

## SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

### PART 1 - GENERAL

#### 1.1 DESIGN REQUIREMENTS

#### 1.2 DEFINITIONS

- A. Refer to Article 100 of the currently adopted National Electrical Code for definitions as applicable to this project.
- B. Other definitions:
  - 1. "Concealed": Embedded in masonry, concrete or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces, or in enclosures.
  - 2. "Exposed": Not installed underground or "concealed" as defined above.
  - 3. "Furnish" or "Provide": To supply, install and connect up complete and ready for safe and regular operation of particular work unless specifically otherwise noted.
  - 4. "Install": To erect, mount and connect complete with related accessories.
  - 5. "Indicated", "Shown" or "Noted": As indicated, shown or noted on drawings or specifications.
  - 6. "Related Work" includes, but is not necessarily limited to, mentioned work associated with, or affected by, the work specified.
  - 7. "Reviewed", "Satisfactory", "Accepted", or "Directed": As reviewed, satisfactory, accepted, or directed by or to Engineer.
  - 8. "Similar": Equal in materials, weight, size, design, construction, capacity, performance, and efficiency of specified product.
  - 9. "Supply": To purchase, procure, acquire and deliver complete with related accessories.
  - 10. "Wiring": Raceway, fittings, wire, boxes and related items.

#### 1.3 SUBMITTALS

- A. Submittals shall be made in accordance with General Conditions of Contract and the requirements of Section 01 33 00.
- B. Shop drawings shall include equipment catalog cuts or manufacturer's printed data identifying: dimensions, weights, recess openings, equipment arrangements, electrical characteristics with bus size, electrical rating, material, wiring diagrams indicating circuit arrangement and NEMA rating for, but not limited to the following:
  - 1. Medium voltage distribution equipment, cable and devices (13..2 kv and above)
  - 2. Low-Voltage Transformers
  - 3. Switchboards
  - 4. Panel boards
  - 5. Motor Control Centers
  - 6. Enclosed Switches and Circuit Breakers
  - 7. Network Lighting Controls
  - 8. Automatic Transfer Switches
  - 9. UPS Equipment
  - 10. Contactors
  - 11. Wiring Devices
  - 12. Interior and Exterior Lighting
  - 13. Hangers and Supports for Electrical Systems
  - 14. Grounding and Bonding
  - 15. Multi-Outlet Assemblies
  - 16. Generators
  - 17. Modular Wiring Systems

18. Electrical Systems Control
19. Fire Detection and Alarm
20. Communication Systems
21. Lightning Protection System
22. Electronic Meters

- C. Submittals shall also include ¼" scale layouts of all electrical rooms, telecom rooms, fire alarm rooms and generator rooms. Include all equipment sizes and clearances.
- D. Submit composite coordination drawings to include location and routing of the electrical system components in relation to the mechanical ducts, piping and structural beams.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: All electrical work at the University shall be performed by a State of Colorado licensed contractor under the supervision of a licensed electrician. Contractors shall verify that electricians are currently licensed by the State of Colorado and shall supply Project Manager with names and license numbers. Contractor shall have a minimum of 3 years of satisfactory performance in conducting the type of work specified.
  1. ANSI/NFPA 70 - National Electrical Code.
  2. ANSI/IEEE C2 - National Electrical Safety Code.
  3. NECA - Standard of Installation.
  4. NFPA – National Fire Protection Association.
  5. IEEE – The Institute of Electrical and Electronics Engineers.
  6. NEMA – National Electrical Manufacturer Association.
  7. The University/Anschutz Medical Campus Project Guidelines and Standards.
  8. International Building Code in accordance with the Campus Building Official.
  9. ASTM - American Society of Testing Materials
  10. IPCEA - Insulated Power Cable Engineers Association
  11. Underwriter's Laboratories (UL)
  12. American National Standards Institute (ANSI)
  13. Other requirements as listed elsewhere in these specifications.
- B. The drawings and specifications take precedence when they are more stringent than codes, statutes, or ordinances in effect. Applicable codes, ordinances, standards and statutes take precedence when they are more stringent than, or conflict with the drawings and specifications.
- C. Record Documents:
  1. Maintain a separate set of contract electrical drawings at the site in accordance with Section 01 74 00 to show the following:
    - a. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.
    - b. All branch circuits, feeders, communications conduits embedded in concrete, dimensioned from prominent building lines.
    - c. Equipment locations (exposed and concealed) dimensioned from prominent building lines.
    - d. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
- D. Operations and Maintenance Data:
  1. O and M Data shall be provided in accordance with Section 01 78 23 including the following information:
    - a. Description of function, normal operating characteristics and limitations, fuse curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.

- b. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
- c. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
- d. Servicing instructions and lubrication charts and schedules.
- e. Complete list of parts and wiring diagrams.
- f. Names, addresses and telephone numbers of the Contractor, Sub-contractors and local company responsible for maintenance of each system or piece of equipment.
- g. All information shall be permanently bound in a 3-ring binder. The job name and address, and Contractor's name and address shall be placed on the cover and spine of each binder in a permanent manner. Dymo-tape is not acceptable.
- h. Copies of all test reports shall be included in the manuals.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products in accordance with manufacturer's instructions, and the requirements of Section 01 10 00.

1.6 WARRANTY

- A. All electrical equipment, materials and workmanship warranties shall be provided in accordance with the requirements of Section 01 78 36 and the following:
  - 1. The Contractor warrants the electrical system, material and workmanship, for a period of one year from the date of the University final acceptance of the installation unless as otherwise noted in Commissioning.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. All equipment and materials installed shall be new, unless otherwise specified. Defective or damaged materials shall be replaced or repaired, prior to final acceptance, in a manner acceptable to the Engineer or The university and at no additional cost to the University.
- B. All electrical materials shall be acceptable for installation only if labeled or listed UL and, if accepted, by the authority having jurisdiction.
- C. All major equipment components shall have the manufacturer's name, address, model number, and serial number permanently attached in a conspicuous location.
- D. Fire Seals:
  - 1. Material: Fire stopping material shall be asbestos free, 100% intumescent, have code approval under BOCA, ICBO, SSBC, NFPA 101, NFPA 70, and be capable of maintaining an effective barrier against flame and gases in compliance with the following requirements.
  - 2. Flame Spread: 25 or less, ASTM E84
  - 3. Fire Resistance and Hose Stream Tests: Fire stopping materials shall be rated "F" and "T" in accordance with ASTM E 814 or UL 1479. Rating periods shall conform to the following:

(F)	3	(T)	3	Time-rated floor or wall assemblies.
(F)	3	(T)	3	Openings between floor slabs & curtain wall.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Construct Work in sequence under provisions of Division 1 where applicable.
- B. Electrical Contractor shall coordinate Divisions 26, 27, and 28 work with the installer of Division 21, 22 and 23 and other work to ensure that code required clearances relating to space required for access to electrical equipment is properly maintained.
- C. Install Work using procedures defined in NECA Standard of Installation.
- D. Workmanship shall conform to highest industry standards for each trade involved in installation of the Work.
- E. Upon completion of work, all equipment and materials shall be installed complete, thoroughly checked, correctly adjusted, and left ready for intended use or operation. All work shall be thoroughly cleaned and all residues shall be removed from surfaces.
- F. Exterior surfaces of all material and equipment shall be delivered in a perfect, unblemished condition.
- G. Carefully lay out all work in advance so as to eliminate where possible, cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings and roofs. Any damage to the building, structure, piping, ducts, equipment or any defaced finish shall be repaired by skilled mechanics of the trades involved at no additional cost to the University.
- H. All openings made in fire-rated walls, floors, or ceilings shall be patched and made tight in a manner to conform to the fire rating for the surface penetrated. Paint to match surface when visible.
- I. All penetrations required through completed concrete construction shall be core drilled at minimum size required. Precautions shall be taken when drilling to prevent damage to structural concrete. The Contractor shall obtain permission from the Architect and Structural engineer before proceeding with drilling.
- J. Sleeve Seals: Provide sleeve seals for penetrations located in foundation walls below grade, or in exterior walls, of one of the following:
  - 1. Caulk between sleeve and raceway with approved Caulk material.
  - 2. Mechanical Sleeve Seals: Modular mechanical type, as manufactured by Thunder line Corp., consisting of interlocking synthetic rubber links shaped to continuously fill annular space between raceway and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal.
- K. Install equipment and materials to provide required Code clearances and access for servicing and maintenance. Coordinate the final location with piping, ducts, and equipment of other trades to insure proper access for all trades. Coordinate locations of concealed equipment, disconnects, and boxes with access panels and doors. Allow ample space for removal of parts, fuses, lamps, etc., that require replacement or servicing according to the National Electric code and the AHJ.
- L. Extend all conduits so that junction and pull boxes are in accessible locations.
- M. Install access panel or doors where equipment or boxes are concealed behind finished surfaces in areas such as restrooms. These access doors shall be a minimum of twenty by twenty inches or as required to accommodate full pull box or equipment access.
- N. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

- O. Electrical system layouts indicated on drawings are generally diagrammatic but shall be followed as closely as actual construction and work of other trades will permit. Govern exact routing of raceways and locations of outlets by structure and equipment served. Take all dimensions from engineering drawings.
- P. Consult all other drawings. Verify all scales and report any dimensional discrepancies or other conflicts to Engineer before submitting bid.
- Q. All home runs to panel boards are indicated as starting from outlet nearest panel and continuing in general direction of that panel. Continue such circuits to panel as though routes were completely indicated.
- R. Furnish and install all necessary hardware, hangers, blocking, brackets, bracing, runners, etc. required for equipment specified under this Division.
- S. Remove all unused or abandoned conduit, junction boxes, panels, and other electrical components back to the source.
- T. Provide GFCI type receptacles for all "above counter" receptacles located within 6' of any sink or basin.
- U. Provide GFCI type receptacles for receptacles located with 6' of any eyewash station.
- V. Clean all luminaries, lamps and lenses prior to final acceptance. Replace all inoperative lamps.
- W. Provide all power feeds and final connections to motors and other electric equipment furnished under Divisions 21, 22, and 23.
  - 1. Install and wire through all control devices which directly handle full load motor or electric heating equipment current, such as magnetic starters, line voltage thermostats, P.E. switches, etc. which are furnished by Electrical Contractor. Located where shown on the electrical drawings.
  - 2. Provide disconnects for all mechanical equipment as indicated on project drawings.
  - 3. Provide all power and control wiring which directly handles full load current of motors or electric heating equipment.

### 3.2 TESTING, CLEANING AND CERTIFICATION

- A. Operating and Acceptance Tests: Provide all labor, instruments, and equipment for the performance of tests as specified below and elsewhere in these specifications.
  - 1. Perform a careful inspection of the main switchboard bus structure and cable connections to verify that all connections are mechanically and electrically tight.
  - 2. For a one-day period after the remodeled area has been placed into normal service, record the full load current in each phase or each line at the panel bus and submit to the Engineer.
- B. Test Reports:
  - 1. Test Reports: Submit three (3) copies of test results.
  - 2. The final University inspection of the project will not be made until a satisfactory report is received and approved by the University Project Manager.
  - 3. Results shall include:
    - a. Insulation resistance readings for each segment of high voltage (over 600V) cable, each phase.
    - b. Insulation resistance readings for transformers for each phase of primary and secondary to ground and for primary to secondary.
    - c. Insulation resistance readings on all feeders entering main distribution switchboard, each phase.
    - d. Resistance to ground readings for main distribution switchboard service ground.
    - e. Insulation resistance readings for all motors and motor feeders 5 horsepower or greater.
    - f. Full load current reading for main service entrance and main distribution panel board, each phase.

4. Testing shall be done by an independent testing agency.

- C. Clean-Up: Remove all materials, scrap, etc., relative to the electrical installation, and leave the premises and all equipment, lamps, fixtures, etc. in a clean, orderly condition. Any costs to the University for clean up of the site will be charged against the Contractor.

### 3.3 COMMISSIONING (DEMONSTRATION)

- A. Acceptance Demonstration: Upon completion of the work, at a time to be designated, the Contractor shall demonstrate for the University the operation of the entire installation, including all systems provided under this contract.
- B. The Contractor shall furnish the services of a qualified representative of the supplier of each item or system who shall instruct specific personnel, as designated by the University, in the operation and maintenance of that item or system.
1. Instruction shall be given when the particular system is complete, and shall be of the number of hours indicated. A representative of the Contractor shall be present for all demonstrations.

**END OF SECTION 26 05 00**