous from splice in outlet box of the building wiring system to lamp socket, or to ballasts terminals in fluorescent luminaires.

J. Provide Type AC/MC Cable or wiring in minimum 1/2” diameter flexible metal conduit (with full parity sized green insulated equipment ground wire) for "drops" from building wiring system junction boxes to suspended ceiling mounted luminaires. Limit the length of these “drops” to 72”. Install "drops" to luminaires in gypsum board, and similar inaccessible ceiling systems, from identified accessible junction boxes.

K. Connect luminaires utilized for emergency egress lighting ahead of switching and other controls. The only exceptions to this are photocell-only controls for outdoor emergency egress luminaires.

L. Provide luminaires and luminaire outlet boxes with hangers to properly support luminaire weight. Submit design of hangers, method of fastening, other than indicated or specified herein, for review by Owner's representative and review by ceiling installer. Anchor luminaires installed in, or on, suspended ceiling systems in strict compliance with NEC, including advance coordination with the ceiling installer. Support surface mounted luminaires greater than 2 feet in length at a point in addition to the outlet box luminaire stud.

M. Fasten electrical luminaires and brackets securely to structural supports. Install luminaires level and plumb.

N. Where special mounting conditions are encountered, such as mounting to rounded columns or similar special circumstances, provide special factory fabricated mounting means (i.e., brackets designed to conform with curvature of rounded columns, or to conform with similar special surfaces).
O. Provide stems and chains for luminaires as designated by the Owner's representative where deemed necessary by the owner's representative to achieve a functional and neat installation. Contact owner's representative to determine pendant, stem, and chain lengths if mounting height is not indicated.

P. Provide plaster frames, or gypsum board frames, or similar kits for recessed luminaires installed in other than suspended grid type acoustical ceiling systems. Brace frames temporarily to prevent distortion during handling.

Q. Wear clean white cotton gloves when handling the luminaires reflective and diffusing surfaces. Clean surfaces including dust, finger prints, paint, etc. with a clean dry cheesecloth after interior work has been completed. Remove plastic shipping bags from luminaires only after work in the respective area is complete.

R. Where applicable, verify that measured illuminance values comply with respective isolux (or equivalent) plot diagram values.

S. Provide full assembly for luminaires that are shipped with any loose components, regardless of who furnishes the luminaires.

**3.2 LIGHTING STANDARDS AND POST LIGHTS**

A. Utilize belt slings or rope (not chain or cable) to protect finishes of poles and standards when raising and setting finished poles and standards.

B. Provide sufficient space encompassing hand access and cable entrance holes for installation of underground cabling where applicable.

C. Fasten electrical poles, luminaires and brackets securely to structural supports.

D. Provide concrete base for each luminaire standard pole. Provide base that is reinforced, and, unless indicated deeper on drawings, of the depth recommended by the manufacturer. Provide galvanized steel washers, nuts and anchor bolts, in diameters, lengths and classes as directed by pole manufacturer.

E. After ensuring that the poles are plumb, neatly fill the entire space between top of concrete bases and bottom of pole bases with grout. Provide poles with matching factory base covers ("skirts"). This applies even if not specifically indicated on Luminaire Schedule.

F. Separately-fuse luminaires within the pole-base handholes.

**3.3 IDENTIFICATION**

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
3.4 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.5 STARTUP SERVICE

A. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner. Burn-in fluorescent and compact fluorescent lamps intended to be dimmed, for at least 100 hours at full voltage.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.
   1. Adjust aimable luminaires in the presence of Architect.

END OF SECTION
Submittal Form - 265100.00 – Luminaires
Provide And Complete This Sheet And Submit As A Cover Sheet For Submittals Requested Within This Section.

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Refer to Division 26 Section 26 05 01.00 “Common Requirements for Electric”. Comply with applicable requirements therein.

C. Refer to Division 26 Section 26 05 02.00 “Common Electric Materials and Methods”. Comply with applicable requirements therein.

D. Refer to Division 26 Section 26 05 05.00 “Existing Conditions”. Comply with applicable requirements therein.

E. Refer to Division 26 Section 26 05 19.00 “Low-Voltage Electrical Power Conductors and Cables”. Comply with applicable requirements therein.

F. Refer to Division 26 Section 26 05 26.00 “Grounding and Bonding for Electrical Systems”. Comply with applicable requirements therein.

G. Refer to Division 26 Section 26 05 33.00 “Raceways and Boxes for Electrical Systems”. Comply with applicable requirements therein.

H. Refer to Division 26 Section 26 05 53.00 “Identification for Electrical Systems”. Comply with applicable requirements therein.

1.2 SUMMARY

A. Section Includes: All materials, labor and services to provide fully operational modifications to and extensions of existing facility fire alarm system(s).

B. Provide minimum 25% spare capacity for each data loop, each alarm circuit and for each set of power supplies and batteries.

1.3 ACTION SUBMITTALS

A. Provide submittals for equipment, materials and systems specified in this section. Include cuts, descriptive information, technical data, wiring diagrams, system battery calculations, plan-view layouts, legend, point-to-point wiring, etc. Identify all information that is specific to this project.

B. The fire alarm system supplier shall provide to the electrical contractor a complete set of floor plan drawings showing conduit sizes and number of conductors required to all components plus detailed wiring connections required at each type of device.
C. It shall be the responsibility of the Fire Alarm System Manufacturer to furnish submittals to the authority having jurisdiction for approval. This action shall be taken during the shop drawing procedure. The system must be approved by this authority and a copy submitted to the Engineer with the shop drawing submittal. All fire alarm system working drawings shall be provided by manufacturer.

1.4 PROJECT CONDITIONS

A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
1. Notify Owner’s Representative no fewer than two days in advance of proposed interruption of fire-alarm service.
2. Do not proceed with interruption of fire-alarm service without Owner’s Representative’s written permission.

1.5 SEQUENCING AND SCHEDULING

A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it “NOT IN SERVICE” until it is accepted. Remove labels from new equipment when put into service and label existing fire-alarm equipment “NOT IN SERVICE” until removed from the building.

B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

PART 2 - PRODUCTS

2.1 FIRE ALARM EXTENSION

A. Connecting to Existing Equipment and System

1. Verify that existing fire-alarm system is operational before making changes or connections.
2. Connect new equipment to existing control panel in existing part of the building.
3. Connect new equipment to existing monitoring equipment at the supervising station.
4. Expand, modify, and supplement existing control/monitoring equipment as necessary to extend existing control/monitoring functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.
5. Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
6. Provide Initiating Device, Notification Appliance, and Signaling Line Circuits that are NFPA 72, Class B, to match existing system.

B. General Requirements

1. Provide materials and labor as required to result in a fully operational extension and modification to the existing fire alarm system.
2. Where indicated on drawings, remove existing fire alarm devices in affected areas and protect during demolition and construction phases. Clean and reinstall these existing devices as indicated on drawings. Relocate devices as indicated on drawings and extend conduit and wiring as required. Modify and/or extend related existing wiring in conduit as required.
3. Fire alarm system devices (smoke detectors, pull stations, A/V alarm indicating devices, etc.) shall be of the same manufacturer as, compatible with, and UL Listed and labeled for use on, the existing building fire alarm system.
4. Provide auxiliary contacts if required for special applications. All strobe alarms shall be ADA compliant, minimum 75cd per ADA unless specifically indicated on drawings with lower candela rating.

5. Install wall-mounted devices at the following heights above finished floor:
   1) Fire Alarm Manual Pull Stations: 46” to top of operating handle.
   2) Fire Alarm A/V Annunciators: 80” to bottom of outlet box.

6. All new wiring shall be installed in strict accordance with manufacturer’s requirements and installed in minimum 3/4” EMT conduit.

7. Fire alarm system wiring shall be installed in a raceway system separate from security sub-system wiring where/if applicable.

8. The installation shall include a complete system test of the equipment by the local representative of the system installed. This test shall be performed in the presence of representatives of the Owner, Engineer, and local fire department.

9. Provide all required modifications (cards, power supplies, hardware, firmware, software, etc.) to the existing Fire Alarm system as required to render the entire extension fully operable.

10. Provide ceiling mounted smoke detector located above each Fire Alarm Control Unit (FACU), if not already existing, and above all remote/satellite control and power units.

11. Provide all required 120VAC power as required to energize all new fire alarm related components. This requirement applies whether or not such power work is shown on the drawings. Branch circuits serving fire alarm related equipment shall be dedicated to fire alarm related equipment only.

12. Connect all new 120VAC power for fire alarm related equipment to emergency panels.

13. Panic (duress) switches shall be Ademco #269 (configure wiring for use with the normally closed contacts for local looping). Mount below counter top as directed in field. Provide end-of-line resistor and separate 2 #14 home-run to the nearest existing transponder (verify in field).

14. The audio/visual and visual-only alarm indicating devices shall be red ADA-compliant units (with minimum 75 candela ADA-compliant strobes) wall mounted at 68” to bottom of outlet box as shown on plans. Strobe units shall be synchronized wherever required by any authority having jurisdiction, including ADAAG. Additionally, where required by local authority, the strobes must meet ANSI S3.41 temporal code.

15. Provide STI #6520 protective cover for A/V alarm indicating devices in gymnasiums.

16. Provide isolation modules as required to isolate wire to wire shorts on a data loop to limit the number of other modules or detectors that are incapacitated by the short circuit fault and/or grounds. Isolation modules shall be part of the smoke detector base. The isolation modules shall permit the entire system to operate independently of the area disconnected by the isolation module due to wiring faults.

17. Provide monitor modules as required to interface "non-intelligent" devices into the system as shown on the drawings (i.e.).

18. Provide control modules for all auxiliary devices.

C. Duct Smoke Detectors
   1. The intelligent addressable duct mounted smoke detectors shall be photoelectric smoke detector unit.
   2. Provide sampling tube per NFPA, test station and all other required accessories.
   3. Duct smoke detectors are typically shown schematically at the respective air handling unit on the plans, but shall actually be installed maximizing the distances between ductwork offsets, and installed ahead of the first branch duct take-off. Coordinate with HVAC Contractor and fire alarm manufacturer’s representative in field. The duct smoke detectors shall be intelligent addressable photoelectric.
   4. Detectors shall operate at air velocities of 300 to 4000 feet per minute.
   5. Coordinate placement of duct detectors with the HVAC contractor.
   6. The shut-down of the air handler shall be via control module, unless specifically forbidden by the AHJ, in which case provide auxiliary contact as required to shut down equipment and wire into the stop circuit of the associated air handler starter.
7. Install all duct smoke detectors in the return air duct/plenum of the respective air handling equipment, or in multiple locations of the return duct branches if necessary to meet the minimum straight distances that are required by manufacturer of smoke duct detectors. Refer to HVAC ductwork drawings, and to HVAC installer’s coordination drawings, for configurations when determining actual locations and quantities of duct smoke detectors. Where more than one detector is already indicated associated with a particular piece of air handling equipment, there are special reasons for the additional detectors (i.e. split returns, return risers serving multiple floors, etc.); coordinate all locations for same with the HVAC installer.

8. In cases where multiple HVAC units serve a common space, provide interlocking functionality so that activation of any one duct smoke detector (or spot smoke detector where applicable) provides shutdown functions for all HVAC units that collectively serve the affected space.

9. In cases where plenum-return methods are utilized for HVAC return-air, provide smoke detector suspended in the air stream near the entrance to the return-air intake to the HVAC unit(s). Install using materials, means and methods pre-approved by authority or authorities having jurisdiction.

10. Provide test/monitor station (with status/alarm/trouble indicating LED’s) on the ceiling or wall (flush in finished areas) beneath the duct detector at discreet but readily visible location as determined in field unless specific location is shown on drawings. Provide engraved (or approved equivalent method) plate at each remote station to read: “#### Duct Smoke Detector”, where #### is the equipment identification used on drawings.

11. If required by authority having jurisdiction, provide identified key-operated air handler reset station on the ceiling or wall (flush in finished areas) beneath the air handler at discreet but readily visible location as determined in field unless specific location is shown on drawings. Provide engraved (or approved equivalent method) plate at each reset station to read: “#### Reset Switch to reset #### after a duct smoke detection event has been cleared and the fire alarm system has been reset.”, where #### is the equipment identification used on drawings. Coordinate with authority having jurisdiction for verification of, or required modification to, the language to be engraved.

12. Provide all required power and control wiring so that upon detection of smoke, the following sequence of operations occurs where applicable.
   a. An alarm signal is sent to the fire alarm control panel and to the monitoring central station.
   b. A/V alarm annunciates at the remote test station.
   c. The HVAC unit shuts down (including applicable dampers).
   d. Associated smoke dampers close (wired to automatically re-open on duct detector reset).

PART 3 - EXECUTION

3.1 REFER TO “PRODUCTS” SUB-SECTION(S) ABOVE
### 3.2 PERFORMANCE

A. The following table shows the schematic sequence of operations for the Fire Alarm System.

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Sequence of Operation Notes:

END OF SECTION 28 3113
SUBMITAL FORM – 263113.00 – FIRE ALARM SYSTEM EXTENSION

PROVIDE AND COMPLETE THIS SHEET AND SUBMIT AS A COVER SHEET FOR SUBMITTALS REQUESTED WITHIN THIS SECTION.

ELECTRICAL CONTRACTOR: __________________________ ELECTRICAL SUPPLIER: __________________________

ELECTRICAL CONTRACTOR REP: __________________________ ELECTRICAL SUPPLIER REP: __________________________

ELECTRIC CONTRACTOR PH. NUMBER: ___________ ELECTRIC SUPPLIER PH. NUMBER: ___________

ELECTRIC CONTRACTOR REP EMAIL: __________________________ ELECTRIC SUPPLIER REP EMAIL: __________________________

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