PROJECT MANUAL

BURTON HALL
ROOM 105 IMPROVEMENTS

University of Oklahoma
Facilities Management
160 Felgar St
Norman, OK 73019
OU Project No. 101-22
RFP #R-23047-23

ISSUED FOR BID
JUNE 27, 2022

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TABLE OF CONTENTS

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SECTION 02 4119

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Items indicated to be removed and salvaged remain Owner's property. Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.

B. Predemolition Photographs: Show existing conditions of adjoining construction and site improvements. Submit before Work begins.

C. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

D. It is not expected that hazardous materials will be encountered in the Work. If hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

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

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 DEMOLITION

A. Maintain services/systems indicated to remain and protect them against damage during selective demolition operations. Before proceeding with demolition, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of the building.

B. Locate, identify, shut off, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

D. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

E. Perform demolition in a manner that maximizes salvage and recycling of materials.
   1. Dismantle existing construction and separate materials.
   2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

F. Protect walls, ceilings, floors, and other existing finish work that are to remain. Erect and maintain dustproof partitions. Cover and protect furniture, furnishings, and equipment that have not been removed.

G. 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.

H. Provide temporary weather protection to prevent water leakage and damage to structure and interior areas.

I. Requirements for Building Reuse:
   1. Maintain existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and nonstructural roofing material) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.
   2. Maintain existing interior nonstructural elements (interior walls, doors, floor coverings, and ceiling systems) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.

J. 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.

K. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill. Do not burn demolished materials.

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

END OF SECTION

DOCUMENT 00 0101

PROJECT TITLE PAGE

1.1 PROJECT MANUAL

A. Burton Hall RM 105.

B. University of Oklahoma.

C. OU Project No. 101-22.

D. RFP #R-23047-23

E. Facilities Management

F. 160 Felgar St

G. Norman, OK 73019

H. Issue for Bid: June 27, 2022

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DOCUMENT 00 0107

SEALS PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

A. Architect:
   1. William R. Cooper.
   2. OK #3165.
   3. Responsible for Division 00.

B. Mechanical:
   1. Korey Jay Wheeler.
   2. OK #31050.
   3. Responsible for Division 20,22,23.

C. Electrical Engineer:
   1. Scott M. Welch.
   2. OK #23399.
   3. Responsible for Division 26, 28.

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DOCUMENT 00 0115

LIST OF DRAWING SHEETS

1.1 LIST OF DRAWINGS

A. Drawings: Drawings consist of the Contract Drawings and other drawings listed on the Table of Contents page of the separately bound drawing set titled Issue for ***Bid***, dated ***06/27/2022***, as modified by subsequent Addenda and Contract modifications.

B. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:

G1.0: General Notes and Legends.

E1.0 Electrical Legends, Abbreviations, General Notes, Details and Schedules.
E2.0 Electrical Plans and One Lines.

P1.0 Plumbing Notes, Symbols and Specifications.

END OF DOCUMENT

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DOCUMENT 00 3100

AVAILABLE PROJECT INFORMATION

1.1 AVAILABLE PROJECT INFORMATION

A. This Document and its referenced attachments are part of the Procurement and Contracting Requirements for Project. They provide Owner's information for the Bidder's convenience and are intended to supplement rather than serve in lieu of the Bidder's own investigations. They are made available for the Bidder's convenience and information but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

B. Existing drawings, specifications and submittals that include information on existing conditions including previous construction at Project site are available for viewing at the office of the Owner – University of Oklahoma, Facilities Management Department, 160 Felgar St., Norman, OK.

C. Permit Application: The building permit for Project has been applied for by Owner. A copy of the permit will be on display at the project site.

D. Hot-Work Permits: Application for Hot-Work Permits, if required, shall be made by the contractor through the University of Oklahoma Office of the Fire Marshall.

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SECTION 01 1000

SUMMARY

PART 1 - GENERAL

1.1 PROJECT INFORMATION

A. Project Identification: Burton Hall Rm 105/105A Improvements. – Project #101-22.
   1. Project Location: 610 Elm Ave. Norman Oklahoma, 73019.

B. Owner: University of Oklahoma.

C. Architect: OU Facilities Management Department.

D. Engineers: OU Facilities Management Department.

E. The Work consists of Mechanical and Electrical Renovation of the existing Rooms 105 and 105A as described in the accompanying design drawings and documents.

F. Contractor's Use of Premises: During construction, Contractor will have limited use of space indicated.
   1. Driveways, Walkways, and Entrances: Keep driveways loading areas and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
   2. Use care when accessing the site to minimize damage to existing intramural fields and grass.
   3. Work Hours: Work hours are generally 7:00am to 5:00pm. Nighttime work will not be allowed. Weekend work is allowed if needed and shall be coordinated with OU Project Manager prior to scheduling weekend work.

G. Nonsmoking Property: Smoking or any other use of tobacco products is not permitted on University of Oklahoma property.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 01 2500

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUBSTITUTION PROCEDURES

A. Substitutions include changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

B. Where one or more manufacturers are listed for a particular equipment item, the Contractor shall furnish the equipment as manufactured by one of the manufacturers listed. **If the Contractor desires to substitute a manufacturer not listed, he must submit his request to the Architect/Engineer in writing by the last day for questions, as determined by OU Purchasing.** If the proposed substitute equipment is determined to be acceptable, the Architect/Engineer will list the approved substitute equipment in an addendum to the project plans/specifications and the Contractor shall base his bid on the equipment items listed.

C. **The Architect/Engineer WILL NOT give verbal approval of any substitute materials**.

D. Substitutions proposed shall be equivalent in such features as noise level, power requirements, metal gages, vibration attenuation, finish, appearance, certification of recognized testing agencies and standards bureaus, allowable working pressures, physical size and arrangement so far as affects installation in the available space, factory applied insulation, electrical devices, controls, access to internal parts, water and air pressure drops, operating speeds, coil face areas, fan diameters, operating efficiencies, and features and capacities specified herein.

E. If required by the Architect/Engineer, the Contractor shall provide complete samples of substitute equipment to be delivered to the Architect/Engineer for examination. Handling, storage, shipping and delivery to and from the Architect/Engineer of any sample required shall be at the cost of the Contractor.

F. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitution Request Form: Use **CSI Form "During the Bidding/Negotiating Stage"**
   2. Submit requests in writing by the last day for questions, as determined by OU Purchasing.
   3. Identify product to be replaced and show compliance with requirements for substitutions. Include a detailed comparison of significant qualities of proposed substitution with those of the Work specified, a list of changes needed to other parts of the Work required to accommodate proposed substitution, and any proposed changes in the Contract Sum or the Contract Time should the substitution be accepted.
   4. Owner will review proposed substitutions and provide notification if accepted **by Addendum**.

G. Do not submit unapproved substitutions on Shop Drawings or other submittals.

H. After the submittals are approved, the Architect/Engineer will consider substitute equipment only if unusual circumstances warrant further consideration. Requests for consideration of substitutes shall be made in writing and state all applicable reasons and/or circumstances. The Contractor's presence will be required in any meetings or discussions regarding the submittals. Owner will review proposed substitutions and notify Contractor of their acceptance or rejection **by Change Order**. If necessary, Owner will request additional information or documentation for evaluation.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 3000

ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 PROJECT MANAGEMENT AND COORDINATION

A. Key Personnel Names: Within 5 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. List e-mail addresses and telephone numbers.

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

C. Requests for Information (RFIs): On discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI. Use **AIA Document G716**.

D. Schedule and conduct progress meetings at Project site weekly. Notify Owner of meeting dates and times. Require attendance of each subcontractor or other entity concerned with current progress or involved in planning, coordination, or performance of future activities.
   1. GC Project Manager will record minutes and distribute to everyone concerned, including Owner.

1.2 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   1. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   2. The Contractor shall provide the submittals in electronic/PDF or hard-copy format. Owner will return a copy with comments as appropriate.
      a. Electronic/PDF Format: Submit one (1) PDF version electronic file to the Owner's representative for approval.
      b. Hard-Copy Format: Submit four (4) copies, bound in four (4) hard plastic, three ring binders with clear plastic envelope on cover and spline, to the Owner's representative for approval.

B. Submittal Schedule:
   1. Within twenty-one (21) calendar days after the project contract is signed or notice to proceed is issued (whichever comes first), this Contractor shall submit the required documents to the Architect/Engineer for his approval.
   2. If the submittal is not received by the Architect/Engineer within the allowed twenty-one (21) calendar day period, each item of equipment must be furnished exactly as specified. If more than one manufacturer is mentioned in the specifications, the Contractor must furnish the equipment of the first manufacturer listed.
   3. The Architect/Engineer may require resubmittals on any equipment found to be unacceptable or incomplete. Any item not resubmitted within ten (10) business days after the issue date of the resubmittal notice shall be furnished exactly as specified.
   4. Contractor shall allow for 10 business days for each round of submittal review.

C. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
   1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item. A transmittal is required for each Specification Section. **DO NOT** bind separate submittals from different Specification Sections.
   2. Name file with unique identifier, including project identifier, Specification Section number, and revision identifier. Contractor shall verify that all material or equipment contained in the submittal

meet all the requirements specified or shown. Contractor shall sign and date submittal indicating that that the submittal complies with the Specifications.

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Owner.

D. Identify options requiring selection by Owner.

E. Provide printed descriptive literature, shop drawings, and illustrations of the equipment submitted. Only portions of catalogs that pertain to the equipment shall be included, and shall indicate completely all of the specification requirements. Where catalog sheets or drawings indicate several sizes or types of construction, they shall be clearly marked to indicate the size and/or type of construction proposed to be used on this project. Complete catalogs are not acceptable as submittals.

F. Identify any deviations in features, function, and/or performance from the equipment specified. Deviations shall be clearly defined and attention directed to the item(s).

G. Partial or incomplete submittals and submittals not conforming to the requirements of this specification will not be accepted, and will be returned to the Contractor for completion and/or correction.

1.3 CONTRACTOR'S CONSTRUCTION SCHEDULE SUBMITTAL PROCEDURE

A. Submit required submittals in the following format:
1. Working electronic copy of schedule file, where indicated.
2. PDF electronic file.
3. Two paper copies.

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
1. Submit a working electronic copy of schedule, using Microsoft Project, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

C. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections.
1. Submit electronic material and equipment submittals via email as PDF electronic files.
a. Owner will return annotated file. Annotate and retain one copy of file as an electronic project record document file.
b. Submit hard copies of full size shop drawings and samples as indicated below.

2.2 ACTION SUBMITTALS

A. Submit 1 copy of each informational submittal. Owner will return a photo copy or electronic copy with comments as appropriate.

B. Product Data: Mark each copy to show applicable products and options. Include the following:
1. Manufacturer's written recommendations, product specifications, and installation instructions.
2. Wiring diagrams showing factory-installed wiring.
3. Printed performance curves and operational range diagrams.
4. Testing by recognized testing agency.
5. Compliance with specified standards and requirements.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data. Submit on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches. Submit shop drawings 11x17 and smaller electronically. Submit shop drawings larger than 11x17 electronically or submit two (2) sets of hard copies. Include the following:
   1. Dimensions and identification of products.
   2. Fabrication and installation drawings and roughing-in and setting diagrams.
   3. Wiring diagrams showing field-installed wiring.
   4. Notation of coordination requirements.
   5. Notation of dimensions established by field measurement.

D. Samples: Submit two (2) samples for review of kind, color, pattern, and texture and for a comparison of these characteristics between submittal and actual component as delivered and installed. Include name of manufacturer and product name on label.
   1. If variation is inherent in material or product, submit at least 3 sets of paired units that show variations.

2.3 INFORMATIONAL SUBMITTALS

A. Informational Submittals: Submit 1 copy of each informational submittal. Owner will return a photo copy or electronic copy with comments as appropriate.

B. Qualification Data: Include lists of completed projects with project names and addresses, names and addresses of Owners, and other information specified.

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

2.4 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Owner.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit 1 copy of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
   1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

2.5 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type schedule within 10 days of date established for Notice of Award.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

C. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

D. Recovery Schedule: When periodic update indicates the Work is 7 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and indicate date by which recovery will be accomplished.

2.6 HOT WORK PERMIT

A. All cutting, welding, brazing, soldering, torch applications, grinding or similar activities must have an authorized hot work permit on display before work can start. Hot Work Permit application is available for printing at the end of this section.

PART 3 - EXECUTION

3.1 SUBMITTAL REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect/Engineer.

B. Architect/Engineer will review each action submittal, make marks to indicate corrections or modifications required, will stamp each submittal with an action stamp, and will mark stamp appropriately to indicate action.

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

D. The Architect/Engineer will review and prepare a report with recommendations on the submittal and one (1) resubmittal. If the resubmittal is incomplete or in any other way unsatisfactory or unacceptable, the review of any further required resubmittals will be at the Contractors expense, otherwise the material must be furnished as specified.

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

3.2 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Updating: At weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule 1 day before each regularly scheduled progress meeting.
   1. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribute copies of approved schedule to Owner, subcontractors, testing and inspecting agencies, and parties identified by Contractor with a need-to-know schedule responsibility. When revisions are made, distribute updated schedules to the same parties.

END OF SECTION

SECTION 01 4000

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

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

B. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements, comply with the most stringent requirement. Refer uncertainties to Owner for a decision.

C. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum. The actual installation may exceed the minimum within reasonable limits. Indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Owner for a decision.

D. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
   1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Owner.
   2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Owner.

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

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

G. 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.

H. Testing Agency Qualifications: An independent agency with the experience and capability to conduct testing and inspecting indicated; and where required by authorities having jurisdiction, that is acceptable to authorities.

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

J. Testing Agency Responsibilities: Cooperate with Owner and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify Owner and Contractor of irregularities or deficiencies in the Work observed during performance of its services.
   2. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
   3. Do not perform any duties of Contractor.

K. Associated Services: Cooperate with testing agencies and provide reasonable auxiliary services as requested. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Facilities for storage and field curing of test samples.
   5. Security and protection for samples and for testing and inspecting equipment.

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

M. Special Tests and Inspections: At Owner’s direction, engage a qualified testing/inspection agent to conduct special tests and inspections required by authorities having jurisdiction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

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

END OF SECTION

SECTION 01 4200

REFERENCES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

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

B. Abbreviations and Acronyms: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
8. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
9. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
10. AF&PA - American Forest & Paper Association; www.afandpa.org.
11. AGA - American Gas Association; www.aga.org.
12. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
13. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
14. AI - Asphalt Institute; www.asphaltinstitute.org.
15. AIA - American Institute of Architects (The); www.aia.org.
16. AISC - American Institute of Steel Construction; www.aisc.org.
17. AISI - American Iron and Steel Institute; www.steel.org.
18. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
19. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
20. ANSI - American National Standards Institute; www.ansi.org.
21. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
22. APA - APA - The Engineered Wood Association; www.apawood.org.
23. APA - Architectural Precast Association; www.archprecast.org.
24. API - American Petroleum Institute; www.api.org.
25. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
26. ARI - American Refrigeration Institute; (See AHRI).
27. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
28. ASCE - American Society of Civil Engineers; www.asce.org.
29. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
30. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
31. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
32. ASSE - American Society of Safety Engineers (The); www.asse.org.
33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34. ASTM - ASTM International; (American Society for Testing and Materials International); www.astm.org.
35. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
36. AWEA - American Wind Energy Association; www.awea.org.
37. AWI - Architectural Woodwork Institute; www.awinet.org.
38. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.

39. AWPA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
40. AWS - American Welding Society; www.aws.org.
41. AWWA - American Water Works Association; www.awwa.org.
42. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
43. BIA - Brick Industry Association (The); www.gobrick.com.
44. BICSI - BICSI, Inc.; www.bicsi.org.
45. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
46. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
47. CDA - Copper Development Association; www.copper.org.
48. CEA - Canadian Electricity Association; www.electricity.ca.
49. CEA - Consumer Electronics Association; www.ce.org.
50. CFFA - Chemical Fabrics & Film Association, Inc.; www.chemicalfabricsandfilm.com.
51. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
52. CGA - Compressed Gas Association; www.cganet.com.
53. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
54. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
55. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
56. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
57. CPA - Composite Panel Association; www.pbmdf.com.
58. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
59. CRRC - Cool Roof Rating Council; www.coolroofs.org.
60. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
61. CSA - Canadian Standards Association; www.csa.ca.
62. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
63. CSI - Construction Specifications Institute (The); www.csinet.org.
64. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
65. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
66. CWC - Composite Wood Council; (See CPA).
67. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
68. DHI - Door and Hardware Institute; www.dhi.org.
69. ECA - Electronic Components Association; (See ECIA).
70. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
71. ECIA ? Electronic Components Industry Association; www.eciaonline.org
72. EIA - Electronic Industries Alliance; (See TIA).
73. EIMA - EIFS Industry Members Association; www.eima.com.
74. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
75. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
76. ESTA - Entertainment Services and Technology Association; (See PLASA).
77. EVO - Efficiency Valuation Organization; www.evo-world.org.
78. FM Approvals - FM Approvals LLC; www.fmglobal.com.
79. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
80. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
81. FSA - Fluid Sealing Association; www.fluidsealing.com.
82. FSC - Forest Stewardship Council U.S.; www.fscus.org.
83. GA - Gypsum Association; www.gypsum.org.
84. GANA - Glass Association of North America; www.glasswebsite.com.
85. GS - Green Seal; www.greenseal.org.
86. HI - Hydraulic Institute; www.pumps.org.
87. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
88. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
89. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
90. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
91. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
92. IAS - International Accreditation Service; www.iasonline.org.

93. IAS - International Approval Services; (See CSA).
94. ICBO - International Conference of Building Officials; (See ICC).
95. ICC - International Code Council; www.iccsafe.org.
96. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
97. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
98. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
99. IEC - International Electrotechnical Commission; www.iec.ch.
100. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
101. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
102. IESNA - Illuminating Engineering Society of North America; (See IES).
103. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
104. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
105. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
106. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
107. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
108. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
109. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
110. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
111. ISO - International Organization for Standardization; www.iso.org.
112. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
113. ITU - International Telecommunication Union; www.itu.int/home.
114. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
115. LMA - Laminating Materials Association; (See CPA).
116. LPI - Lightning Protection Institute; www.lightning.org.
117. MBMA - Metal Building Manufacturers Association; www.mbma.com.
118. MCA - Metal Construction Association; www.metalconstruction.org.
119. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
120. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
121. MHIA - Material Handling Industry of America; www.mhia.org.
122. MIA - Marble Institute of America; www.marble-institute.com.
123. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); www.wmmpa.com.
124. MPI - Master Painters Institute; www.paintinfo.com.
125. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
126. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
127. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
128. NADCA - National Air Duct Cleaners Association; www.nadca.com.
129. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
130. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
131. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
132. NCMA - National Concrete Masonry Association; www.ncma.org.
133. NEBB - National Environmental Balancing Bureau; www.nebb.org.
134. NECA - National Electrical Contractors Association; www.necanet.org.
135. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
136. NEMA - National Electrical Manufacturers Association; www.nema.org.
137. NETA - InterNational Electrical Testing Association; www.netaworld.org.
138. NFHS - National Federation of State High School Associations; www.nfhs.org.
139. NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
140. NFPA - NFPA International; (See NFPA).
141. NFRC - National Fenestration Rating Council; www.nfrc.org.
142. NHLA - National Hardwood Lumber Association; www.nhla.com.
143. NLGA - National Lumber Grades Authority; www.nlga.org.

144. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
145. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
146. NRCA - National Roofing Contractors Association; www.nrca.net.
147. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
148. NSF - NSF International; (National Sanitation Foundation International); www.nsf.org.
149. NSPE - National Society of Professional Engineers; www.nspe.org.
150. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
151. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
152. NWFA - National Wood Flooring Association; www.nwfa.org.
153. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
154. PDI - Plumbing & Drainage Institute; www.pdionline.org.
155. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
156. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
157. RFCI - Resilient Floor Covering Institute; www.rfci.com.
158. RIS - Redwood Inspection Service; www.redwoodinspection.com.
159. SAE - SAE International; (Society of Automotive Engineers); www.sae.org.
160. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
161. SDI - Steel Deck Institute; www.sdi.org.
162. SDI - Steel Door Institute; www.steeldoor.org.
163. SEFA - Scientific Equipment and Furniture Association; www.sefalabs.com.
164. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
165. SIA - Security Industry Association; www.siaonline.org.
166. SJI - Steel Joist Institute; www.steeljoist.org.
167. SMA - Screen Manufacturers Association; www.smainfo.org.
168. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
169. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
170. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
171. SPIB - Southern Pine Inspection Bureau; www.spib.org.
172. SPRI - Single Ply Roofing Industry; www.spri.org.
173. SRCC - Solar Rating and Certification Corporation; www.solar-rating.org.
174. SSINA - Specialty Steel Industry of North America; www.ssina.com.
175. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
176. STI - Steel Tank Institute; www.steeltank.com.
177. SWI - Steel Window Institute; www.steelwindows.com.
178. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
179. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
180. TCNA - Tile Council of North America, Inc.; (Formerly: Tile Council of America); www.tileusa.com.
181. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
182. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
183. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
184. TMS - The Masonry Society; www.masonrysociety.org.
185. TPI - Truss Plate Institute; www.tpinst.org.
186. TPI - Turfgrass Producers International; www.turfgrasssod.org.
187. TRI - Tile Roofing Institute; (Formerly: National Tile Roofing Manufacturing Association); www.tileroofing.org.
188. UBC - Uniform Building Code; (See ICC).
189. UL - Underwriters Laboratories Inc.; www.ul.com.
190. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
191. USAV - USA Volleyball; www.usavolleyball.org.
192. USGBC - U.S. Green Building Council; www.usgbc.org.
193. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
194. WASTEC - Waste Equipment Technology Association; www.wastec.org.
195. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
196. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
197. WDMA - Window & Door Manufacturers Association; www.wdma.com.

198. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); www.wicnet.org.
199. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
200. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
201. WWPA - Western Wood Products Association; www.wwpa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.
1. DIN - Deutsches Institut f?r Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 01 5000

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Use Charges: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated.

B. Water and Electric Construction Power: Available from Owner's existing system without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

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

D. Accessible Temporary Egress: Comply with applicable provisions in ICC A117.1.

PART 2 - PRODUCTS

2.1 MATERIALS – NOT USED

2.2 TEMPORARY FACILITIES

A. Provide field offices, storage and fabrication sheds, and other support facilities as necessary for construction operations and as approved by OU Project Manager. Store combustible materials apart from building.

2.3 EQUIPMENT

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

PART 3 - EXECUTION

3.1 TEMPORARY UTILITY INSTALLATION

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

B. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
   1. Toilets: Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

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

D. Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

3.2 SUPPORT FACILITIES INSTALLATION

A. Install project identification and other signs in locations approved by Owner to inform the public and persons seeking entrance to Project.

B. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.

C. Use of Owner's existing elevators is contingent upon approval by Owner's Project Manager. If elevator usage is permitted, elevators shall be cleaned and maintained in a condition acceptable to Owner. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

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

D. Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.

E. Install and maintain temporary fire-protection facilities. Comply with NFPA 241.

3.4 MOISTURE AND MOLD CONTROL

A. Before installation of weather barriers, protect materials from water damage and keep porous and organic materials from coming into prolonged contact with concrete.
1. Protect stored and installed material from flowing or standing water.
2. Remove standing water from decks.
3. Keep deck openings covered or dammed.

B. After installation of weather barriers but before full enclosure and conditioning of building, protect as follows:
1. Do not load or install drywall or porous materials into partially enclosed building.
2. Discard water-damaged material.
3. Do not install material that is wet.
4. Discard, replace, or clean stored or installed material that begins to grow mold.
5. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

3.5 OPERATION, TERMINATION, AND REMOVAL

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

B. Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion.

C. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period.

END OF SECTION

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SECTION 01 6000

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

B. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced.
   1. Show compliance with requirements for comparable product requests.
   2. Architect will review the proposed product and notify Contractor of its acceptance or rejection.

C. Basis-of-Design Product Specification Submittal: Show compliance with requirements.

D. Compatibility of Options: If Contractor is given option of selecting between two or more products, select product compatible with products previously selected.

E. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
   1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
   2. Deliver products to Project site in manufacturer's original sealed container or packaging, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
   3. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
   4. Store materials in a manner that will not endanger Project structure.
   5. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.

F. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. Provide products that comply with the Contract Documents, are undamaged, and, unless otherwise indicated, are new at the time of installation.
   1. Provide products complete with accessories, trim, finish, and other devices and components needed for a complete installation and the intended use and effect.
   2. Where products are accompanied by the term "as selected," Architect will make selection.
   3. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Where the following headings are used to list products or manufacturers, the Contractor's options for product selection are as follows:
   1. Products:
      a. Where requirements include "one of the following," provide one of the products listed that complies with requirements.
      b. Where requirements do not include "one of the following," provide one of the products listed that complies with requirements or a comparable product.

2. Manufacturers:
    a. Where requirements include "one of the following," provide a product that complies with requirements by one of the listed manufacturers.
    b. Where requirements do not include "one of the following," provide a product that complies with requirements by one of the listed manufacturers or another manufacturer.
3. Basis-of-Design Product: Provide the product named, or indicated on the Drawings, or a comparable product by one of the listed manufacturers.

C. Where Specifications require "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

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

2.2 COMPARABLE PRODUCTS

A. Architect will consider Contractor's request for comparable product when the following conditions are satisfied:
1. 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.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications.
3. List of similar installations for completed projects, if requested.
4. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 7000

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 EXECUTION REQUIREMENTS

A. Cutting and Patching:
   1. Structural Elements: When cutting and patching structural elements, notify Owner of locations and details of cutting and await directions from Owner before proceeding. Shore, brace, and support structural elements during cutting and patching.
   2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that result in increased maintenance or decreased operational life or safety.
   3. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Owner's opinion, reduce the building's aesthetic qualities.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

1.2 CLOSEOUT SUBMITTALS

A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

B. Certified List of Incomplete Items: Final submittal at Final Completion.

C. Operation and Maintenance Data: Submit **2 copies** of manual.

D. PDF Electronic File: Assemble manual into a composite electronically indexed file. Submit on digital media.

E. Record Drawings: Submit 2 set(s) of marked-up record prints.

F. Record Digital Data Files: Submit data file and 1 set(s) of plots.

G. Record Product Data: Submit 2 paper copies and 1 electronic .pdf file of each submittal.

1.3 SUBSTANTIAL COMPLETION PROCEDURES

A. 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.

B. Submittals Prior to Substantial Completion: Before requesting Substantial Completion inspection, complete the following:
   1. Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   2. Submit closeout submittals specified in other sections, including project record documents, operation and maintenance manuals, property surveys, similar final record information, warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   3. Submit maintenance material submittals specified in other sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner.
   4. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Before requesting Substantial Completion inspection, complete the following:
   1. Advise Owner of pending insurance changeover requirements.
   2. Make final changeover of permanent locks and deliver keys to Owner.
   3. Complete startup and testing of systems and equipment.
   4. Perform preventive maintenance on equipment used prior to Substantial Completion.
   5. Advise Owner of changeover in heat and other utilities.
   6. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
   7. Remove temporary facilities and controls.
   8. Complete final cleaning requirements, including touchup painting.
   9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Owner will proceed with inspection or advise Contractor of unfulfilled requirements. Owner will prepare the Certificate of Substantial Completion after inspection or will advise Contractor of items that must be completed or corrected before certificate will be issued.

1.4 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting inspection for determining final completion, complete the following:
   1. Submit a final Application for Payment.
   2. Submit certified copy of Owner's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Owner. Certified copy of the list shall state that each item has been completed or otherwise resolved.
   3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
   4. Submit pest-control final inspection report.

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

PART 2 - PRODUCTS

2.1 MATERIALS

A. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

B. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
   1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

2.2 OPERATION AND MAINTENANCE DOCUMENTATION

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.

B. Organization: Unless otherwise indicated, organize manual into separate sections for each system and subsystem, and separate sections for each piece of equipment not part of a system.

C. Organize data into three-ring binders with identification on front and spine of each binder, and envelopes for folded drawings. Include the following:
   1. Manufacturer's operation and maintenance documentation.
   2. Maintenance and service schedules.
   3. Maintenance service contracts. Include name and telephone number of service agent.
   4. Emergency instructions.
   5. Spare parts list and local sources of maintenance materials.
   6. Wiring diagrams.
   7. Copies of warranties. Include procedures to follow and required notifications for warranty claims

2.3 RECORD DRAWINGS

A. Record Prints: Maintain a set of prints of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued. Mark to show actual installation where installation varies from that shown originally. Accurately record information in an acceptable drawing technique.
   1. Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Owner. When authorized, prepare a full set of corrected digital data files of the Contract Drawings compatible with AutoCAD Release 2000.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

B. Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance.
   1. Verify compatibility with and suitability of substrates.
   2. Examine roughing-in for mechanical and electrical systems.
   3. Examine walls, floors, and roofs for suitable conditions.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Take field measurements as required to fit the Work properly. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication.

E. Verify space requirements and dimensions of items shown diagrammatically on Drawings.

F. Surface and Substrate Preparation: Comply with manufacturer's written recommendations for preparation of substrates to receive subsequent work.

3.2 CONSTRUCTION LAYOUT AND FIELD ENGINEERING

A. Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks.

3.3 INSTALLATION

A. 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. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations.

C. 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.

D. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed.

E. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place. Where size and type of attachments are not indicated, verify size and type required for load conditions.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Owner.

F. 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.

G. Use products, cleaners, and installation materials that are not considered hazardous.

3.4 CUTTING AND PATCHING

A. Provide temporary support of work to be cut.

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

C. Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

D. Cutting: Cut in-place construction using methods least likely to damage elements retained or adjoining construction.
   1. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

E. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
   1. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction in a manner that will minimize evidence of patching and refinishing.
   2. Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance.
   3. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

3.5 CLEANING

A. Clean Project site and work areas daily, including common areas. Dispose of materials lawfully.
   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. Remove debris from concealed spaces before enclosing the space.

B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion:
   1. Clean Project site, yard, and grounds, in areas disturbed by construction activities. Sweep paved areas; remove stains, spills, and foreign deposits. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   2. Sweep paved areas broom clean. Remove spills, stains, and other foreign deposits.
   3. Remove labels that are not permanent.
   4. Clean transparent materials, including mirrors. Remove excess glazing compounds.
   5. Clean exposed finishes to a dust-free condition, free of stains, films, and foreign substances. Sweep concrete floors broom clean.
   6. Vacuum carpeted surfaces and wax resilient flooring.
   7. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and foreign substances. Clean plumbing fixtures. Clean light fixtures, lamps, globes, and reflectors.

3.6 OPERATION AND MAINTENANCE MANUAL PREPARATION

A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
   1. Prepare supplementary text if manufacturers' standard printed data are unavailable and where the information is necessary for proper operation and maintenance of equipment or systems.

C. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams.

3.7 DEMONSTRATION AND TRAINING

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system. Include a detailed review of the following:
   1. Include instruction for basis of system design and operational requirements, review of documentation, emergency procedures, operations, adjustments, troubleshooting, maintenance, and repairs.

END OF SECTION

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SECTION 01 7419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Contractor shall provide for and haul off a roll off construction waste dumpster. The Contractor shall coordinate with OU Facility Management on the location of the construction waste dumpster.

B. Action Submittals:
   1. Waste Management Plan: Submit plan within 5 days of date established for commencement of the Work that maximizes salvage and recycling of materials.

C. Informational Submittals:
   1. Waste Reduction Progress Reports: Submit concurrent with each Application for Payment. Include total quantity of waste, total quantity of waste salvaged and recycled, and percentage of total waste salvaged and recycled.
   2. Records of Donations and Sales: Receipts for salvageable waste donated or sold to individuals and organizations. Indicate whether organization is tax exempt.
   3. Recycling and Processing Facility Records: Manifests, weight tickets, receipts, and invoices.
   4. Landfill and Incinerator Disposal Records: Manifests, weight tickets, receipts, and invoices.
   5. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations.

D. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 01 3000 "Administrative Requirements." Review methods and procedures related to waste management.

E. Waste Management Plan: Develop a waste management plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume but use same units of measure throughout waste management plan.
   1. Salvaged Materials for Reuse: Identify materials that will be salvaged and reused.
   2. Salvaged Materials for Sale: Identify materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
   3. Salvaged Materials for Donation: Identify materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
   4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
   5. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

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

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

3.2 RECYCLING WASTE

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

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

3.3 DISPOSAL OF WASTE

A. Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

B. Do not burn waste materials.

END OF SECTION

SECTION 26 0010

BASIC ELECTRICAL MATERIALS, METHODS AND REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Division 1 General Conditions applying to the General Contractor also apply to this Subcontractor as modified by Division 26 requirements.

1.2 ELECTRICAL CONTRACTOR QUALIFICATIONS

A. The Electrical Contractor shall be a company or firm engaged in the business of electrical contracting on a full-time basis and has had a minimum of five (5) years experience in the business of electrical contracting. The firm shall have completed a minimum of three (3) projects similar in size and scope to this project.

B. The Electrical Contracting firm shall be capable of providing a performance bond equal to the amount of 100% of the electrical contract sum.

C. The Electrical Contractor shall have a current Oklahoma State License.

D. Proof of the Contractor qualifications shall be submitted to the Owner upon request.

1.3 ELECTRICAL CONTRACTOR RESPONSIBILITY

A. The Electrical Contractor shall be the entity responsible for the proper execution of this project in accordance with the drawings and following specifications. If a materials supplier and/or manufacturer's representative assists in preparation of bids and/or submittals for the project, it is the Electrical Contractor's responsibility to determine that the materials being submitted meet the quality and performance criteria of the materials specified in these specifications.

1.4 DESCRIPTION OF THE WORK

A. The Contractor shall furnish all labor, materials, appliances, equipment, tools, transportation, superintendence and service required to construct and install complete and operative in accordance with the true intent of the drawings and specifications, the electrical system as specified herein and as shown on the drawings.

B. The Contractor shall bid all labor and materials to make equipment that is specified and/or shown complete and functioning, whether all details are specifically mentioned or not. In the case of conflicts, these Specifications shall have precedence over the plans.

1.5 ELECTRICAL STANDARDS, REGULATIONS, AND CODES

A. All ordinances, laws, and codes of the City, County, State, and National governments, and the local utility company standards shall be observed, and no work shall be acceptable that does not comply. The Contractor shall be held responsible and shall make any of the work installed by him conform to these regulations and codes with no additional expense to the Owner.

B. Applicable provisions of the following statutes, laws, codes, and standards are hereby imposed on a general basis for the electrical work in addition to specific application specified by individual work sections of these specifications:
1. National Electrical Code (NFPA 70)
2. Life Safety Code (NFPA 101)

3. National Electrical Safety Code, (ANSI C2.)
4. International Code Council
5. Accessible and Usable Buildings and Facilities (ICC/ANSI A117.1)
6. Statutes and regulations of the State of Oklahoma
7. University of Oklahoma standards

1.6 DRAWINGS AND SPECIFICATIONS

A. General:
1. The Division 26 specifications and “E-sheet” drawings have been made to form the basis for the installation of the electrical work. The drawings and specifications shall be considered as mutually explanatory, and any work required by one, but not by the other, will be performed as though required by both.
2. The work shall be accomplished as called for in the specifications and as shown on the drawings.

B. Basic documents describing the electrical work:
1. Drawings: Refer to the ("E") series drawings for the graphic representations, schedules and notations showing electrical work.
2. Specifications: Refer to Division 26 for the primary technical specifications of electrical work.
3. Base Bid Proposal: For the complete description refer to Division 1 and to the Bid Form.
4. Alternate Bid Proposals: Refer to Division 1 and to the Bid Form for the complete description.

C. Other documents affecting the electrical work:
1. The Architectural, Structural, Mechanical, Plumbing, Fire Sprinkler System, Civil, and other special system drawings and specifications for this project may also contain important information that must be taken into consideration while preparing bids for and installing the electrical work. It is the responsibility of this Contractor to examine all available drawings and to determine their effect on the electrical work.
2. Do not scale the electrical drawings for locations of equipment and devices. Refer to the Architectural, Structural, and shop drawings for actual dimensions.

D. Accuracy of drawings and specifications:
1. The specifications and drawings have been made to form the basis for the installation of this contractor's work. The plans and specifications shall be considered as mutually explanatory, and any work required by one, but not by the other shall be performed as though required by both.
2. These drawings and specifications are presumed to be accurate, but extreme accuracy is not guaranteed. **Any errors or ambiguities in the drawings and/or specifications that are discovered by the Contractor during the bidding phase shall be reported to the Architect/Engineer.** The Architect/Engineer will review and issue an addendum.
3. Any errors or ambiguities in the drawings and specifications that are discovered by the Contractor after the bidding phase shall be reported to the Architect/Engineer before the work is started. Omission of particular reference to any item necessary for complete installation and proper operation thereof shall not relieve the Contractor of responsibility of furnishing the same at no extra cost.

1.7 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

A. If the Contractor has any questions concerning the true intent and/or meaning of these drawings and specifications, he shall request a clarification in writing from the Architect/Engineer before submitting his bid (See Division 1).

B. In case of a dispute concerning the true intent and/or meaning of these drawings and specifications, the Architect/Engineer shall interpret the same, and his interpretation shall be accepted by the Contractor as final.

1.8 EXAMINATION OF THE SITE AND EXISTING FACILITIES

A. All Contractors submitting proposals for this work shall, before submittal of proposals, examine the site and thoroughly familiarize themselves with the existing conditions. All bid proposals shall take into consideration all such conditions that may affect the work under this contract and the bidders shall satisfy themselves as to the existing building conditions, the actual configurations, existing equipment, etc. *No information given on the drawings or in the specifications shall relieve the Contractor of this responsibility.*

B. Failure of the Contractor to examine the site and/or existing facilities *will not be cause for extras by reason of unforeseen conditions.*

1.9 PERMITS, FEES, LICENSES, AND TAXES

A. All necessary licenses or permits for the carrying out of this work shall be secured and paid for by this Contractor. The Contractor shall be responsible for any damages sustained due to his failure to secure such licenses or permits. This Contractor shall pay all taxes applicable to his work.

1.10 ELECTRICAL DEFINITIONS

A. The following definitions supplement definitions of the Contract, General Conditions, Supplementary Conditions and other General Contract Documents, and apply generally to the work.
   1. General Requirements: Provisions of Division 1 sections of these specifications.
   2. Indicated: Shown on drawings by notes, graphics or schedules, or written into other portions of contract documents. Terms such as "shown", "noted", "scheduled" and "specified" have same meaning as "indicated", and are used to assist the reader in locating particular information.
   3. Directed, Requested, Approved, Accepted, etc.: These terms imply "by the Architect/Engineer", unless otherwise indicated.
   4. Approved by Architect/Engineer: In no case releases Contractor from responsibility to fulfill requirements of contract documents.
   5. Project Site: Space available to Contractor at location of project, either exclusively or to be shared with separate Contractors, for performance of the work.
   6. Furnish: Supply and deliver to project site, ready for unloading, unpacking, assembly, installation, and similar subsequent requirements.
   7. Install: Operations at project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar requirements.
   8. Provide: Furnish and install, complete and ready for intended use.
   9. Installer: Entity (firm or person) engaged to install work, by Contractor, Subcontractor or Sub subcontractor. Installers are required to be skilled experts in work they are engaged to install.

1.11 COOPERATION

A. This Contractor shall employ a full time experienced and competent electrical superintendent to supervise the installation of the electrical system, represent him on the project and to coordinate the electrical work with the other trades.

B. This Contractor shall cooperate fully with all other Contractors on this project. If any part of this Contractor's work depends for proper execution or results upon the work of any other Contractor, this Contractor shall inspect and promptly report to the Architect/Engineer any defects in such work that render it unsuitable for such execution and results. His failure to so inspect and report shall constitute an acceptance of the other Contractor's work as fit and proper for the reception of this work.

C. This Contractor shall coordinate work with all other Contractors or Subcontractors whose work will be in contact with the work under this heading, so that proper cooperation between the different trades shall result there from.

D. To insure against delaying any other Contractor, this Contractor shall install immediately any of his work necessary at the time for continuous construction operations, and shall be held responsible for any delays caused due to his negligence. This Contractor shall at all times keep in close contact with the project, so that all work will proceed without delay.

1.12 WORKMANSHIP

A. The work to be performed as a part of this contract shall be performed by experienced craftsmen in a neat, careful, and workman-like manner, and in full compliance with all requirements of the latest revision of the National Electrical Code (NEC) and The National Electrical Installation Standards (NEIS), latest issue. The entire installation shall conform to the best standard practices of the electrical industry.

B. Any work found to be defective, not approved in writing, or in any way contrary to the provisions of this specification, no matter in what state of completion, may be rejected by the Architect/Engineer and must be brought into compliance immediately upon notification.

1.13 COORDINATION OF ELECTRICAL INSTALLATION

A. Sequence, coordinate and integrate the various elements of electrical work so that the electrical system will perform as indicated and be in harmony with the other work of the building. The Architect/Engineer will not supervise the coordination, which is the exclusive responsibility of the Contractor.

B. Raceways and cables shall not be installed closer than 6 inches from flues and steam or hot water lines. Give the right-of-way in confined-service spaces to piping which must slope for drainage and to larger HVAC ductwork and similar services which are less conformable than electrical services. The various phases of work shall have precedence over each other in the following sequence:
1. Soil and Waste Piping
2. Condensate Piping
3. Primary Electrical Conduit
4. Domestic Water Piping
5. Duct Work
6. Refrigerant Piping
7. Chilled and Heating Hot Water Piping
8. Gas Piping
9. Electrical Conduit and Wireways
10. Fire Sprinkler Piping

C. Locations, horsepower, and electrical ratings of motors and other electrical equipment indicated on the drawings are for guidance only and do not limit the equipment sizes or exact locations. When electrically operated equipment furnished under other divisions of these specifications materially differs from the design shown, this Contractor shall make the necessary adjustments to the wiring, disconnect devices, control devices, and branch circuit protection to accommodate the equipment actually installed. Coordinate exact locations of connections, sizes, etc. with the contractor providing the equipment.

1.14 ELECTRICAL WORK INDICATED ON THE DRAWINGS

A. The branch circuit wiring is indicated on the drawings, and is intended to be generally installed as shown. Any changes in the circuiting or conduit routing shall be submitted to the Architect/Engineer for approval before any deviations are made.

B. Any changes to the work under this contract from that shown on the drawings to make the work conform to the structure, to fit the work of other trades, or alternate methods of installation preferred by the Contractor shall be submitted to the Architect/Engineer for his approval before any deviations are made.

1.15 PRODUCT HANDLING AND STORAGE

A. Scheduling: This contractor shall be responsible for the proper scheduling, for delivery of his materials, equipment, and etc., to minimize the possibilities of damage or theft.

B. Storage:
1. This Contractor shall be responsible for the proper care of all his materials, equipment, etc., delivered at the site.
2. Building materials, Contractor's equipment, etc., may be stored on the premises, but the placing of same shall be subject to the approval of the Project Manager.
3. When any room in the building is used as a shop, storeroom, etc., the one making use of such room will be held responsible for any repairs, patching or cleaning arising from such use.

C. Damage:
1. This Contractor shall protect and be responsible for any damage to his work or material, from the date of the agreement until the final acceptance is made, and shall make good without cost to the Owner any damage or loss that may occur during this period.
2. Contractor shall handle all material as directed, so that they may be inspected by the Architect/Engineer upon request.
3. Should any material be found defective, not approved in writing, or in any way contrary to the contract, this material, no matter in what state of completion may be rejected by the Architect/Engineer and must be removed from the premises at once.

D. No waste material or rubbish resulting from this work shall be allowed to accumulate on or about the premises, but shall be promptly removed at the Contractor's expense.

1.16 TELEPHONE AND DATA SERVICES

A. Telephone and data cables will be furnished and installed by The University of Oklahoma.

B. Furnish and install raceways for the telephone and data cables per Section 26 0533 and as indicated on the drawings.

1.17 ELECTRICAL SERVICE

A. Refer to Electrical drawings for secondary electrical service to the building.

1.18 TEMPORARY ELECTRIC SERVICE

A. This Contractor shall furnish and install a temporary electrical lighting and power system in the building for use during construction. The existing electrical power system may be utilized, if allowed by Division 1, and as necessary for this system. Refer to Section 01 5000 for additional information regarding temporary facilities.

1.19 SERVICE INTERRUPTIONS

A. Any revisions to the electrical system which require interruption to the electrical services in use in the existing building(s) shall be of the shortest duration as practical. Times of interruption shall be coordinated with the Owner's Representative and accomplished after hours, on weekends, and/or at times as directed.

1.20 PENETRATIONS OF FIRE WALLS AND SMOKE PARTITIONS

A. All openings for electrical raceways, sleeves, devices, etc. which penetrate fire walls and/or smoke partitions shall be sealed with an approved sealing material, which will maintain the fire and/or smoke rating of the separation.

1.21 ELECTRICAL SYSTEM PERFORMANCE

A. This Contractor shall provide the necessary personnel and equipment to demonstrate that the electrical systems, equipment, and/or other system components are functioning to the performance as specified. The necessary personnel shall include electricians, technicians, engineers, or vendors' representatives as necessary for the system involved. The equipment shall include electrical metering and test equipment as necessary to demonstrate performance for the particular system or equipment in question.

B. All electrical systems and installations shall be tested to show that the equipment is installed and operates as planned and specified.

C. Take load readings at all panelboards and change branch circuits as required if unbalance of the load exists. The ampere readings should not differ more than 20% on ungrounded conductors. Submit load readings to the Architect/Engineer.

D. At the completion of the project, and before final payment is made, this Contractor shall submit to the Architect/Engineer for transmittal to the Owner, two (2) copies of a written record of performance tests on the electrical systems. Such tests shall show compliance with governing codes. These test reports shall be signed and certified by this Contractor.

E. This Contractor shall take all actions necessary to eliminate the source of any objectionable noise or vibration. Such changes shall be made without cost or inconvenience to the Owner. All air devices, transformers, relays, starters, lighting units, and other equipment shall not exceed the noise criterion curve of 35 db SPL when measured on the flat response C scale in any occupied spaces.

1.22 ELECTRICAL CONNECTIONS TO EQUIPMENT

A. Mechanical equipment supplied under Divisions 11, 22, 23, Owner furnished equipment, and other equipment supplied under other Divisions of this specification will require electrical feeders, control wiring, and connections as indicated on the drawings. Sizes of the feeders and circuit protective devices have been indicated. Exact locations, details and sizes of connections shall be coordinated with the supplier of the equipment item and connected as directed by the equipment manufacturer's instructions or Owner's Representative.

B. Outlets for electric water coolers (drinking fountains) shall be coordinated with the contractor responsible for furnishing and installing the coolers. Install the receptacles in accordance with the water cooler manufacturer recommended locations.

C. If disconnect switches for equipment are indicated to be mounted directly on the equipment, bring the conduits and wiring to and mount switch at the location as directed by the equipment manufacturer.

D. Maintain required working space per NEC 110.26.

1.23 CONTROL WIRING, DEVICES AND CONNECTIONS

A. Wiring required for control of mechanical equipment has been indicated in schematic diagrams on the E series drawings. The Contractor shall coordinate the installation and connection of the wiring with the Contractor providing the controls.

B. Line voltage control wiring shall be per Sections 26 0519, installed in conduits per Section 26 0533 of this specification. Low voltage thermostat wire shall be provided by the supplier of the equipment, installed and connected by this Contractor.

C. Control Relays where required: Coil voltage, number of poles and ratings shall be as indicated

1. Manufacturers: Subject to compliance with requirements, provide Square D, Class 8501 installed in NEMA-1 enclosures or approved equivalent from one of the following manufacturers:
   a. Allen Bradley
   b. Siemens
   c. GE
   d. Square D
2. Substitutions: Under provisions of Division 01.

1.24 REMODEL WORK

A. Certain areas of the existing building(s) may be required to be remodeled as shown on the drawings. In these areas electrical equipment and devices may be required to be disconnected and/or relocated from their points of service or function. Where these conditions are encountered, this Contractor shall remove and/or relocate the devices as shown or required and reconnect the devices to their original source as required.

B. Work in the remodeled areas shall be phased the same as the general contractor's work.

C. New devices and circuits are indicated to be connected to existing panelboards. Spare breakers may be used where available. If spare breakers are not available, install new circuit breakers in existing spaces.

1.25 DAMAGE

A. Damage to the Owner's property or other Contractor's work caused by this Contractor, or damage due to failure of his equipment or materials, shall be repaired or replaced at this Contractor's expense.

1.26 SALVAGE MATERIALS

A. Electrical materials which are removed from the existing building(s) (lighting fixtures, transformers, generators, etc.) shall be offered to the Owner. If the Owner does not want the materials, they shall become the property of the Contractor and removed from the job site. Owner retained materials shall be transported to and stored at the locations as directed by the Owner.

1.27 CLEANING AND TOUCH-UP

A. Prior to final inspection the Contractor shall clean the construction dust from all lighting fixtures and lamps, clean any paint or other foreign material from all panelboards and devices, and touch-up paint on all electrical equipment.

1.28 GUARANTEE

A. Warranties: The contractor shall deliver to the owner, via architect, all warranties on all equipment, which are for a longer period than one year.

B. Guarantee: The Contractor shall guarantee the apparatus as installed by him to develop the performance as specified, and shall guarantee to keep the entire system as installed by him or his Subcontractors in repair and perfect working order for one (1) year after day of acceptance of same, and shall furnish free of cost to the Owner all material, labor and other expenses necessary to comply with the above guarantee, said guarantee being based upon defective material, workmanship, and equipment performance.

1.29 SUBSTITUTIONS OF SPECIFIED MATERIALS AND EQUIPMENT

A. Where an item of equipment is specified on the plans or in the specifications with no specific manufacturer named, it shall be assumed that products of any manufacturer meeting the requirements of the specification will be acceptable.

B. Refer to Section 01 2500 for additional information regarding substitutions.

1.30 ELECTRICAL SUBMITTALS

A. General:
1. Submittals shall be in accordance with Division 1 requirements except as modified herein. Refer to Section 01 3000 for additional information regarding submittals.
2. Each item of electrical equipment shall be submitted for approval.
3. The Electrical Contractor is responsible for the content, preparation and timely delivery of the electrical submittal. If a second party prepares the submittal for the Contractor, it is the Electrical Contractor's responsibility to assure that the submittal is complete and in the proper format and content as set forth in this specification.
4. Contractor shall submit dimensioned shop drawings where required. Shop drawings shall show relationship of electrical equipment with the building structure and equipment of other trades.
   a. Shop drawings will be submitted for any items or equipment which is fabricated specifically for this project. All such shop drawings shall be included with the submittal data. Fabrication or shipment of such equipment shall not be started until all shop drawings have been approved and released by the Owner's representative.
   b. Shop drawings shall be provided for modifications to the fire alarm system.

B. Certification Statement:
1. The electrical submittal shall be accompanied by a statement signed by the Electrical Contractor or his authorized representative stating that:
   a. He has thoroughly reviewed the project drawings and specifications and has made himself aware of all of the requirements contained therein.
   b. He has thoroughly reviewed the electrical submittal, certifies that it is complete, that he is familiar with the equipment being submitted, and certifies that all substituted products are equal in every way to those specified.
   c. He is submitting to the Architect/Engineer a list of any deviations in quality or performance of materials being submitted from the quality or performance of materials specified on drawings or in the specifications.
2. Any submittal without this statement is considered to be incomplete and will not be reviewed until the letter is received.

C. Submittal Schedule:
1. Refer to Section 01 3000 for information on submittal schedule.

D. Submittal Format:
1. The Contractor shall provide the submittal in electronic/PDF format to the Owner's representative for approval.
2. Submittals shall be provided with an index and divided by specification section – no more than one specification section per electronic file. Materials, devices, and equipment shall be submitted under their associated specification section. Each submittal shall include an entire specification section (for example, submit all items included in the raceways and boxes section, not just the EMT). Submittal data shall be arranged in the same order as the specifications.
3. When utilizing catalog pages, highlight or indicate the items, accessories, and options, to be provided as part of the project.
4. Provide a separate sheet similar to the index, recording deviations from Contract Document requirements, including minor variations and limitations. Highlight these deviations so it is apparent to the reviewer.
5. Include Contractor's certification that information and equipment complies with Contract Document requirements.
6. Submittal shall be provided with specification section title sheets corresponding to the specification.
7. Partial specification section submittals will not be accepted.
8. The submittal shall consist of a list of the materials, devices, and equipment to be furnished together with descriptive literature, equipment name, capacities, manufacturer's model and size,

performance data as the conditions specify, approximate delivery date, and any other pertinent facts concerning the various items. The submittal shall consist of all the items in the specifications, and shall include the following for each item or group of similar items:

a. Item name and designation number shown on plans; manufacturer's name, model and size number; capacity and performance data corresponding to that set forth in the specifications and shown in the schedule on the plans.

b. Printed descriptive literature and cuts showing general arrangement and design of the equipment submitted. Complete catalogs are neither desired nor acceptable as submittals. Include only portions of catalogs that pertain to the equipment submitted with specific items/models to be provided for the project clearly indicated.

NOTE: PARTIAL OR INCOMPLETE SUBMITTAL SPECIFICATION SECTIONS AND SUBMITTAL SPECIFICATION SECTIONS NOT CONFORMING TO THE REQUIREMENTS OF THIS SPECIFICATION MAY NOT BE ACCEPTED, AND MAY BE RETURNED TO THE CONTRACTOR FOR COMPLETION AND/OR CORRECTION.

E. Submittal Review:

1. The Architect/Engineer will review the submittal for conformance with the requirements of the specification and issue a report thereon. Items rejected, incomplete, or request for additional information will be contained in the report and may require resubmittal.
2. The Architect/Engineer will review and prepare a report with recommendations on the submittal and one (1) resubmittal. If the resubmittal is incomplete or in any other way unsatisfactory or unacceptable, the review of any further required resubmittals will be at the Contractors expense, otherwise the material must be furnished as specified.

1.31 APPROVAL OF MATERIALS

A. The Architect/Engineer will not, under any circumstances, give verbal approval for any item. The Contractor must obtain the Architect/Engineer's written approval of each item submitted.

B. The Architect/Engineer will not be required to prove that an item proposed for substitution is or is not of equal quality to the specified item. It is mandatory that the Contractor submit to the Architect/Engineer, in writing, all evidence required to support his contention that the item proposed for substitution is equal to the item indicated by the plans and/or specifications. Any deviations from the specified products shall be called to the attention of the Architect/Engineer.

C. The Architect/Engineer's approval of such submittals shall not relieve the Contractor of the responsibility for proper performance of all equipment.

D. The Architect/Engineer's approval of submitted equipment shall not relieve the Contractor of the responsibility for providing materials and equipment that have the features, function, and performance of the specified items, unless he has in writing, directed the attention of the Architect/Engineer to such deviations at the time the materials are submitted for approval.

E. The Architect/Engineer's decision on the approval or rejection of any item shall be accepted by the Contractor as final.

F. Approved submittals and shop drawings will become a part of the construction documents for this project.

1.32 MATERIALS INSTALLED ON PROJECT

A. The Contractor shall verify that materials installed on the project have been approved by the Architect/Engineer.

B. All materials furnished shall be new and a standard catalog product of the manufacturer. Experimental or unproven designs will not be considered.

1.33 AS CONSTRUCTED DRAWINGS AND OPERATING AND MAINTENANCE (O&M) MANUAL

A. At the completion of the project, and before final payment is made, this Contractor shall submit as-built Record Drawings and Operating and Maintenance Manuals to the Architect/Engineer. Refer to Section 01 7000 for information regarding Record Drawings and O&M Manuals.
   1. As-Constructed Drawings: The Contractor shall maintain a set of electrical drawings during construction on which any and all changes made in the installation of the electric system are recorded. These recorded changes shall include any changes in routing of conduits, relocated electrical equipment, etc. and any other changes made during the progress of the work. Locate all underground conduits with dimensions. Show the actual panel board circuit numbers and load description of each circuit. At the completion of the project, neatly transfer all of the changes in colored pencil or pen, in the same nomenclature as the original drawings, to one (1) clean, complete set of electrical working drawings.
   2. Operating and Maintenance Manual (O & M Manual): One (1) loose-leaf 3 ring binder with tabs or in electronic pdf form, containing a compilation of catalog data of each manufactured item of equipment used in the electrical work. This catalog may be similar to the electrical submittal, but shall include all descriptive data and printed installation, operating, instructions, guarantees, warranties, maintenance agreements, maintenance proposals and maintenance instructions for each item of equipment. A complete type written index shall be provided listing each product alphabetically by name together with the manufacturer, catalog number, and name, address, and telephone number of the area sales representative.

1.34 SPARE MATERIALS AND KEYS

A. At the completion of the project, and before final payment is made, this Contractor shall submit the following to the Architect/Engineer for transmittal to the Owner:
   1. Keys: Two keys of each type of key on the job.
   2. Spare Materials: Deliver spare fuses, lamps, and other spare equipment specified in various sections of this specification and store as directed.

1.35 PROJECT CLOSEOUT OR SUBSTANTIAL COMPLETION SITE VISIT

A. Refer to Section 01 7000 for additional information regarding project closeout.

B. The Architect/Engineer will conduct a review of the electrical installation when the Contractor gives notification that all the materials have been furnished and all work has been performed, and all the construction provided for by the contract has been completed in accordance with the contract terms.

C. In order to expedite the review of the electrical system installation, the Contractor shall have the following available at the job site on the agreed upon day(s) and time of the Architect/Engineer site visit.
   1. The Electrical Superintendent to represent the Contractor and to be available to answer any questions that may arise regarding the installation of the electrical system.
   2. Three (3) copies of a list of any items that are not complete with supporting documentation for the reasons the items are incomplete.
   3. As constructed drawings per Section 26 0010.
   4. Equipment catalog with operation and maintenance manuals, per Section 26 0010.
   5. Spare parts and equipment, per 26 0010.
   6. Warranties, guarantees, and certification letters.
   7. Electrical system performance test reports and certifications.

D. If it is necessary for the Architect/Engineer to make a return trip to the jobsite for another review due to the Contractor's failure to adequately complete his portion of the work, the cost of the Architect/Engineer's time and expenses of the return to the jobsite for the review will be at the Contractor's expense and will be withheld from the Contractor's final payment.

PART 2 - PRODUCTS

2.1 Refer to specific sections of Division 26 for products required for described work.

PART 3 - EXECUTION (Not applicable)

END OF SECTION

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SECTION 26 0040

ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Division 1 General Conditions applying to the General Contractor also apply to this Subcontractor as modified by Division 26 requirements.

1.2 DESCRIPTION OF WORK

A. The extent of demolition work is indicated on the drawings and by the requirements of this section. A visit to the site will be required to properly bid the demolition work.

B. Provide all demolition work required for the removal and/or relocation of electrical equipment and associated conductors, conduit, boxes, etc. to provide a complete and operable system upon completion of the project.

C. Work shall at all times be in compliance with local and national safety codes. Great care shall be taken to avoid leaving hazardous conditions unattended.

D. Schedule any required power outages in writing a minimum of 10 days in advance with the Owner.

E. Division 26 work includes removal or relocation of electrical devices which may include panels, transformers, lighting, fire alarm devices, exit signs, conduit, wiring, etc., in the areas to be remodeled as required and as indicated on the drawings. Demolition plans were prepared from as-built drawings and site surveys. Field modifications and/or additions have been made since the preparation of the as-built drawings, and all demolition items may not be shown or exist as exactly indicated, and absolute accuracy cannot be guaranteed. Contractor shall field verify actual conditions for himself during bidding and shall anticipate and include in his bid contingencies for any necessary work that may appear after demolition work has begun.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION

3.1 DEMOLITION

A. Where devices or equipment are indicated or required to be removed, the associated boxes, conduit, and conductors shall be removed back to their source.

B. Where devices or equipment are indicated or required to be relocated, the associated boxes, conduit, and conductors shall be removed back to a junction box and new products shall be used to extend the service to the new location.

C. Where devices or equipment are served from under a concrete floor, the conduit shall be cut off below finish floor level and capped. Non-shrink cementitious grout shall be provided to level the finished floor.

D. Where underfloor duct openings are deactivated the pedestal and associated fittings shall be removed and returned to the owner. Install a mud cap in the underfloor duct insert and grout flush with finished floor.

E. Where conduits are run above inaccessible ceilings or in walls which are to remain undisturbed, conductors shall be removed and the conduits capped and abandoned in place.

F. Where the demolition work renders equipment downstream inoperable, service shall be extended to the downstream devices or equipment so that they are left in operating condition.

G. Where devices or equipment are served with conduits penetrating a basement wall, the conduits shall be cut off outside the basement wall and capped. The basement wall penetration shall be sealed and made watertight.

END OF SECTION

SECTION 26 0049

ELECTRICAL TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Division 1 General Conditions applying to the General Contractor also apply to this Subcontractor as modified by Division 26 requirements.

1.2 DESCRIPTION OF WORK

A. The types of temporary facilities and uses requiring electrical work may include (but are not necessarily limited to) the following:
   1. Temporary power service/source.
   2. Temporary power distribution.
   3. Temporary lighting.
   4. Temporary use of permanent electrical facilities.

B. Refer to Division 1 and Section 01 5000 for basic requirements and administrative requirements relating to electrical work of temporary facilities.

1.3 QUALITY ASSURANCE

A. Governing Regulations, Permits: Comply with governing regulations for the electrical work of temporary facilities; including but not necessarily limited to code compliance's, permits, inspections, and health and safety compliance's.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide either new or used materials and equipment for electrical temporary facilities which are suitable for intended uses and will ensure safe, adequate performance of the facilities in accordance with governing regulations and codes.

PART 3 - EXECUTION

3.1 INSTALLATION AND OPERATION

A. General: Connect and terminate electrical temporary facilities at locations as determined by the General Contractor to fulfill project requirements. Unless specifically indicated in Division 1, the General Contractor will pay for electric utility usage during the period of construction. Install meters as required for the proper allocation of charges for temporary power use.

B. Electrical Work:
   1. Temporary power service to the project construction area, including stand-alone power generating units, or connected power service from an existing utility source, is not feasible.
   2. Temporary power distribution (temporary wiring) for the purpose of supplying convenience outlets, heating, temporary lighting, and similar facilities for construction, general services, security and protection. Work includes outlets with ground fault circuit interrupter protection and similar devices and facilities, but does not include extension cords and actual temporary mechanical equipment connections.
   3. Temporary lighting for construction areas; for temporary offices, shops, storage sheds and similar temporary space enclosures; for exterior construction areas, parking roadways and walkways;

and for special lighting for security, protection and project identification; but excluding plug-in type task lighting (defined as "tools"), needed to supplement general temporary lighting for specific construction activities.

4. A ground fault protective system per the N.E.C. shall be installed and maintained and shall be subject to the approval of the authority having jurisdiction.

3.2 REMOVAL AND RESTORATION

A. When no longer needed for construction work, remove electrical temporary facilities. Repair and restore or replace work damaged by installation and operation of electrical temporary facilities. Electrical equipment and devices installed as temporary facilities shall, upon removal, remain the property of the Installer. All debris and unused materials shall be removed from the site at the Contractors expense.

B. Restore any permanent equipment used for temporary facilities to original condition including lamps that have been in operation for one half or more of their rated life. All equipment shall be cleaned and touched up with manufacturer's matching paint. Light fixtures shall be carefully cleaned so as to not scratch or dull specular surfaces.

END OF SECTION

SECTION 26 0519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. The Division 1 General Conditions applying to the General Contractor also apply to this Subcontractor as modified by Division 26 requirements.

1.2 GENERAL CONDITIONS

A. Provide wires, cables, and connector products which are UL-listed and labeled for the temperature, conditions, and location where installed.

B. All wiring shall be installed in raceways per Section 26 0533 unless specifically noted or specified otherwise.

C. Type MC cable is only approved for use as lighting fixture whips of 6 foot length or less on this project, unless other uses are preapproved by Architect/Engineer.

1.3 CODES AND STANDARDS

A. NEC Compliance: Comply with applicable requirements of NEC (current edition) for construction and installation of wires/cables and connectors.

B. UL Compliance: Comply with UL Stds 83 and 486A.

C. NEMA/ICEA Compliance: Comply with NEMA/ICEA Std Pub/no. WC-5.

D. ASTM Compliance: Comply with ASTM B1, 2, 3, and 8.

1.4 DESCRIPTION OF WORK

A. The requirements of this section apply to cable, wire and conductor splices for work indicated in drawings, schedules and elsewhere in these specifications.

B. Copper conductors for systems less than 50V including remote control, signaling, and communications circuits.

C. The types of connectors suitable for copper conductors, as applicable, required for the project include the following:
   1. Solderless pressure type
   2. Compression type
   3. Split-bolt type

1.5 CONTROL WIRING

A. Control wiring shall be in accordance with this section, No. 16AWG minimum size or as recommended by manufacturer of systems equipment (motor control, alarm systems, communications, etc.)

1.6 SPECIAL SYSTEM WIRE AND CABLE

A. Clock system wire:
   1. This project does not require clock system wiring.

B. Refer to the following sections for wiring for other special systems:
   1. Section 283111 or Section 283112 for fire alarm system wire.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. American Insulated Wire Corp.
   2. Brintec Corp.
   3. Carol Cable Co. Inc.
   4. Senator Wire and Cable Co.
   5. Southwire Company

B. Copper conductors shall be furnished for all wires and cables. No aluminum or copper clad aluminum conductors will be allowed.

C. For voltages greater than 50V, provide wire and cable listed for 600V.

D. Conductor Color Coding: Provide color coding for secondary service, feeder, and branch circuit conductors throughout the project secondary electrical system as follows:

208 or 240/120 Volts	Conductor	480/277 Volts
Black	A Phase	Brown
Red	B Phase	Orange
Blue	C Phase	Yellow
White	Neutral	Gray
Green	Equipment Ground	Green
Green/yellow stripe	Isolated Ground	Green/yellow stripe

   1. Conductors No. 10 and smaller shall have color factory-applied the entire length of the conductors. Conductors No. 8 and larger may instead have colors applied according to Section 26 0533.
   2. Control and Special Systems: In accordance with IPCEA or equipment manufacturer's recommendations.

E. Provide THHN/THWN insulation for all conductors size 500MCM and larger. For all other sizes, unless otherwise noted, provide THW, THHN/THWN or XHHW insulation as appropriate for the locations where installed. Provide types THW, THHW, THWN installation for conductors installed underground, under floor, or in wet locations. Provide USE insulation for underground service cable when specified in drawings.

F. Conductors and Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THW, Type THHN/THWN, Type THWN-2, Type XHHW and Type USE.

G. Multi-conductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for Type AC, Type MC, Type MI, Type NM, Type SO, and Type USE with ground wire.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. AMP
   2. 3M Company
   3. O-Z/Gedney Co.
   4. Square D Company

B. For voltages greater than 50V, provide connectors listed for 600V.

C. Description: Factory-fabricated, solderless, metal connectors and splices of sizes, amp ratings, materials, types, and classes for applications and services indicated. Use connectors with temperature ratings equal to or greater than those of the wires upon which used.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wire sizes shall be as noted on the drawings. Wire shall be a minimum of No. 12 AWG unless noted otherwise.

B. No more than three circuits shall be allowed in a raceway. Where more than three (3) current carrying conductors are installed in a raceway, comply with NEC adjustment factors for reduced ampacity and for higher ambient temperatures.

C. Each circuit shall have a green grounding conductor installed with the phase and neutral conductors. The grounding conductor shall be sized as indicated and/or per the NEC. Refer to Section 26 0526.

D. Neutrals shall not be combined on branch circuits. A separate neutral shall be installed for each circuit. Multiconductor circuits are not allowed, except within UL listed equipment.

E. Feeders and Branch Circuits: Copper; solid or stranded for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

F. Service Entrance: Type THHN/THWN single conductors in raceway, Type XHHW single conductors in raceway, or, when specified, Type USE single conductors in raceway or direct burial.

G. Exposed Feeders, Branch Circuits, and Class 1 Control Circuits, Including in Crawlspaces: Type THHN/THWN single conductors in raceway.

H. Feeders and Branch Circuits Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN single conductors in raceway.

I. Feeders and Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN single conductors in raceway.

J. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, and strain-relief device at terminations to suit application.

K. Class 2 Control Circuits: Type THHN/THWN single conductors, or approved control system's pre-made cables in raceway. Where pre-made cables are connector type for connecting to open control modules, raceway shall terminate with protective bushing near control module allowing cable to be disconnected and reconnected easily.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

A. The wiring layout indicated on the drawings is intended to be diagrammatic and minor variances to accommodate the building structure are acceptable. If the Contractor desires to make major modifications to the general layout, (ie. install conduits overhead where indicated to be underfloor, etc.), he shall obtain the approval of the Architect/Engineer before beginning the changes.

B. Complete raceway installation between conductor and cable termination points according to Section 26 0533 prior to pulling conductors and cables.

C. Complete cable tray installation as applicable according to Section 26 0536 prior to pulling cables.

D. Install sleeves and sleeve seals at penetrations of exterior concrete floor and exterior concrete wall assemblies. Comply with requirements in Section 26 0544.

E. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

F. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

G. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway. Do not use rope hitches for pulling attachment to wire or cable.

H. Pull conductors simultaneously where more than one is being installed in same raceway. Use manufacturer-approved pulling compound or lubricant, where necessary.

I. 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.

J. Make splices, terminations, and taps that are compatible with conductor material. Install conductor at each outlet, with at least 6 inches of slack.

K. Splices: No splices or joints will be permitted in feeders or branches except at outlets or accessible junction boxes. Secure joints in branch circuit wiring mechanically and electrically with solderless connectors as listed by Underwriters Laboratories, Inc., pressure cable type, 600 volt rating, compression type. Install approved insulated connectors integral or separate cover to provide insulating value equal to that of the conductors being joined

L. Identify conductors and cables according to Section 26 0533.

3.3 FIELD QUALITY CONTROL

A. When the wiring has been pulled in and before tying into circuit breakers, motors, etc., test each conductor to ground and between conductors on each conduit run with a 600V DC "megger".
   1. Insulation should show a resistance reading of 150 megohms or higher. Any conductor in a conduit that doesn't, or shows a significantly lower resistance than the other conductors in the same conduit must be thoroughly checked and replaced

B. Prior to energizing, test wires and cables for electrical continuity.

C. Subsequent to wire and cable hook-ups, energize circuits and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and then retest to demonstrate compliance.

END OF SECTION

SECTION 26 0529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Division 1 General Conditions applying to the General Contractor also apply to this Subcontractor as modified by Division 26 requirements.

1.2 SECTION REQUIREMENTS

A. Steel slotted support systems shall be submitted for approval.

B. REFER TO SECTIONS 01 3000 AND 26 0010 FOR SUBMITTAL FORM AND REQUIREMENTS:

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: U-Channel, 16-gauge steel channels with 9/16" diameter holes a minimum of 8" on center in top surface, "Unistrut" or approved equal. Provide fittings and accessories that mate and match U-channel and are of the same manufacture. Comply with MFMA-4, factory-fabricated components for field assembly.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Unistrut
      b. Thomas and Betts
      c. Gregory Industries, Inc.
      d. Flex-Strut
      e. Haydon Corporation, Inc.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit, Cable, and Box Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings. Shall be "Caddy" or approved equivalent.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Caddy.
      b. Cooper B-Line.
      c. Steel City.

D. Mounting, Anchoring, and Attachment Components:
   1. Powder-Actuated Fasteners: Threaded heat-treated steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
   2. Mechanical-Expansion Anchors: Insert-wedge type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
   3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.

4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 SUPPORT INSTALLATION

A. Comply with NFPA 70, NECA 1, and NECA 101 for installation requirements except as specified in this Article.

B. Separate dissimilar metals and metal products from contact with wood or cementitious materials by painting each metal surface in area of contact with a bituminous coating or by other permanent separation.

C. Raceway Support Methods: In addition to methods described in NECA 1, EMT and RMC may be supported by existing openings through structure members, as permitted in NFPA 70.

D. Parallel Runs of Horizontal Raceways: Install on trapeze-type supports fabricated with approved U-channel.

E. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4-inch-diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.

F. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb at each support.

G. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 or Spring-tension clamps.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount on slotted-channel racks attached to substrate.

H. Support exposed and concealed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.

I. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.

J. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

K. Conduit, Cable, and Boxes shall be mounted to the structural members with approved mounting clips.

L. Vertical Conductor Supports: Install simultaneously with installation of conductors

M. Boxes mounted in metal stud walls:
   1. All single gang boxes shall be mounted with approved mounting clips.
   2. All multiple gang boxes shall be mounted with Caddy #TSGB or equal box supports.
   3. Conduits shall be secured to studs with approved clips.

N. Support outlet boxes above suspended ceilings from the structure above. Provide outlets occurring at locations other than at the main ceiling channels with auxiliary metal cross members of adequate strength and stiffness. Conduits above suspended ceilings and flexible metallic raceway runs from junction boxes above removable suspended ceilings shall be adequately fastened to ceiling supporting members by means of clamps, spring clips, or other positive devices.

O. Device Box Supports: All device boxes mounted in metal stud walls shall be mounted with approved mounting clips and conduits secured with approved clips. 4" square and multi-gang boxes shall have far-side box supports.

P. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.

Q. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cable trays, busways, cabinets, panelboards, transformers, boxes, disconnect switches, and control components in accordance with the following:
   1. Fasten by means of wood screws or screw-type nails on wood, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry, and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.
   2. Holes cut to depth of more than 1-1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete shall not cut the main reinforcing bars. Fill holes that are not used.
   3. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load. Use vibration-resistant and shock-resistant fasteners for attachments to concrete slabs.

R. Do not use wooden plugs inserted in masonry or concrete as a base to secure conduit supports. Provide toggle bolts for use with hollow concrete masonry units (CMU), and wedge anchors in concrete or brick. Hangers and devices for mounting of electrical equipment and devices shall be galvanized or otherwise protected from rusting by an approved method

END OF SECTION

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SECTION 26 0533

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. The Division 1 General Conditions applying to the General Contractor also apply to this Subcontractor as modified by Division 26 requirements.

B. Submittals:
1. Product Data and Shop Drawings for custom enclosures and cabinets.
2. Manufacturer's data on raceways, boxes, and fittings.
3. REFER TO SECTIONS 01 3000 AND 26 0533 FOR SUBMITTAL FORM AND REQUIREMENTS.

PART 2 - PRODUCTS

2.1 GENERAL

A. Products shall be new and undamaged. Raceways shall be a standard cataloged product of the manufacturer. Minimum conduit size shall be ¾", except for fire alarm FMC whips which shall be ½".

B. Conduit will be color coded as follows:
1. Normal power – Galvanized or no color
2. Emergency power – Yellow
3. Fire alarm - Red

2.2 GENERAL COMPLIANCE

A. NEC Compliance: Comply with National Electrical Code (NFPA 70) as applicable to construction and installation of raceways, boxes, and fittings.

B. Listing and Labeling: raceways, boxes, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. NEMA Compliance: Comply with National Electrical Manufacturers Association standards as applicable to nonmetallic fittings for underground installation.

D. NECA Standard: Comply with applicable portions of the National Electrical Contractors Association's "Standard of Installation".

2.3 CONDUITS, TUBING, FITTINGS, AND WIREWAY MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, conduits, tubing, fittings, and wireways shall be manufactured by firms regularly engaged in the manufacture of conduits, tubing, fittings, and wireways of the types and capacities required, whose products have been in satisfactory use in similar service for not less than 10 years. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Conduit Bodies:
   a. Appleton Electric Co.
   b. Crouse-Hinds Co.
   c. Killark Electric Mfg. Co.
   d. Pyle-National Co.
2. Bushings, Knockout Closures, and Locknuts:
   a. Allen-Stevens Conduit Fittings Corp.

b. Allied Metal Stamping, Inc.
c. Appleton Electric Co.
d. Carr Co.
e. Raco, Inc.
f. Steel City
g. Midland-Ross Corp.
h. Thomas and Betts Co., Inc.

2.4 METAL CONDUITS, TUBING, AND FITTINGS

A. Conduit Bodies: Provide galvanized cast metal conduit bodies (condulets), of the type, shape and size, to suit each respective location and installation, constructed with threaded conduit hubs, removable cover with gasket, and corrosion resistant screws.

B. Conduit fittings shall conform to UL 467 and UL 514 as applicable for rigid metal conduit, flexible metal conduit, EMT, and MI cable. Fittings for each type of conduits shall be of the same material as the conduit and when installed underground or in wet locations, they shall provide a watertight joint.

C. Bushings, Knockout Closures and Locknuts: Provide corrosion resistant punched steel box knockout closures, conduit locknuts and malleable iron conduit bushings of the type and size to suit each respective use and installation.

D. Galvanized Rigid Conduit (GRC)
1. Comply with ANSI C80.1 and UL 6.
2. Rigid galvanized steel conduit shall be hot-dip galvanized steel with threads hot-dip galvanized after cutting.
3. Provide threaded GRC fittings.

E. Electrical Metallic Tubing (EMT)
1. Comply with ANSI C80.3 and UL 797.
2. Electrical metallic tubing shall be hot galvanized steel tubing with an additional outside and inside urethane or similar coating for further rust protection.
3. Provide steel compression fittings. Cast fittings, setscrew fittings, and indent fittings will not be accepted.

F. Flexible Metal Conduit (FMC)
1. Comply with UL 1.
2. Flexible metal conduit shall be zinc-coated steel.

G. Liquidtight Flexible Metal Conduit (LFMC)
1. Comply with UL 360.
2. Liquid-tight flexible metal conduit shall be comprised of single strip, continuous, flexible, interlocked, double wrapped steel, galvanized inside and outside; forming smooth internal wiring channel; liquid tight jacket of flexible polyvinyl chloride (PVC). Provide separate green insulated equipment grounding conductor.
3. Liquid-tight flexible metal conduit shall be produced in accordance with U.L. Standard #360.

H. PVC Externally-Coated Rigid Galvanized Steel Conduit and Fittings
1. The galvanized conduit, prior to plastic coating, shall be new, unused material and conform to specifications given above for galvanized rigid conduit.
2. The exterior galvanized surfaces shall be coated with primer before PVC coating to insure a bond between the zinc substrate and the PVC coating.
3. Nominal thickness of the exterior coating shall be 40 mils
4. A PVC sleeve extending one pipe diameter or two inches, whichever is less, shall be formed at every female conduit opening on fittings except unions. The inside diameter of the sleeve shall be the same as the outside diameter of the conduit to be used.
5. The PVC coating on the exterior of conduit couplings shall have a series of longitudinal ribs 40 mils thick to protect the coating from tool damage during installation.

6. A urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal two mil thickness. Conduit having areas with thin or no coating will not be accepted.
7. All male and female threads on conduit, elbows and nipples shall be protected by application of a urethane coating.
8. Conduit bodies shall be supplied with stainless steel cover screws. Screw heads shall be encapsulated with plastic to assure corrosion protection.

I. Raceway Fittings: Specifically designed for raceway type used in Project.

2.5 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Electrical Nonmetallic Tubing: Comply with NEMA TC 13 and UL 1653.

B. Rigid Nonmetallic Conduit (RNC)
1. Comply with NEMA TC 2 and UL 651 unless otherwise indicated.
2. Provide nonmetallic conduit and fittings of the type, grade, size and weight (wall thickness) indicated for each service. Where type and grade are not indicated, provide proper selection as determined by the Installer to fulfill the wiring requirements (Schedule 40 minimum, unless noted otherwise). Type selected shall comply with the National Electrical Code and all applicable standards.

C. Raceway Fittings: Specifically designed for raceway type used in Project.

2.6 METAL WIREWAYS

A. Description: Rigid steel sheets formed into rectangular or square shapes and totally enclosed. It shall comply with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and be sized as indicated on drawings or according to NFPA 70.
1. Fittings: Specifically designed for raceway type used in Project.
2. Covers: Hinged-cover type unless otherwise indicated.
3. Finish: Manufacturer's standard enamel finish.

2.7 SURFACE RACEWAY SYSTEMS

A. Manufacturers
1. Manufacturers: Subject to compliance with requirements, surface raceway systems shall be manufactured by firms regularly engaged in the manufacture of surface raceway systems of the types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years. Provide Legrand “Wiremold” system or approved equivalent system Available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. Legrand
   b. Hoffman
   c. Hellermann Tyton
   d. National Electric Products Co.
2. Substitutions: Under provisions of Division 01.

B. Surface raceways shall be metal, paintable, and sized in accordance with the wiring installed. Furnish raceway system complete with all necessary accessories, hardware, and fittings for a complete system as recommended by the manufacturer.

C. Surface raceway color shall match the mounting surface, unless otherwise noted.

2.8 CONDUIT AND TUBING ACCESSORIES

A. Provide conduit and tubing accessories including straps, hangers, supports and expansion joints, bonding jumpers and conduit seals for hazardous areas as required and as recommended by the conduit and tubing manufacturer.

2.9 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, boxes, enclosures, and cabinets shall be manufactured by firms regularly engaged in the manufacture of boxes, enclosures, and cabinets of the types and capacities required, whose products have been in satisfactory use in similar service for not less than 10 years. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Interior Outlet Boxes:
      a. Appleton Electric Co.
      b. Arrow Conduit and Fittings Corp.
      c. National Electric Products Co.
      d. Steel City
      e. Midland-Ross Corp.
      f. Raco
   2. Weatherproof Outlet Boxes
      a. Appleton Electric Co.
      b. Crouse-Hinds Co.
      c. Harvey Hubbell, Inc.
      d. Pyle-National Co.
   3. Junction and Pull Boxes:
      a. Arrow-Hart, Inc.
      b. General Electric Co.
      c. Keystone Columbia, Inc.
      d. Square “D” Co.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Boxes shall be provided in wiring or raceway systems wherever required for pulling of wires, making connections, and mounting devices or fixtures. Construction and design of boxes to be the best adapted for the location, fixture and/or device. Boxes shall be of the cast metal hub type when located in normally wet locations, when surface mounted on outside of exterior surfaces, in hazardous areas, and when installed exposed up to seven (7) feet above interior floors and walkways. Boxes in other locations shall be sheet steel.

E. Interior Boxes:
   1. Concealed Work: Provide galvanized steel interior outlet wiring boxes of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices.
   2. Exposed Work: Provide die-cast alloy outlet wiring boxes of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with integral conduit hubs and tapped holes for securing box covers or wiring devices.
   3. Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations. Choice of accessories is Installer's option.

F. Pull boxes shall be constructed of code gage galvanized sheet steel except where cast metal boxes are required in location specified herein.

G. Covers shall be provided on outlet boxes, pull boxes and junction boxes if no device or fixture is attached. Covers shall be blank, suitable for painting and exactly fit the box.

H. Weatherproof Outlet Boxes: Provide corrosion-resistant cast metal weatherproof outlet wiring boxes, of the type, shape and size, including depth of box, with threaded conduit ends, cast metal face plate with spring-hinged waterproof cap suitably configured for each application, including face plate gasket and corrosion proof fasteners.

I. Junction and Pull Boxes: Provide galvanized sheet steel junction and pull boxes, with screw-on covers; of the type, shape and size, to suit each respective location and installation; with welded seams and equipped with steel nuts, bolts, screws and washers.

J. Floor Boxes: All floor boxes shall be provided with all necessary faceplates, covers, dividers and other hardware necessary for a complete and functional installation. Communications wiring and receptacles are to be provided by others.

1. Manufacturers: Subject to compliance with requirements, provide Hubbell “SystemOne Round Non-Metallic Floor Box” or approved equivalent from:
    a. Hubbell
    b. Raco
    c. Steel City
    d. Substitutions: Under provisions of Division 01.
2. Boxes in existing on-grade concrete floors: Provide required dividers to separate compartments for communications and power. Electrical contractor shall sawcut existing slab where necessary to install conduits and floorbox. After installation, electrical contractor shall patch and repair existing slab. Coordinate installation with structural/architectural contractor, in some areas existing floor may be removed by others.
    a. Power and Data Floorbox: Provide 4x4 sub-plate with four openings for voice/data jacks and four NEMA 5-20 receptacles.
    b. Power, Data, and Audio/Visual Floorbox: Provide Hubbell S1SP3IM “INFINeSTATION” sub-plate or approved equivalent as allowed above, with one NEMA 5-20 receptacle and space for communications and A/V jacks.
3. Boxes in all floors not on grade:
    a. Duplex Floor Outlet: Provide Hubbell “SystemOne” Dual-Channel Floor Fitting Fire Rated Poke Through #S1R6PTFIT, or approved equivalent as allowed above. Provide Hubbell “Style Line” sub-plate or approved equivalent as allowed above, with two compatible NEMA 5-20 duplex receptacles.
    b. Power and Data Floorbox: Provide Hubbell “SystemOne” Dual-Channel Floor Fitting Fire Rated Poke Through #S1R6PTFIT, or approved equivalent as allowed above. Provide Hubbell “Style Line” sub-plate or approved equivalent as allowed above, with four openings for voice/data jacks and four NEMA 5-20 receptacles.
    c. Power, Data and Audio/Visual Floorbox: Provide Hubbell “SystemOne” Dual-Channel Floor Fitting Fire Rated Poke Through #S1R6PTFIT, or approved equivalent as allowed above. Provide Hubbell S1SP3IM “INFINeSTATION” sub-plate or approved equivalent as allowed above, with one 5-20 receptacle and space for communications and A/V jacks.
    d. Furniture Feed Floorbox: Provide Hubbell “SystemOne” Dual-Channel Floor Fitting Fire Rated Poke Through #S1R6PTFIT, or approved equivalent as allowed above, or approved equivalent as allowed above. Provide sub-plate to allow connection to modular furniture. Conductors or modular furniture will be provided by others, and terminated in floor box by electrical contractor.
4. (Optional alternate) Boxes in existing on-grade concrete floors: Provide required dividers to separate compartments for communications and power. Electrical contractor shall sawcut existing slab where necessary to install conduits and floorbox. After installation, electrical contractor shall patch and repair existing slab. Coordinate installation with structural/architectural contractor, in some areas existing floor may be removed by others.

a. Power and Data Floorbox: Provide 4x4 sub-plate with four openings for voice/data jacks and four NEMA 5-20 receptacles.
b. Power, Data, and Audio/Visual Floorbox: Provide Hubbell S1SP3IM “INFINeSTATION” sub-plate or approved equivalent as allowed above, with one NEMA 5-20 receptacle and space for communications and A/V jacks.

5. (Optional alternate) Boxes in all floors not on grade:
   a. Duplex Floor Outlet: Provide Hubbell “System One” Dual-Channel Floor Fitting Fire Rated Poke Through, or approved equivalent as allowed above. Provide Hubbell “Style Line” sub-plate or approved equivalent as allowed above, with two compatible NEMA 5-20 duplex receptacles.
   b. Power and Data Floorbox: Provide Hubbell “System One” One-Piece 4x4 Fire Rated Poke-Through box, or approved equivalent as allowed above, with four openings for voice/data jacks and four NEMA 5-20 receptacles.

c. Power, Data and Audio/Visual Floorbox: Provide Hubbell “System One” Dual-Channel Floor Fitting Poke Through, or approved equivalent as allowed above. Provide Hubbell S1SP3IM “INFINeSTATION” sub-plate or approved equivalent as allowed above, with one 5-20 receptacle and space for communications and A/V jacks.

d. Furniture Feed Floorbox: Provide Hubbell “System One” 4x4 Floor Fitting Fire Rated Poke-Through with one ¾” conduit for power and two ¾” conduits for communications, or approved equivalent as allowed above. Provide sub-plate to allow connection to modular furniture. Conductors or modular furniture will be provided by others, and terminated in floor box by electrical contractor.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

A. Provide color-coded thread protectors on the exposed threads of threaded rigid metal conduit. Handle conduit and tubing carefully to prevent end-damage and to avoid scoring the finish. Store conduit and tubing inside and protect from weather. When necessary to store outdoors, elevate well above grade and enclose with durable, waterproof wrapping.

3.2 INSTALLATION

A. General Installation

1. Install raceways, boxes, and fittings as indicated, in compliance with NEC requirements, in accordance with the manufacturer's written instructions, and with recognized industry practices to ensure that the boxes and fittings service the intended purposes.
2. Provide knockout closures to cap unused knockout holes where blanks have been removed. Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring. Avoid using round boxes where conduit must enter box through side of box, which would result in a difficult and insecure connection with a locknut or bushing on the rounded surface. Secure boxes rigidly to the substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry.
3. Furnish and install outlet boxes for the various special systems such as intercommunication, burglar alarm, television, fire alarm, etc., as well as special outlets to accommodate devices, of such size, type, material and configuration as required to suit the equipment provided, type of occupancy, and space available. In the event the approved equipment for these special systems requires boxes, the contractor shall furnish and install the boxes, conduit and all required fittings at no increase in the contract amount.
4. Install outlet boxes for switches and receptacles in finished walls, except for special applications as specified herein or indicated of one piece standard gang type, a minimum of 4" x 1 1/2" deep for one device and 6 7/8" x 4" x 1 1/2" deep for two devices, with plaster covers and rectangular openings of proper size and shape. Install other special boxes as shown on drawings or details as necessary to meet structural requirements.
5. Install outlet boxes at mounting heights indicated on the drawings. Install those not definitely located or where the heights interfere with mechanical, architectural, or structural elements as directed by the Architect. Outlet mounting heights are construed to mean the distance from centerline of cover plate to finished floor unless otherwise noted. Generally, receptacle heights shall be 18" and wall switches shall be mounted 48" high above the finished floor to the center of the device. These heights may be adjusted with permission, if necessary to more nearly fit architectural features and shall comply with the ADA. Other heights shall be as noted or as necessary to meet equipment or safety requirements.
6. In no instance will boxes be allowed to be installed back-to-back in rooms with tenants such as, nursing homes, dormitories, hospital rooms, etc., or in rooms which need to sound isolated such as conference rooms, exam rooms, classrooms, etc.
7. "Outdoor Raceways Applications" and "Indoor Raceways Applications" paragraphs below provide examples of application requirements for various types of raceways. Coordinate with Drawings. Unless noted otherwise, provide conduit systems as described below for the conditions given.
    a. Outdoor Raceways Applications:
        1) Exposed or Concealed: GRC
        2) Underground or in concrete: RNC

3) Connection to Vibrating Equipment (dry-type transformers, motors, recessed luminaires, etc.): LFMC (12” minimum and 72” maximum)
4) Corrosive environments – PVC coated GRC
5) Boxes and Enclosures: Metallic, NEMA 250, Type 3R or Type 4

b. Indoor Raceways Applications:
1) Exposed or Concealed: EMT; for 3” and larger use GRC
2) Underground or in concrete: RNC
3) Connection to Vibrating Equipment (dry-type transformers, motors, recessed luminaires, etc.): FMC; in wet or damp locations use LFMC (12” minimum and 72” maximum)
4) Damp or Wet Locations: GRC
5) Corrosive environments – PVC coated GRC
6) Boxes and Enclosures: Metallic, NEMA 250, Type 1, unless otherwise indicated.

8. Install conduit and tubing products as indicated, in accordance with the manufacturer's written instructions, the applicable requirements of NEC, the National Electrical Contractors Association's "Standard of Installation", and in accordance with recognized industry practices to ensure that products serve the intended function.
9. All conduits installed below grade, under-floor, or in damp areas shall have connections coated with an approved sealant and tightened securely to make each joint waterproof.
10. Conduits shall be of sizes required to accommodate the number and size of conductors required in accordance with the tables given in the latest edition of the National Electrical Code. Where space will not permit the installation of one conduit of sufficient size to contain the conductors of a circuit required, two conduits shall be provided, each conduit shall contain duplicate phase, neutral and grounding conductors. The number and size of conduits indicated on the drawings are a minimum for the various systems required. If larger conduits or greater numbers are required, they shall be provided as necessary to accommodate the wiring as recommended by the manufacturer supplying the particular equipment. Where more than three (3) current carrying conductors are installed in a raceway, comply with NEC adjustment factors for reduced ampacity and for higher ambient temperatures.
11. Conduit and electrical metallic tubing shall be cut square, reamed smooth and drawn up tight.
12. Maintain electrical continuity throughout metallic raceway systems. Install removable cover pull boxes on long runs. Allow for natural drain of condensate. Install conduit bushings at all boxes, cabinets, etc. and at the termination ends of conduit stub-outs.
13. Do not use wooden plugs inserted in masonry or concrete as a base to secure conduit supports. Provide toggle bolts for use with hollow concrete masonry units (CMU), and wedge anchors in concrete or brick. Hangers and devices for mounting of electrical equipment and devices shall be galvanized or otherwise protected from rusting by an approved method.
14. Where wiring is required to be installed on the surface of walls in finished spaces, it shall be installed in surface raceway systems. Installation of surface raceways shall be in accordance with the manufacturer's instructions. In unfinished spaces such as mechanical rooms, surface mount conduit shall be acceptable.
15. Complete each electrical raceway system before installing cables or wire.
16. All raceway systems shall be equipped with a separate, green insulated equipment grounding conductor installed with the circuit conductors. In no case shall the grounding properties of the raceway itself be relied upon as the sole grounding means.
17. Wire pulling lubricants, when utilized, shall be in accordance with the requirements of Underwriters Laboratories, Inc., applicable to the specific conductor or cable insulation and raceway material.
18. Install nylon pull rope having 600 LB tensile strength in all empty conduits. Leave 12" of tail at each end.
19. RNC or PVC Externally-Coated conduit shall not be installed above grade indoors except as specifically noted or detailed.

B. Conduit through or in concrete:
1. Conduit shall be installed under concrete, unless specifically noted or detailed otherwise.
2. Install raceways embedded in concrete in middle third of concrete thickness where practical, and leave at least 1-inch thick concrete cover. Conduits shall not be larger in outside diameter than 1/3 the thickness of the concrete in which they are embedded.
3. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.

4. Space raceways laterally a minimum of three diameters to prevent voids in concrete.
5. Install conduit larger than 1-inch trade size, parallel to, or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.
6. Transition from nonmetallic tubing or RNC to PVC Externally-Coated Rigid Galvanized Steel sweeps and risers before rising from concrete outdoors, and to GRC before rising from concrete indoors. In no case shall PVC conduit be stubbed up from concrete, unless specifically noted or detailed.
7. Arrange raceways to cross building expansion joints at right angles with expansion fittings. Install expansion fittings on runs over 150 feet long. Expansion fittings shall be telescopic and waterproof and permit a movement up to 4 inches. Fittings shall be equipped with approved bonding jumpers around or through each fitting.

C. Routing:
1. Install raceways and cables concealed within finished walls, ceilings, and floors unless in mechanical rooms or otherwise indicated.
2. Route concealed conduits in as direct a line with as long bends as possible. Exposed conduits shall be routed parallel to or at right angles to the lines of the building. Boxes, plates, and etc. shall be accurately set plumb and level. Where conduits are routed exposed, right angle bends shall be made with standard conduit ells or field bends to not less than the same radius. All bends shall be free from dents or flattening. Not more than the equivalent of four quarter bends shall be used in any run between terminals at cabinets, outlets, junction boxes or pull boxes.
3. Route horizontal runs of concealed conduit close to ceiling beams, passing across and above water, steam, or other piping, etc., where possible.
4. Install raceways and cables at least 6 inches away from parallel runs of flues and steam or hot-water pipes.
5. Except as otherwise indicated, arrange electrical services and overhead equipment with a minimum of 7'-0" headroom in storage spaces, and 8'-6" headroom in other spaces. Arrange work to facilitate maintenance and repair or replacement of equipment. Locate services requiring maintenance on wiring devices and similar units in front of services requiring less maintenance.
6. Connect equipment for ease of disconnecting, with minimum of interference with luminaries, with ceiling finish, suspension, ductwork, air diffusers and other work, so that required performances of each will be achieved.
7. Do not install conduits through beams without special permission of the Architect unless specifically detailed or noted in drawings or specifications.
8. Flush mounted panelboards shall have three (3) ¾ inch empty conduits extended from the panelboard into accessible ceiling space, terminating in a 6" x 6" x 4" pull box with screw cover for future use. Install other future conduits as noted or required for future systems as directed by Architect/Engineer.

D. Terminations:
1. Terminate all rigid steel conduits with double lock nuts and bushings or hubs. For grounding purposes, secure EMT terminations at outlet boxes, junction boxes, panelboard cabinets, etc., with steel interlocking compression connectors. Set screws or indentations will not be accepted as a method of attachment of fittings to conduit or electrical metallic tubing.
2. Equip rigid steel conduit with insulated end bushings. Provide electrical metallic tubing 3/4" and larger with insulated connectors or end bushings. Bushings shall be of the type to prevent abrasion of wires without impairing the continuity of the conduit system grounding. The insulating insert material shall be thermoplastic molded and locked into the steel casing forming the body of the connector or bushing.
3. Provide the ends of each conduit or tubing in outlet boxes, pull boxes, and cabinets with blank discs ("pennies") inserted in bushings or other approved bushing closures to prevent the entrance of foreign material during the construction period. Conduits left empty for future wiring shall also be so equipped.

E. Special raceway systems:
1. Install conduits for thermostats, control, interlock wiring, and as otherwise required to effect proper operation of all systems specified in this and other sections of the specifications. Also provide

empty conduits for future systems as required in the specifications and as noted or shown on the drawings.

2. Communication raceways:
   a. Minimum size of telephone and data conduits shall be 1”.
   b. Provide telephone conduit system suitable for installation of fiber optic cable having a minimum bend radius of 8". All sweeps, pull boxes, and junction boxes shall accommodate this minimum radius. No conduit bodies shall be installed in the telephone raceway system, unless specifically indicated on the drawings.
   c. Install a pull rope with 12" of tail in all empty communication raceways.
3. Existing unmarked Fire Alarm raceways in project areas with fire alarm work:
   a. Junction box covers shall be painted red.
   b. Conduit runs over 10ft shall be painted red for 3 feet on the visible side a minimum of every 10 feet.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior concrete floor and exterior concrete wall assemblies. Comply with requirements in Section 26 0544.

3.4 FIRESTOPPING

A. Install fire-stopping at penetrations of fire-rated floor and wall assemblies sufficient to maintain original fire-rating.

END OF SECTION

SECTION 26 0553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Division 1 General Conditions applying to the General Contractor also apply to this Subcontractor as modified by Division 26 requirements.

1.2 SECTION REQUIRMENTS

A. Identification materials and accessories shall be submitted for approval.

B. REFER TO SECTIONS 01 3000 AND 26 0010 FOR SUBMITTAL FORM AND REQUIREMENTS.

1.3 CODES AND STANDARDS

A. Comply with NFPA 70 "National Electrical Code."

B. Comply with ANSI Standard A13.1, "Scheme for the Identification of Piping Systems," with regard to type and size of lettering for raceway and cable labels.

1.4 DESCRIPTION OF WORK

A. The extent of the electrical systems and equipment requiring identification is shown on the drawings and the extent of identification required is specified herein and in individual sections of work requiring identification.

B. The types of electrical identification specified in this section include the following:
1. Cable/conductor identification
2. Conduit identification
3. Danger signs
4. Equipment/system identification signs
5. Receptacles and switch circuit identification

PART 2 - PRODUCTS

2.1 ELECTRICAL IDENTIFICATION MATERIAL

A. General: Except as otherwise indicated, provide manufacturer's standard products of the categories and types required for each application.

B. Baked Enamel Danger Signs: Provide manufacturer's standard Danger Signs of baked enamel finish on 20 gauge steel of standard red, black and white graphics with recognized standard wording where applicable. Signs shall be 14" x 10" in size except where physically too large to apply, in which case 10" x 7" signs shall be used.

C. Engraved Plastic Laminate Signs: Provide engraving stock melamine plastic laminate, complying with FS-L-P-387 for all electrical equipment provided, installed or connected by the Contractor. Signs shall be black with white core, and shall be of suitable size to for the equipment to which they are attached.
1. Thickness: 1/16" for units up to 20 square inches or 8" length 1/8" for larger units.
2. Size: Unless noted otherwise, provide single line of text, 3/8" high lettering on 1" high sign (2" high where 2 lines are required).

3. Fasteners: Self-tapping stainless steel screws, except where screws cannot or should not penetrate the substrate use contact type permanent adhesive.

D. Fasteners for Plastic Laminated and Metal Signs: Epoxy adhesive or self tapping stainless steel screws or number 10/32 stainless steel machine screws with nuts and flat and lock washers

E. Adhesive backed vinyl markers: Provide self-stick markers of standard color and wording for voltage and system identification of equipment, raceways and enclosures (Emergency, Lighting, Power, Light, Power DC, Air Conditioning, Communications, Control, Fire, etc)
   1. Label Size as follows:
      a. Raceways 1 Inch and Smaller: 1 1/8 inches high by 4 inches long.
      b. Raceways larger than 1 Inch: 1 1/8 inches high by 8 inches long.

F. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape not less than 3 mils thick by 1 inch to 2 inches in width.

G. Pretensioned Flexible Wraparound Colored Plastic Sleeves for Raceway and Cable Identification: Flexible acrylic bands sized to suit the raceway diameter and arranged to stay in place by pre tensioned gripping action when coiled around the raceway or cable.

H. Wire/Cable Designation Tape Markers: Vinyl or vinyl cloth, self adhesive, wraparound, cable/conductor markers with pre-printed numbers and letter.

I. Aluminum, Wraparound, Cable Marker Bands: Bands cut from 0.014 inch thick, aluminum sheet, fitted with slots or ears for securing permanently around wire or cable jacket or around groups of conductors. Provide for legend application with stamped letters or numbers.

J. Underground Line Marking Tape: Permanent, bright colored, continuous printed, acid and alkali-resistant polyethylene film for direct burial service not less than 6 inches wide with minimum thickness of 0.004 inch. Tape shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise with an elongation factor of 350 percent. Tape color shall be as specified in Table 1 below, and shall bear a continuous printed inscription describing the specific utility.

Table 1 - Tape Color

Red	Electric
Yellow	Gas, Oil, Dangerous Materials
Orange	Telephone, Telegraph, Television, Police, and Fire Communication
Blue	Water System
Green	Sewer Systems

K. Switch and Receptacle Covers: Provide and install circuit identification label with black or white letters (to best contrast wall plates) on clear adhesive tape. Size shall be 3/8" wide and a maximum of 1-3/4" long. Each label shall show panelboard and circuit number, i.e., 1N2Y-12 with letter and numbers a minimum of 1/8" high. Where receptacle is dedicated to serving a piece of equipment, label shall also show equipment name. Brady BMP21 electronic labeling system or approved equal. Provide labels for all receptacles and switches including those not provided by division 26. Dymo type tape system is not acceptable.

2.2 CONDUIT AND JUNCTION BOX IDENTIFICATION

A. Provide junction box and pullbox exterior labeling indicating all panels and circuit numbers, or signal systems contained in the junction box. Label all junction boxes.

B. Provide heat shrink conduit identification to indicate origination point of all conduits stubbing up from underground into equipment. Also provide conduit identification at 20'-0" intervals along corridors, and 10'-0" intervals in electrical and mechanical rooms.

C. Band exposed or accessible raceways of the following systems for identification: Bands shall be pretensioned plastic sleeves, colored adhesive marking tape, or a combination of the two. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two color markings in contact, side by side. Install bands at changes in direction, at penetrations of walls and floors, and at 40 foot maximum intervals in straight runs. Apply the following colors:
   1. Fire Alarm System: Red
   2. Fire-Suppression Supervisory and Control System: Red and yellow
   3. Emergency Power: Yellow
   4. Security System: Blue and yellow
   5. Mechanical and Electrical Supervisory System: Green and blue
   6. Telecommunication System: Green and yellow
   7. Control Wiring: Green and red

D. Identify Junction, Pull, and Connection Boxes: Code required caution sign for boxes shall be pressure sensitive, self-adhesive label indicating system voltage in black, pre-printed on orange background. Install on outside of box cover. Also label box covers with identity of contained circuits. Use pressure sensitive plastic labels at exposed locations and similar labels or plasticized card stock tags at concealed boxes.

PART 3 - EXECUTION

3.1 APPLICATION, INSTALLATION, AND GENERAL INSTALLATION REQUIREMENTS

A. Coordination: Install identification after completion of painting.

B. Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals and as required by code.

C. Install identification devices in accordance with manufacturer's written instructions and requirements of NEC.

D. Regulations: Comply with NEC Article 110, governing regulations, and the requests of governing authorities for the identification of electrical work.

E. Conductors #10 and smaller shall have color factory applied the entire length of the conductors according to Section 26 0519. Conductors #8 and larger shall have colors applied as follows:
   1. The following field applied color coding methods may be used in lieu of factory coded wire (See Section 26 0519 for color code) for sizes larger than No. 10 AWG:
      a. Apply colored, pressure sensitive plastic tape in half lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Use 1 inch wide tape in colors as specified. Do not obliterate cable identification markings by taping. Tape locations may be adjusted slightly to prevent such obliteration.
      b. In lieu of pressure sensitive tape, colored cable ties may be used for color identification. Apply three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten for snug fit, and cut off excess length.

F. Tag or label conductors as follows:

1. Future Connections: Conductors indicated to be for future connection or connection under another contract with identification indicating source and circuit numbers.
2. Multiple Circuits: Where multiple branch circuits or control wiring or communications/signal conductors are present in the same box or enclosure (except for three circuit, four wire home runs), label each conductor or cable. Provide legend indicating source, voltage, circuit number, and phase for branch circuit wiring. Phase and voltage of branch circuit wiring may be indicated by means of coded color of conductor insulation. For control and communications/signal wiring, use color coding or wire/cable marking tape at terminations and at intermediate locations where conductors appear in wiring boxes, troughs, and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking tapes.
3. Match identification markings with designations used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installations.

G. Apply warning, caution, and instruction signs and stencils as follows:
1. Install warning, caution, or instruction signs where required by NEC, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect. Install engraved plastic laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation. Install butyrate signs with metal backing for outdoor items.
2. Emergency Operating Signs: Install engraved laminate signs with white legend on red background with minimum 3/8 inch high lettering for emergency instructions on power transfer, load shedding, or other emergency operations.

H. Install equipment/system circuit/device identification as follows:
1. Apply equipment identification labels of engraved plastic laminate on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm systems, unless unit is specified with its own self-explanatory identification. Except as otherwise indicated, provide single line of text, with 1/2 inch high lettering on 1 inch high label (2 inch high where two lines are required), white lettering in black field. Text shall match terminology and numbering of the Contract Documents and shop drawings. Apply labels for each unit of the following categories of electrical equipment.
    a. Panelboards, electrical cabinets, and enclosures
    b. Access doors and panels for concealed electrical items
    c. Electrical switchboards and switchgear
    d. Transformers
    e. Motor starters and motor controllers
    f. Pushbutton stations
    g. Clock/program master equipment
    h. Call system master station
    i. Fire alarm master station or control panel and major equipment
    j. Intrusion alarm control panel and major equipment
    k. Any device serving a remote load

I. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, and similar items for power distribution and control components above, except panelboards and alarm/signal components, where labeling is specified elsewhere. For new panelboards or panelboards affected by this project, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.

J. Install labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.

K. Underground Line Marking Tape: Warning tapes shall be installed directly above the conduit, at a depth of 6 to 8 inches below finished grade unless otherwise indicated. Where multiple lines installed in a common trench or concrete envelope, do not exceed an overall width of 16 inches; install a single line marker.

END OF SECTION

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SECTION 26 2200

LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Division 1 General Conditions applying to the General Contractor also apply to this Subcontractor as modified by Division 26 requirements

1.2 SECTION REQUIREMENTS

A. Identification materials and accessories shall be submitted for approval.

B. REFER TO SECTIONS 01 3000 AND 26 0010 FOR SUBMITTAL FORM AND REQUIREMENTS.

C. Submit manufacturer's data:
   1. Include sufficient information, clearly presented, to determine compliance with drawings and specifications.
   2. Include electrical rating, nameplate data, impedance, reactance, resistance, dimensions, weight, mounting material, decibel rating, terminations, temperature rise, no load and full load losses, and connection diagrams.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70 and list and label as complying with UL 1561.

B. NEC Compliance: Comply with the National Electrical Code (NFPA No. 70/ANSI C1) as applicable to the construction and installation of transformers.

C. NEMA and ASA Standards: Comply with applicable standards

2.2 GENERAL

A. Furnish and install specialty transformers as shown on drawings and as specified herein. Transformers shall have KVA and voltage ratings indicated on the drawings.

2.3 DISTRIBUTION TRANSFORMERS

A. Manufacturers: Provide transformer from a firm regularly engaged in the manufacture of transformers of the size required, whose products have been in satisfactory use in the same type service for not less than 10 years. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Siemens.
   2. Square D.
   3. GE.
   4. Eaton.

B. Description: Factory-assembled and factory-tested, air-cooled units for 60-Hz service, with steel enclosure. Electrical components, devices, and accessories to be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Enclosure: Ventilated, NEMA 250, Type 2 in dry indoor locations, Type 3R for damp, wet, or outdoor locations.
   1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

D. Taps:
   1. Transformers Smaller than 3 kVA: None.
   2. Transformers 7.5 to 14 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.
   3. Transformers 15 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

E. Transformers shall be provided with suitable terminal compartment with conductor termination lugs, arranged for required feeder terminations and for side or bottom entrance of flexible metallic raceways. The maximum temperature of terminal compartment shall not exceed 75 degrees C. at rated load with an ambient of 40 degrees C.

F. Transformers 15 KVA and above shall have Class H insulation and be rated for 150 degrees C maximum temperature rise at 40 degrees C ambient while operating at full rated KVA in accordance with NEMA Standards, Publication No. 20-4.14.

G. All transformers shall meet or exceed sound level requirements in accordance with ANSI Standard C89.2-1974.

H. K-Factor Rated Transformers: Where K-Factor rated transformers are indicated on the drawings, provide transformers in accordance with the following requirements:
   1. Ratings Information
      a. Transformer insulation shall be a UL recognized 220°C system. Neither the primary nor the secondary temperature shall exceed 220°C at any point in the coils while carrying their full rating of non-sinusoidal load. The maximum temperature hot spot temperatures shall not exceed the following values for the indicated K factors, defined as the sum of fundamental and harmonic I(pu)2h2 per ANSI/IEEE C57.110-1986. Manufacturers rating K factors by average temperature rise alone shall not be acceptable.

HOT SPOT TEMPERATURE	K FACTOR RATING	
	NL	NLP
220°C	4.0	13.0
185°C	3.2	9.6
150°C	2.	6.9

      b. Transformer Construction
         1) All cores to be constructed with low hysteresis and eddy current losses. The core flux density shall be well below the saturation point to prevent core overheating caused by harmonic voltage distortion. Manufacturers shall submit verification of induction levels well below the usual level for standard transformers.
         2) Transformers shall be common core construction. Transformers utilizing more than one core, or Scott-T connections, shall not be acceptable.
         3) The transformer secondary neutral terminal shall be sized for 200% of the secondary phase current.
         4) Transformers shall be supplied with a quality, full width electrostatic shield resulting in a maximum effective coupling capacitance between primary and secondary of 33 picofarads. With transformers connected under normal, loaded operating conditions, the attenuation of line noise and transients shall equal or exceed the following limits:
            a) Common Mode: 0 to 1.5kHz - 120db; 1.5 to 10kHz - 90db; 10 to 100kHz - 65db; above 100kHz - 40db
            b) Traverse Mode: 1.5 to 10kHz - 52db; 10 to 100kHz - 30db
         5) Sound levels shall be warranted by the manufacturer not to exceed the following:

a) 15 to 50kVA - 45db; 51 to 150kVA - 50db; 151 to 300kVA - 55db; 301 to 500kVA - 60db

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fasten transformers securely in place, with provisions for thermal and structural movement, according to manufacturer's recommendations. Install with concealed fasteners unless otherwise indicated. Install with manufacturer's vibration mountings.

B. Separate dissimilar metals and metal products from contact with wood or cementitious materials by painting each metal surface in area of contact with a bituminous coating or by other permanent separation.

C. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

D. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions.

END OF SECTION

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SECTION 26 2416

PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Division 1 General Conditions applying to the General Contractor also apply to this Subcontractor as modified by Division 26 requirements.

1.2 SECTION REQUIREMENTS

A. Panelboards, circuit breakers, and accessories shall be submitted for approval.

B. REFER TO SECTIONS 01 3000 AND 26 0010 FOR SUBMITTAL FORM AND REQUIREMENTS

C. Submit series connected interrupting ratings for all panelboards and circuit breakers.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application. Load Center type construction is not acceptable.

B. Comply with NEMA PB 1.

C. Materials shall be new and a standard cataloged product of the manufacturer. Experimental or unproven designs will not be acceptable.

2.2 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: Flush or surface mounted cabinets as noted in panelboard schedule; NEMA 250, Type 1 in dry indoor areas and Type 3R in wet or outdoor areas.

B. Service Equipment Label, when required: Nationally Recognized Testing Laboratory (NRTL) labeled for use as service equipment for panelboards with one or more main service disconnecting and over-current protective devices.

C. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

D. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Provide with rating sufficient for design requirements.

2.3 DISTRIBUTION PANELBOARDS

A. Panelboards, circuit breakers, and accessories:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Siemens
      b. GE
      c. Square D
      d. Cutler Hammer

2. Substitutions: Under provisions of Division 01.

B. Panelboards: NEMA PB 1, power and feeder distribution type, interrupting capacity to meet available fault currents.

C. Dead-front construction with concealed trim clamps.

D. Cabinets: Code gauge galvanized steel.

E. Gray baked enamel code gauge steel fronts and doors with flush hinges.

F. Metal flush catch and latches, shall not require key. Plastic cover catches are not acceptable.

G. Circuit breaker numbers permanently engraved on panel interior. Stick-on tape numbers are not acceptable.

H. Metal frame with clear plastic cover for panel index card.

I. Mains: Circuit breaker or Lugs only as noted in the panelboard schedule.

J. Branch Overcurrent Protective Devices: Plug-in circuit breakers as noted in the panelboard schedule.

K. Copper bus bars, including ground bars.

L. Main terminals shall be listed and identified for 60/75°C wire.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES WITHIN PANELBOARDS

A. Disconnects and over-current protective devices:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Siemens
   b. GE
   c. Square D
   d. Cutler Hammer
2. Substitutions: Under provisions of Division 01.

B. Molded-Case Circuit Breaker: Comply with UL 489, to meet available fault currents.
1. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
2. Molded case, thermal magnetic, with ON, OFF, and TRIPPED positions. Two and three pole breakers shall be common trip. BREAKER HANDLE TIES FOR TRIP OPERATION ARE NOT ACCEPTABLE.
3. Breakers shall be rated at 22 KAIC (minimum).
4. Circuit breakers serving heating and air conditioning equipment shall be HACR rated breakers. Breakers serving HID lighting loads shall be HID rated.
5. Ground-Fault Circuit-Interrupter Circuit Breakers: Single-pole and two-pole configurations with Class A ground-fault protection (6-mA trip).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Receive, inspect, handle, store, and install panelboards and accessories according to NEMA PB 1.1. Do not install damaged panelboards; remove from project site.

B. Store panelboards in a clean dry space which prevents formation of condensate. Use storage space with uniform temperature and adequate air circulation. Protect panelboards from dirt, fumes, water and physical damage

C. Install in accordance with the manufacturer's instructions, the applicable requirements of NEC, and in accordance with recognized industry practices to ensure that products serve the intended function.

D. Mount top of trim 90 inches above finished floor unless otherwise indicated. If this places the center of the operating handle of the top-most switch or circuit breaker (in highest position) higher than 6’7” then lower mounting of panel to bring it to 6’7”.

E. Panelboard boxes and trims shall be installed accurately and set plumb and level and in accordance with the manufacturer mounting instructions.

F. Arrange conductors into groups; bundle and wrap with wire ties.

G. Filler plates shall be used for all unused spaces in panelboards.

H. Connect branch and feeder circuits to panelboards in such a manner as to balance, as equally as possible, the loads connected to each phase.

I. At the completion of the work and when connected loads can be energized, check the load current in each phase of each feeder and make adjustments as necessary to correct load unbalances.

J. Create a typed directory to indicate installed circuit loads and incorporating Owner's final room designations according to Section 26 0553.

END OF SECTION

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SECTION 26 2726

WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Division 1 General Conditions applying to the General Contractor also apply to this Subcontractor as modified by Division 26 requirements.

1.2 SECTION REQUIREMENTS

A. Wiring devices shall be submitted for approval.

B. REFER TO SECTIONS 01 3000 AND 26 0010 FOR SUBMITTAL FORM AND REQUIREMENTS.

1.3 DESCRIPTION OF WORK

A. The extent of wiring device work is indicated by drawings and schedules, and by the requirements of this section. Wiring devices are defined as single discrete units of electrical distribution systems which are intended to carry but not utilize electric energy. The devices covered in this section may include, but not necessarily be limited by the following:
   1. Receptacles
   2. Switches
   3. Wall plates

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Materials shall be new and a standard cataloged product of the manufacturer. Experimental or unproven designs will not be acceptable.

C. Comply with NFPA 70.

D. Comply with National Electrical Manufacturers Associations standards for wiring device products.

2.2 DEVICES

A. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
   1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
   2. Devices shall comply with the requirements in this Section.

B. Duplex receptacles and lighting switches shall be of the same manufacturer.

C. Device Color:
   1. Wiring Devices: Gray unless otherwise indicated or required by drawings, NFPA 70, or device listing.

2.3 RECEPTACLES

A. Duplex Ground-Fault Circuit-Interrupter (GFCI) Convenience Receptacles, 125V, 20A, straight blade, non-feed-through type. NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
   1. Provide heavy duty, weather resistant, with integral personnel ground fault and self test protection.
   2. Manufacturers: Subject to compliance with requirements, provide Hubbell #GFR5362SG, or approved equivalent. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Hubbell Wiring Device Div.
      b. Arrow-Hart, Inc.
      c. Pass and Seymour, Inc.
      d. General Electric
      e. Leviton
   3. Substitutions: Under provisions of Division 01.

2.4 SWITCHES

A. Toggle, 3-Way, and 4-Way Switches, 120/277V, 20A, comply with NEMA WD 1 and UL 20.
   1. Provide wide body, heavy duty, industrial specification grade switch with mounting yoke insulated from mechanism, and which shall accept side or back wiring.
   2. Manufacturers: Subject to compliance with requirements, provide Hubbell #1221, #1223, #1224, or equivalents. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Hubbell Wiring Device Div.
      b. Arrow-Hart, Inc.
      c. Pass and Seymour, Inc.
      d. General Electric
      e. Leviton
   3. Substitutions: Under provisions of Division 01.

2.5 WALL PLATES

A. Manufacturers
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Sierra
      b. Pass and Seymour, Inc.
      c. Hubbell
      d. GE
      e. Leviton
   2. Substitutions: Under provisions of Division 01

B. Wall Plates, All Areas: Type 302 stainless-steel with a nominal thickness of 0.032” and beveled edges and satin finish.

PART 3 - EXECUTION

3.1 INSPECTION

A. Installer must examine the areas and conditions under which wiring devices are to be installed and notify the General Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Architect.

3.2 INSTALLATION

A. Comply with NFPA 70.

B. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

C. Furnish and install devices in accordance with the manufacturer's recommendations, and in accordance with recognized industry practices to ensure that products serve the intended function.

D. Delay installation of devices until wiring is completed. Install receptacles and switches only in electrical boxes which are clean and free from excess building materials, debris, etc.

E. Set occupancy switch functions per directions from the Owner Representative.

F. When installing occupancy sensors, consideration shall be given to the location of the sensor and occupant locations. Sensors shall not be located behind doors or furniture where the sensor's ability to sense traffic would be affected. Install unshared neutral conductors on line and load side of dimmers.

G. Where a GFCI receptacle is indicated on the drawings, it is intended that a GFCI receptacle as specified be installed at the location indicated. No feed-through wiring to adjacent receptacles indicated to be GFCI will be acceptable, unless otherwise noted.

H. Unless noted otherwise, wiring devices shall be mounted as follows:
   1. Wall mounted switches and dimmers: 48" above finished floor.

I. Mount devices flush, with long dimension vertical, unless above kitchen/break room countertops or otherwise directed. Install grounding terminal on top with type 302 stainless-steel wall plates, and grounding terminal on bottom with plastic wall plates. Group adjacent devices under single, multi-gang wall plates.

J. NEMA configuration and capacity of three and four wire receptacles serving equipment supplied by others shall be compatible with the plug on the equipment being supplied. Coordinate with the equipment supplier.

K. 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.

L. If devices are installed prior to wall painting or finish, the Contractor shall carefully mask all devices to prevent paint splatters on devices.

M. Devices or plates with scratches or blemishes in finish shall be replaced as determined by the Architect/Engineer.

N. Prior to the project completion inspection, the Contractor shall:
   1. Clean the construction dust and other debris from all devices and plates.
   2. Clean all construction paint from devices and plates.
   3. Apply supply circuit labeling to the device cover plates according to Section 26 0553.

END OF SECTION

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SECTION 26 2816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. The Division 1 General Conditions applying to the General Contractor also apply to this Subcontractor as modified by Division 26 requirements.

B. Enclosed switches and circuit breakers to be submitted for approval.

C. REFER TO SECTIONS 01300 AND 260533 FOR SUBMITTAL FORM AND REQUIREMENTS.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMNTS

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.

2.2 SHUNT TRIP SWITCHES

A. Comply with UL 50 and UL 98 (and ASME A17.1 if used as elevator shunt trip disconnect) with 200-kA interrupting and short-circuit current rating when fitted with Class J fuses.

B. Manufacturers: Firms regularly engaged in the manufacture of shunt trip switches of the size required, whose products have been in satisfactory use in the same type service for not less than 10 years.

2.3 FUSIBLE AND NONFUSIBLE SWITCHES

A. Fusible Switches, 600 A and Smaller: UL 98 and NEMA KS 1, Type HD, single throw that accommodate specified fuses, and with lockable handle interlocked with cover in closed position.

B. Nonfusible Switches, 600 A and Smaller: UL 98 and NEMA KS 1, Type HD, single throw with lockable handle interlocked with cover in closed position.

C. Switch Interior: Switch blades to be fully visible in the OFF position when the door is open. Dead-front construction with permanently attached arc suppressors hinged or otherwise attached to permit easy access to line-side lugs without removal of the arc suppressor. Lugs to be UL listed for copper and/or aluminum cables and front removable. Current carrying parts to be plated by electrolytic processes. Fuse holders to be of a type to reject all class H fuses.

D. Switch Mechanism: Provide a quick-make and quick-break operating handle and mechanism as a integral part of the box, not the cover. Provide a dual cover interlock to prevent unauthorized opening of the switch door in the ON position or closing of the switch mechanism with the door open.

E. Enclosures: furnish switches in NEMA 1 enclosures or as shown on the plans. Attach covers on NEMA 1 enclosures with suitable hinges. All enclosures installed where exposed to the weather shall be in NEMA 3R (raintight) enclosures. Raintight covers shall be securable in the open position. Provide NEMA 3R switches thru 200 amperes with closing caps, interchangeable hubs. Enclosures of code gauge (UL 98) sheet steel (NEMA 1) or code gauge (UL 98) galvanized steel (NEMA 3R), treated with a rust-inhibiting phosphate, finished in gray baked enamel.

F. Ratings: Switches to be horsepower rated for 250 or 600 volts AC or DC as required.

G. Provide fuses located as indicated and in accordance with the following:
   1. Section 26 2813.
   2. Provide any other time delay fuses for safety switches, as recommended by the switch or equipment manufacturer, and/or as shown, of class, type and rating needed to meet electrical requirements.

H. Manufacturers
   1. Manufacturers: Subject to compliance with requirements, provide from one of the following manufacturers:
      a. General Electric
      b. Westinghouse
      c. Square D
      d. Siemens
      e. Cutler Hammer
   2. Substitutions: Under provisions of Division 01.

2.4 MOLDED-CASE CIRCUIT BREAKERS

A. Description: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to meet available fault currents, (minimum 22KA interrupting capacity).
   1. Thermal-Magnetic Circuit Breakers: Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
   2. Electronic Trip Circuit Breakers: Field-replaceable rating plug, RMS sensing, with field-adjustable instantaneous trip settings.
   3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
   4. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.
   5. GFEP Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.

B. Features and Accessories:
   1. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
   2. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.

C. Manufacturers
   1. Manufacturers: Subject to compliance with requirements, provide from the manufacturer of panelboard or switchboard in which it will be installed as applicable, or one of the following manufacturers:
      a. General Electric
      b. Westinghouse
      c. Square D
      d. Siemens
      e. Cutler Hammer
   2. Substitutions: Under provisions of Division 01.

2.5 ENCLOSURES

A. NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
   1. Outdoor Locations: NEMA 250, Type 3R.
   2. Kitchen Areas: NEMA 250, Type 4X, 304 stainless steel.
   3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide a motor disconnect switch under this section of the specifications when required by NEC, even when not indicated.

B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

C. Install all switches to meet NEC clearance requirements for working space.

D. Install electrical equipment to allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.

E. Install electrical equipment to provide for ease of disconnecting the equipment with minimum interference to other installations.

F. Install electrical equipment to allow right of way for piping and conduit installed at required slope.

G. In locations where a VFD is provided by others, the VFD shall be installed by the electrical contractor downstream from the equipment disconnect.

H. Install electrical equipment to ensure that connecting raceways, cables, wireways, cable trays, and busways are clear of obstructions and of the working and access space of other equipment.

I. Install required supporting devices in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

J. Install fuses in fusible devices, with a voltage rating not less than the circuit voltage. Provide one set of spare fuses for each size and type fusible device installed, or as noted.

K. Comply with NECA 1.

3.2 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections, and prepare test reports:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

END OF SECTION

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SECTION 26 5000

LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Division 1 General Conditions applying to the General Contractor also apply to this Subcontractor as modified by Division 26 requirements.

1.2 SECTION REQUIREMENTS

A. Substitution of lighting fixtures are under provisions of Division 01. Substitution is for fixtures that do not meet the design specifications as provided.

B. Lighting fixtures shall be submitted for approval.

C. REFER TO SECTIONS 01 3000 AND 26 0010 FOR SUBMITTAL FORM AND REQUIREMENTS.

D. Lighting fixtures need not be submitted, and will not be reviewed BEFORE bid is awarded. Lighting fixtures submittals will be reviewed after bid is awarded according to the requirements of this Section.

E. Each lighting fixture type shall be submitted for approval as follows:
   1. Submit copy of manufacturer's catalog sheet for each fixture. If substitute fixture is being submitted, mark proposed fixture features specified clearly in colored marker. If more than one fixture is indicted on the catalog page, clearly mark the fixture and features proposed to be provided. Clearly note any deviation(s) from the specified fixture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fixtures, Emergency Lighting Units, 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. Materials shall be new and a standard cataloged product of the manufacturer. Experimental or unproven designs will not be acceptable.

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

A. Lighting fixtures shall be furnished complete with plaster frames where required by room finish. Lay-in type fixtures installed in grid ceilings shall be furnished with four (4) hold down clips. Lay-in type fixtures indicated to be installed in gyp board ceilings shall be furnished with mounting kits.

B. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

C. Exterior Luminaires: Comply with UL 1598, and listed and labeled for installation in wet locations by a Nationally Recognized Testing Laboratory acceptable to authorities having jurisdiction.

D. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

2.3 REQUIREMENTS FOR INDIVIDUAL LIGHTING FIXTURES

A. Fixtures as indicated on Electrical drawings and in lighting schedules.

B. Manufacturers:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide lighting fixtures indicated on Electrical drawings and in lighting schedules, or product comparable in all ways (including color, style, finish, etc.) by a manufacturer who is regularly engaged in the manufacture of lighting fixtures and whose products have been in satisfactory use in similar service for not less than 5 years.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate ceiling-mounted luminaire with ceiling construction, mechanical work, and security and fire-prevention features mounted in ceiling space and on ceiling.

B. Lighting fixtures shall be installed in accordance with NECA/IESNA 500, Recommended Practice for Installing Indoor Commercial Lighting Systems (ANSI).

C. Refer to Architectural Reflected Ceiling Plan(s) for exact locations of ceiling mounted lighting fixtures.

D. Coordinate fixture locations with other ceiling mounted mechanical and electrical devices. If the fixture cannot be installed where indicated due to any obstruction, the Contractor shall move the fixture up to ten (10) feet in any direction directed prior to its installation without additional cost to the Owner.

E. Lighting Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

F. Comply with NFPA 70 for minimum fixture supports. Provide special supports or mounting construction where necessary to meet architectural requirements and per manufacturer's specifications and recommendations.

G. Provide independent wire supports from both ends of each lay-in fixture directly to structure in accordance with requirements for seismic zone 2.

H. Suspended Lighting Fixture Support:
   1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
   2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
   3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

I. Recessed fixtures mounted in ceiling tiles shall be furnished with metal bars to support the fixture from the ceiling suspension members.

J. Outlet boxes for surface mounted fixtures shall have box supports attached to the ceiling supporting members.

K. Install fixtures with finishing frames firmly to the ceiling and furnish gaskets as necessary to prevent light leaks.

L. Each light fixture shall have its own whip. Daisy-chaining of the circuit to light fixtures is not permitted.

M. Install lay-in troffers with maximum of 6 ft. whips. Support whips above ceiling panels with approved clips attached to ceiling support wires.

N. In fire-rated ceilings, lighting fixture support wire shall be marked red.

O. Air-Handling Fixtures: Install with dampers closed and ready for adjustment.

P. Align luminaries, and clean inside and outside of fixtures, lenses, and diffusers prior to final acceptance. Any scratches or blemishes in fixture painted finishes shall be touched up in matching paint. Scratches in anodized or duranotic finishes shall be repaired or part shall be replaced as directed by the Architect/Engineer. Any burned-out lamps and defective ballasts shall be replaced.

Q. When light fixtures are to be installed with the building insulation system placed directly on top of the fixture, the fixture shall be protected in accordance with the Fire Resistance Directory.

END OF SECTION

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