

SECTION 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The work included in this section of the specifications consists of furnishing labor, equipment, supplies, and materials, unless otherwise specified, and in performing operations necessary for the installation of electrical work as listed in the Instruction to Bidders and as required by these specifications and shown on the drawings, subject to the terms and conditions of the contract. The work shall also include the completion of details of electrical work not mentioned or shown which are necessary for the successful operation of electrical systems described on the drawings or required by these specifications.
- B. Section Includes:
 - 1. Definitions
 - 2. Bid Options
 - 3. Unit Prices
 - 4. Allowances
 - 5. Quality Assurance
 - 6. Coordination
 - 7. Permit, Fees, and Inspections
 - 8. Insurance
 - 9. Substitutions
 - 10. Shop Drawings
 - 11. Payment Request Breakdown
 - 12. Project Record Drawings
 - 13. Operating and Maintenance Manuals
 - 14. Project Conditions
 - 15. Commissioning and Testing
 - 16. Guarantee/Warranty
 - 17. Common requirements for Electrical Installation
 - 18. Penetration Firestopping
 - 19. Refinishing and Touchup painting
 - 20. Cleaning and Protection
 - 21. Equipment Furnished by Owner
 - 22. Interruption of Existing Electric Service
 - 23. Temporary Generator/Power Connections
 - 24. Building Structure Penetrations
 - 25. Final Tests and Adjustments
 - 26. Instruction of Owners Employees
 - 27. Electrical equipment coordination and installation.
 - 28. Sleeves for raceways and cables.
 - 29. Sleeve seals.
 - 30. Grout.
 - 31. Common electrical installation requirements.

1.3 DEFINITIONS

- A. Basic Contract definitions are as follows:
 - 1. Provide: The term "provide" means "to furnish and install, ready for the intended use and in complete operating condition."

2. Furnish: The term "furnish" means "to purchase devices and/or equipment and hand over to another entity for installation"
 3. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."
 4. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean "directed by the Engineer," "requested by the Engineer," and similar phrases.
 5. Approve: The term "approved," where used in conjunction with the Engineer's action on the Contractor's submittals, applications and requests, is limited to the Engineer's duties and responsibilities as stated in the Conditions of the Contracts.
 6. Indicated: The term "indicated" refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.
 7. Contractor: The term "Contractor" shall carry the same meaning as "Electrical Contractor" or "Division 26 Contractor".
 8. Or Equal: The term "Or equal" shall carry the same meaning as "approved as equal by the Engineer"
 9. Owner: All references here-in and on drawings to "Owner" shall be the same as "Veterans Affairs Minneapolis Medical Center".
- B. Product specific to this section definitions:
1. EPDM: Ethylene-propylene-diene terpolymer rubber.
 2. NBR: Acrylonitrile-butadiene rubber.

1.4 BID OPTIONS, UNIT PRICES, AND ALLOWANCES – NOT APPLICABLE

1.5 SUBMITTALS

- A. Product Data: For sleeve seals.

1.6 QUALITY ASSURANCE

- A. Drawings and Measurements
1. The drawings are not intended to be scaled for roughing-in measurements or to serve as shop drawings. The Contractor shall consult the architectural, structural, mechanical, or equipment drawings for dimensions **noted**, obstructions and location of equipment of other trades.
 2. Outlet devices, switches, panels, cabinets, fixtures and special equipment are shown on the drawings only in a schematic manner and not necessarily in their specific location. The Contractor shall be responsible for exact locations of the outlets to form a functional and aesthetic installation either by careful review of all architectural elevations, tile patterns, surface finishes, and equipment arrangements or by consultation with the Engineers and/or other trades involved.
- B. Ordinances and Codes
1. All work shall be executed in accordance with the current edition of the City Electrical Ordinances, State Electrical Laws and Statutes and National Electrical Code (NEC), and be subject to the inspection of these departments. All fees, permits, licenses, etc., necessary to complete the work of this section shall be paid by this Contractor.
- C. Personnel
1. All Electrical workers on this project shall be thoroughly knowledgeable of all applicable codes related to all electrical systems for this project. All installations shall be performed by skilled electrician tradesmen fully aware of the latest techniques, practices, and standards of the industry. Haphazard or poor installation practice as determined by the Architect or Engineer will be cause for rejection of work.
- D. Workmanship

1. The installation work included in this specification shall be performed in a neat workmanlike manner. Only the best quality workmanship will be accepted. All exposed parts of the electrical wiring systems such as exposed conduits, flush plates, cabinet trim, fixtures, etc., shall be square and true with the building construction.
- E. Guarantee
 1. This Contractor shall assume responsibility for any defects which may develop in any part of his work caused by faulty workmanship, material or equipment, and agrees to replace, repair, or alter, at their expense, any such faulty workmanship, material or equipment that has been brought to their attention during a period of one year from the date of substantial completion. Acceptance of the work shall not waive this guarantee.
- F. Materials and Equipment
 1. All materials and equipment shall be new and of best quality, of the type best suited for the purpose intended. All items shall be furnished by the Manufacturer's Authorized Supplier. All electrical materials used in this work shall be listed by the Underwriter's Laboratories, Inc., where testing is provided and shall bear their label.
 2. Recycle all materials as required by Division 0 and 1 specifications and additional sections of this Division.

1.7 COORDINATION

- A. All drawings, specifications and referenced documents for this project shall be taken together as a complete set of documents. Prior to installation, the Contractor shall be familiar with this project by carefully reviewing and comparing all documents and existing site conditions that pertain to this project.
- B. In preparation of the contract documents, a reasonable effort has been made to provide layouts and connections based on selected and specified manufacturer's equipment. Since physical space, electrical connections, equipment arrangements and other requirements may vary according to each manufacturer, the final responsibility for connections, initial access and proper fit is the responsibility of this Contractor.
- C. Coordinate arrangement, mounting, and support of electrical equipment:
 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 2. To provide for ease of disconnecting the equipment with minimum interference to other installations, and maintain working clearances per the NEC or additional as required by these documents.
 3. To allow right of way for piping and conduit installed at required slope.
 4. To allow the connecting of raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- D. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations.
- E. Coordinate installation locations of all equipment with other trades to verify proper fit and function. The General Contractor and/or Construction Manager shall facilitate a pre-construction planning meeting for all major sub-contractors (Divisions 21 thru 28) to coordinate actual equipment with installation locations. General contractor and/or Construction Manager shall provide meeting minutes as a part of the shop drawing review process.
- F. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- G. Provide access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Refer to Division 8 for requirements, and coordinate locations with other trades prior to rough-in.
- H. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
- I. Prior to roughing in for electrical equipment furnished by others, verify the voltage and current characteristics and control connections of this equipment. Notify the Engineer where equipment connection requirements do not match the provisions indicated on the documents.

- J. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
- K. Coordinate all utility services work with the serving utility company.
- L. Utility use charges
 - 1. Electric power from Owner's existing system is available for use without metering and without payment of use charges.
 - 2. All utilities must be maintained at all times unless approved by Owner. Provide temporary connections equivalent to existing services. Electrical contractor is responsible for all temporary installation costs and new installation costs.
- M. Permit and Inspection Fees
 - 1. Secure regular inspections as required by State and local regulations. Pay charges by regulating agencies for Drawings, Specifications, review of Drawings and Specifications, and the inspections of installations.
 - 2. Electrical contractor shall pay all fees for permits, licensing, and inspections applicable to the work of Division 26.
 - 3. Contractor shall pay all charges and fees levied by the serving utility and include these charges in the bid.

1.8 SUBMITTALS

- A. General: Follow the procedures specified in Division 1 Sections.
- B. Substitutions:
 - 1. Submittal dates: For a period of as stated in Division 1 sections prior to bid date, Engineer will consider written requests from bidders, manufacturers, and suppliers for substitution of products.
 - 2. Submission: Submit a separate request for each product, supported with descriptions, drawings and samples as appropriate, including:
 - a. Comparison of the qualities of the proposed substitution with that specified. Standard features and options of the proposed substitution shall be clearly identified on the submittal.
 - b. Changes required in other elements of the work because of the substitution.
 - c. Availability of maintenance service, and source of replacement materials.
 - 3. Substitution request constitutes a representation that bidder submitting request:
 - a. Has investigated the proposed product and determined that it is equal to or superior in all respects to that specified.
 - b. Will provide the same warranties or bonds for the substitution as for the product specified.
 - c. Will coordinate the installation of an accepted substitution into the Work, and make such other changes as may be required to make the Work complete in all respects.
 - d. Waives all claims for additional costs, under his responsibility which may subsequently become apparent.
 - 4. Engineer Review: The Engineer will review requests for substitutions with reasonable promptness to judge the acceptability of the proposed substitution, and notify bidders by addendum the decision to accept the requested substitution.
 - 5. Late Request for Substitutions: Requests for substitution received after bidding will not be considered except in such cases where it is necessary to make a substitution due to strikes, lockouts, bankruptcy, discontinuing of a product, etc. Requests for such substitutions of materials after award of contract shall be made in writing to Engineer and shall be made within ten days of date that Contractor ascertains he cannot obtain material or equipment specified.
 - 6. Engineer's Acceptance: Engineer's acceptance of a substituted item applies only to the general quality and arrangement of the items substituted. Substituted items are still subject to the shop drawing review process.
- C. Payment Request Breakdown:
 - 1. For the purpose of establishing a schedule of values to be used for Application and Certification for Payments as defined in the General Conditions of the specifications, the items of electrical work shall be broken down per the following schedule. Each item of

schedule shall contain its proper share of overhead and profit and shall be broken into a labor and material figure.

- a. General Conditions
- b. Electrical demolition and remodeling work
- c. Dry type transformers
- d. Switchboards
- e. Panelboards
- f. Isolation power panels
- g. Surge Suppression Devices (at panelboards)
- h. Conduits - 1" and larger
- i. Conduits - 1/2" and 3/4"
- j. Conductors - #6 and larger
- k. Conductors - #8 and smaller
- l. Interior lighting fixtures
- m. Uninterruptible power system
- n. Floor boxes and Poke Throughs
- o. Core Drilling
- p. Wiring devices
- q. Flexible wiring system
- r. Outlet boxes, junction boxes, pull boxes
- s. Lighting control system
- t. Motor disconnects, starters, controls, etc.
- u. Automatic Transfer Switch Programming
- v. Temporary Generator/Connections
- w. Miscellaneous

D. Project Record Documents:

1. As work progresses: Record changes or deviations from the contract drawings as follows:
 - a. Record location and elevation of underground conduits and direct burial wiring.
 - b. Record as-built changes for electrical work within the building that occur during the progress of construction and before the work is concealed. Record shall include such changes as:
 - 1) Relocation of devices to avoid obstacles.
 - 2) Routing of conduit from outlet to outlet.
 - 3) Routing of conduit under floor, overhead, in walls or exposed.
 - 4) Combining of circuits into common conduit.
 - 5) Sizes of conduits and conductors.
 - 6) Revisions to circuit breaker quantity or arrangement in panelboards.
 - 7) Equipment IP Addresses
2. Location: The record drawings shall be maintained at the job site and be subject to review by the Owner or Engineer during the construction period. Prints for this purpose may be obtained from the Architect at cost. This record keeping requirement shall not be construed as authorization for the Contractor to make changes in the layout without definite instructions by the Architect/Engineer in each case.
3. Submission: Upon completion of the work, a set of drawings showing changes as noted on the record set of prints shall be submitted to the Engineer.
4. Operating and Maintenance Manuals:
 - a. Submittal: At the completion of the contract submit to the Engineer the number of sets of operating and maintenance manuals as required in Division 1 (including parts lists bound into hard covered manuals for the electrical equipment). Each manual to include an electronic data disk of the entire operating and maintenance manual with folder structure and naming to match tabs in the manual. Manuals shall be labeled with the local supplier's name and address. Information not definitely applying to these pieces of equipment shall be crossed out or deleted from the submission. Information shall be included for equipment for which shop drawings have been provided.
 - b. Content:

- 1) Approved shop drawings. Approved shop drawings or product data sheets alone are not to be considered as acceptable maintenance material. Most items of equipment are shipped with installation/maintenance sheets included in the shipping package which shall also be included into the maintenance manual.
- 2) Special warranties.
- 3) Programming: Instructions for programmable systems.
- 4) Hazardous Materials: Disposal Certificates.

1.9 PROJECT CONDITIONS

- A. Exterior Environmental Conditions: Electrical systems shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
 1. Ambient Temperature: Temperature ranges at the Project location as determined by the U.S. Weather Bureau.
 2. Altitude: Elevation of the Project locations.
- B. Interior Environmental Conditions: Electrical systems shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
 1. Ambient Temperature: 72 to 75 deg F (conditioned spaces), 55 deg F to ambient (unconditioned spaces).
 2. Relative Humidity: 0 to 95 percent.
 3. Altitude: Elevation of the Project location.
- C. Interior Mission Critical Environmental Conditions: Electrical systems shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
 1. Ambient Temperature: 68 to 74 deg F (conditioned spaces).
 2. Relative Humidity: 30 to 70 percent.
 3. Altitude: Elevation of the Project location.

1.10 GUARANTEE/WARRANTY

- A. The electrical system installed under this contract shall be left in proper working order. Replace, without additional charge, new work or material which develops defects from ordinary use within one year unless a longer period is specified elsewhere, from substantial completion, except materials not furnished by the Contractor, or unless specified otherwise in Sub-Sections as Special Warranties.
- B. New materials and equipment shall be guaranteed against defects in composition, design or workmanship. Guarantee certificates shall be furnished on special equipment, indicated.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel.
 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
 - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 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. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
 - 2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 3. Pressure Plates: Carbon steel. Include two for each sealing element.
 - 4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.4 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
 - 2. Sealant shall have VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- B. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- D. Right of Way: Give to piping systems installed at a required slope.
- E. Securely fasten and support electrical components and devices.
- F. All devices installed in the ceiling grid shall be centered on the tile. Corridor devices shall be mounted in a straight line.
- G. Make electrical connections in accordance with equipment manufacturer's instructions.
- H. All wiring shall be installed in conduit unless otherwise noted and of a type allowed the contract documents. All conduits shall be concealed unless otherwise noted.
- I. In general, the electrical loads shall be circuited as shown on the Drawings. If the Division 26 contractor modifies the circuiting and can meet all the requirements of the contract documents then it shall be allowed to be different from that shown. All modifications shall be recorded on the as-built drawings.

- J. Conduit routing is not shown on the Drawings. It is the Contractor's responsibility to provide required wire count and conduit sizing for a complete and functional system that meets all the requirements of the Division 26 contract documents.
- K. Review all contract documents for equipment and devices that require electrical connections. Coordinate connections with all trades, review shop drawings to verify connection requirements (voltage, amperage, phase, location, etc), and verify special electrical connection requirements.
- L. Motor Phase Rotation: Verify proper motor rotation by "bumping" the motor. Coordinate this test with Divisions 21, 22, 23, and 26. Modify circuiting if phase rotation is not correct.

3.2 EXISTING CONDITIONS

- A. Drawing Representations: Conduits, lights, circuiting, devices, speakers, etc., shown on the drawings as existing are based on existing plans and may not be installed as originally shown. A field survey was conducted to verify the general accuracy of the existing plans. However, no attempt has been made to find the changes which occur in concealed areas such as above inaccessible ceilings and in walls. Verify the accuracy of the "Existing Conditions" as shown on the drawings as the demolition work progresses. Perform modifications and additions as necessary to correct for these hidden conditions and allow for the completion of the new work.

3.3 INTERRUPTION OF EXISTING ELECTRIC SERVICE

- A. The existing building will be in use during construction. Schedule and carry out the Work in such a manner as to cause the Owner a minimum of inconvenience due to service interruption. Temporary services (feeder, branch circuit and signal systems) shall be installed if one area or phase of construction disrupts service to another area of the building(s) or if equipment, conduits, or feeders have to be relocated to allow construction to progress. Service interruptions shall be confined to the smallest area possible at any one time and interruptions shall be scheduled in advance with the Owner's site representative. All interruptions shall be conducted and shall be limited to after hours (9:00 pm – 6:00am) and weekends, or as directed by the Owner. After service has been restored following an interruption, inspect areas affected by the interruption and be responsible for returning automatically controlled equipment to the same operating condition which existed prior to the interruption.

3.4 Notify the Owner a minimum of 30 days for shutdowns of panels below 277/480 and 60 days for panels 277/480, transfer switches and substations. **DEMOLITION RESPONSIBILITIES**

- A. Resupport or Removal: For electrical equipment to be demolished; remove accessible wiring including conduit, junction boxes, hangers and supports for feeders conduits, branch circuits from panelboards to electrical devices such as light fixtures, receptacles, switches, floor outlets, special outlets and equipment, etc., indicated to be removed. Existing conduit, boxes, cable, etc. indicated to remain which are presently being supported from existing ceilings or walls to be removed, shall be temporarily supported to building structure then reinstalled in new ceilings or walls.
- B. Raceway System Rework: Rework the existing raceway system such that upon completion of the remodeling, no junction boxes are located in inaccessible locations. This includes existing junction boxes that may be rendered inaccessible due to new piping or ductwork installation. Coordinate with other trades in this effort. Provide additional conduit and connections as required.
- C. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.
- D. Patching: Where conduits are stubbed out of a surface not being removed for new construction, such as a floor slab or poured concrete column or wall, these conduits must be cut back to a point where patching can adequately be performed.
- E. Coordinate with Owner: Demolition work shall be coordinated with the Owner. Should questions arise regarding the removal of a conduit and/or wiring, (i.e. Is it energized? Does it serve a load in an area not be remodeled?), confer with the Owner before such wiring or conduit is demolished.

- F. Salvaged, Reused and Reinstalled equipment and devices: Carefully disconnect and remove items to be salvaged, reused or reinstalled. Any questions regarding the quality and reusability of an item shall be brought to the attention of the Engineer/Architect prior to removal. Items shall be properly stored in a manner causing no additional damage to the item. Prior to reinstalling, clean and test item. Upon completion, the item shall be in equivalent condition as prior to its removal. Items damaged due to improper handling and storage by the Contractor shall be replaced with new items of the same type and quality as the original item. Reinstalled light fixtures shall be relamped with new lamps. Non-functioning ballasts shall be replaced with new ballasts. Lamps and ballasts shall be guaranteed as new items. Salvaged items to be turned over to the Owner as described in this specification section and on plans.
- G. Demolition equipment and devices: Existing equipment, devices, and light fixtures not indicated for reuse or salvage shall [become the property of this Contractor, unless indicated otherwise, and disposed of properly.
 - 1. Light fixtures scheduled for removal on this project may contain PCB impregnated ballasts. Remove PCB ballasts from light fixtures and place ballasts in hazardous waste disposal containers. Properly dispose of the ballasts with a registered hazardous materials disposal contractor.
 - 2. Fluorescent and HID lamps removed from light fixtures shall be placed in containers, and properly disposed of with a registered disposal contractor.
- H. Wiring Devices: Disconnect and remove wiring devices and replace with devices and cover plates as shown on the drawings or as specified in Division 26 "Wiring Devices". All unused existing junction boxes shall be provided with a blank cover plate.
- I. Low Voltage Systems: Existing communication must remain intact and operating. Should portions of systems require relocation due to demolition, coordinate this move with the Owner before disconnection. Should portions of the fire alarm system require removal or relocation, contact the fire alarm monitoring company and the Owner before initiating any work on the system.
- J. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety. Remove all unused cabling not labeled for future use.
- K. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches (50 mm) below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.
- L. Remove demolished material from Project site. Recycle all materials per Specification 017419 Construction Waste Management.
- M. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.
- N. Contractor shall visit existing building before submitting bid and become familiar with existing conditions.
- O. In general, wiring in existing building shall remain as is except as noted on drawings or specified elsewhere. When existing walls, ceilings, floors, electrical panels, light fixtures, switches or other outlets are removed, Contractor shall extend existing circuiting, if required, install junction boxes in walls, ceilings or floors, if required, to continue circuiting; remove all unused wire; remove all unused conduit where accessible; and install new plates with blank gangs as required on existing outlet boxes.
- P. Added loads to existing circuiting shall be balanced between phases. On existing panelboards where circuitry is changed, this Contractor shall furnish a revised, typed panel directory.
- Q. Contractor shall assume in his bid that all existing equipment and fixtures noted to be reused are in good working condition and can be installed without any repairs. If certain items are found to need repair or in unusable condition, Contractor shall notify the A/E for decision; however, Contractor shall be responsible for any damage caused by them to equipment in removal or handling.
- R. Fixtures and other equipment removed and to be re-used shall be cleaned before reinstallation. New lamps shall be provided for all fixtures that are contained within the project scope of work and not specifically called out to be replaced.
- S. Any existing switches or receptacles that are relocated shall be replaced with new device.

- T. Existing equipment removed and not re-used, at owner's option, be returned to owner. If owner does not wish to keep the items, they shall become the Contractor's property and be removed from the site, unless otherwise specified or shown.
- U. Demolition shown on plans is based on information shown on Owner's existing plans and an on-site review of the facility. Quantities, types, and locations of items shown are believed to be accurate. However, this contractor shall be responsible for removing and/or relocating electrical equipment as required to accommodate remodeling.
- V. In general, Contractor shall assume that all work which involves a service outage to areas occupied by the Owner or other building tenants shall be performed on an overtime basis. Work shall continue until service is restored.
- W. Provide generator backup for any downtime.
- X. Coordinate all work with the Power Company for revisions to the electrical service.

3.5 BUILDING STRUCTURE PENETRATIONS

- A. Where existing or temporary raceway systems are being demolished, which leave openings in the existing building structure, the building structure shall be patched to match the existing construction and maintain the existing building fire ratings.

3.6 CUTTING AND PATCHING

- A. Provide cutting and patching in conformance the following requirements for and limitations on cutting and patching of construction elements:
 - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity
 - 2. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
 - a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.
 - d. Sprayed fire-resistive material.
 - e. Equipment supports.
 - f. Piping, ductwork, vessels, and equipment.
 - g. Noise- and vibration-control elements and systems.
 - 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 Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- B. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved. Any cutting or drilling shall not affect structural integrity. Contractor shall contact A/E prior to drilling through any structural beam. No such cutting or drilling process shall endanger the structure integrity of the building.
- C. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.
- D. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

- E. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- F. Temporary Support: Provide temporary support of work to be cut.
- G. 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. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill. Proceed with patching after construction operations requiring cutting are complete.
- I. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 - 2. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 - 3. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 - 4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- J. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- D. Cut sleeves to length for mounting flush with both surfaces of walls.
- E. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
- F. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- G. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
- I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
- J. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- K. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

3.8 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.9 PENETRATION FIRESTOPPING

- A. General: All devices/equipment in fire rated ceiling spaces and walls shall be installed in such a manner as to retain fire rating as required. All penetrations of fire rated floors or walls shall be protected by materials and installation details that conform to Underwriter Laboratories Listings for through penetration fire stop systems.
- B. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Sections.
- C. Additional specialty fire stopping devices are called out in other portions of these documents, specific to the systems that they serve. Refer to these sections to provide all required firestopping materials as called out herein.
- D. General Requirements:
 1. Provide penetration fire stopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration fire stopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
 2. Penetrations in Fire-Resistance-Rated Walls: Provide penetration fire stopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - a. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls, and fire partitions.
 - b. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
 3. Penetrations in Horizontal Assemblies: Provide penetration fire stopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - a. Horizontal assemblies include floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.
 - b. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated. T-rating in subparagraph below indicates resistance to excessive thermal transmission.
 - c. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
 4. Penetrations in Smoke Barriers: Provide penetration fire stopping with ratings determined per UL 1479.

5. Accessories: Provide components for each penetration fire stopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration fire stopping manufacturer and approved by qualified testing and inspecting agency for fire stopping indicated.
 - a. Permanent forming/damming/backing materials, including the following:
 - 1) Slag-wool-fiber or rock-wool-fiber insulation.
 - 2) Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - 3) Fire-rated form board.
 - 4) Fillers for sealants.
 - b. Temporary forming materials.
 - c. Substrate primers.
 - d. Collars.
 - e. Steel sleeves.
- E. Fill Materials:
 1. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
 2. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
 3. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
 4. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.
 5. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
 6. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
 7. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
 8. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
 9. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
 10. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 - a. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.
- F. Mixing:
 1. For those products requiring mixing before application, comply with penetration fire stopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.
- G. Installation:
 1. General: Install penetration fire stopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
 2. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

- a. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
3. Install fill materials for fire stopping by proven techniques to produce the following results:
 - a. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - b. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
4. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.10 REFINISHING AND TOUCHUP PAINTING

- A. Refinish and touch up paint:
 1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
 2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
 3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.
 5. Paint exposed conduits to match painted surfaces.

3.11 CLEANING AND PROTECTION

- A. Progress Cleaning:
 1. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - a. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - b. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
 - c. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - 1) Use containers intended for holding waste materials of type to be stored.
 - d. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
 2. Site: Maintain Project site free of waste materials and debris.
 3. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - a. Remove liquid spills promptly.
 - b. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
 4. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
 5. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
 6. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
 7. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Sections.
 8. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

9. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
 10. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.
- B. Final Cleaning:
1. Thoroughly clean electrical materials, equipment and apparatus to be free of dust, dirt, rust, and foreign materials before acceptance at Substantial Completion.
 2. Clean electrical materials in conformance with manufacturer's instructions.
 3. Clean panelboards, switchboards, motor controls, etc. Take special care to remove dirt, mortar, wire scraps, etc., from equipment interiors.
 4. Clean accessible elements of disconnecting and protective devices of equipment, coils of dry type transformers, etc. with compressed air (less than 15 psi) and vacuum clean enclosure prior to being energized.
 5. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
 6. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

3.12 EQUIPMENT FURNISHED BY THE OWNER

- A. Contractor Requirement:
1. Inspect in presence of the Owner's Representative, and report in writing, any damage.
 2. Assume responsibility for receiving, storing, protecting, installing, and connecting owner furnished equipment.
- B. List of Owner furnished equipment:
1. Equipment as indicated on the drawings.

3.13 FINAL TESTS AND ADJUSTMENTS

- A. Provide personnel for initial start-up and operation of the electrical equipment and for a trial run of the equipment to demonstrate that the equipment and associated systems are properly installed and operating as intended before the date of substantial completion.
- B. Upon completion, subject the work to such tests as are required under industry standards and/or specified herein. Acceptance of the work by Owner shall be contingent upon satisfactory completion of these tests.
- C. Subject the work to a careful and thorough visual inspection to detect erroneous or loose connections, damaged components, presence of foreign objects or materials, poor workmanship, incorrect ratings of overcurrent protective devices, or other abnormal conditions.
- D. Perform tests to demonstrate proper functioning of lighting equipment, controls, proper rotation, etc. Proper operation of permanently connected meters and metering equipment shall be demonstrated, and the accuracy thereof established to a reasonable degree.
- E. Overcurrent protective devices shall be properly coordinated, and as the equipment is put into service, necessary final adjustments shall be made to equipment within the scope of work under this contract to make the electrical system operative throughout.
- F. Should any operating condition be encountered which would require abnormal or unsafe settings of protective devices, this fact shall be brought to the attention of the Engineer immediately. Tests shall be recorded and the reports submitted to the Engineer.
- G. Perform specific testing as may be required to comply with special installation requirements of the National Fire Protection Association (NFPA). Reporting of these tests shall be submitted to the Engineer and to Authority Having Jurisdiction as defined by the code.

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