

## **SECTION 651 GENERAL REQUIREMENTS FOR ELECTRICAL WORK**

### **651.1 Description**

- (1) This section describes general personnel qualifications, materials, construction methods, and testing requirements used to perform electrical work required in the contract under section 651 through section 678.

### **651.2 Materials**

- (1) Furnish materials conforming to the Wisconsin State Electrical Code (WSEC), consisting of chapter comm. 16 of the WEC combined with the NEC. Do not consider the department a municipal electric department under the provisions of the WEC component of the WSEC.
- (2) The department specifies approved materials and construction products for electrical work on the department's approved products list.
- (3) Within 10 days after notice of award of the contract, furnish a complete list of all material not on the department's approved products list, proposing to use, give the name and address of all manufacturers, along with catalog tear sheets showing catalog numbers, and specifications for each material. Furnish six copies of the list to the engineer. Do not order materials until the engineer approves the list. All material is subject to the engineer's inspection and approval before installation, and the contractor shall not make changes or substitutions in material or its installation without the engineer's written consent. The engineer will base material acceptance on inspection and testing of material delivered. Approval does not change contract requirements. If submitting a material as an alternate to the specified material, furnish all pertinent data necessary to show equal status with the approved material.
- (4) Furnish and install UL listed electrical materials or obtain the engineer's approval for materials that do not have a UL standard.
- (5) Furnish samples of materials proposing to use for testing at the engineer's request. Contractor shall be compensated if material is destroyed.
- (6) (Vacant)
- (7) Return materials loaned from the region electrical units stock to that region electrical unit under the following terms:
  - Ensure that return materials are new.
  - Return materials to the electrical unit within 6 months of the date that they were picked up.
  - Region electrical personnel will not release materials for contractor pick up until the region traffic engineer has a copy of the contractor's order forms for exact replacement materials.
  - Ensure that contractor-ordered replacement materials conform to the latest specifications and drawings used for new state replacement orders.
  - The department will not accept monetary reimbursement.

### **651.3 Construction**

#### **651.3.1 General**

- (1) Perform all electrical work as specified in the applicable requirements of the WSEC, these specifications, the MUTCD, and the plan details.
- (2) If the contractor encounters stones, boulders, debris, or other material not normally contemplated in excavating, remove and dispose of the material as necessary and as incidental to completing the work.
- (3) If using trenching methods, place backfill in layers not exceeding 12 inches (300 mm) in depth and thoroughly compact each layer.
- (4) Dispose of surplus material from backfilling, excavating, and trenching as specified for disposing of surplus unsuitable material in 205.3.12. Restore all areas damaged or disturbed by the contractor's operations to conditions equal to those existing before the start of work.
- (5) Provide rust, corrosion, and anti-seize protection at all threaded assemblies by coating all mating surfaces with an approved compound provided on the department's approved products list. Do not use anti-seize material in aerosol cans. Paint or dip the anti-seize material on threads.

- (6) Unless specified otherwise in subsequent subsections, touch up mars and scratches on painted equipment with 2 coats of synthetic resin enamel, or with 2 coats of a zinc-rich paint acceptable to the engineer, or as the engineer directs. This requirement applies whether using contractor-furnished or state-furnished equipment. Galvanized scratches shall be prepared as specified in 614.3.3.
- (7) Furnish and install, as incidental, all material needed to make the proposed system complete from the source of supply to the most remote unit if any piece of material is not designated in the contract as separate bid items. These materials may include but are not limited to wire nuts, grommets, tape, connectors, conduit lock nuts, split bolts, varnish, and putty.
- (8) Make the electrical connection between the equipment grounding conductor and any equipment-grounding electrode by the exothermic weld method.

### **651.3.2 Personnel Qualifications**

- (1) Perform all electrical work using a journey worker electrician or an electrical apprentice under the onsite supervision of a journey worker electrician. Before performing electrical work, provide the documentation specified in 651.3.2(3) to the engineer proving that the electricians performing the work have attained status as journey worker and apprentice electricians.
- (2) The department defines electrical work as electrical and related construction required under the contract, performed as specified in the standard specifications, contract special provisions, standard detail drawings, and plan details applicable to electrical construction.
- (3) Proof of qualification to do electrical journey worker level work shall be a certification of completion of a state apprenticeship program or a card issue by the department of commerce certifying the person as a journey wireman.

### **651.3.3 Testing**

- (1) After installation and before final hookup, disconnect all loads whether buried or not, and test all grounded conductors, equipment grounding conductors, ungrounded conductors, and shielding contained in the cable with a megger. Submit the megger test results to the engineer. Ensure that the megger reads infinity during each of the following tests:
  - To ground.
  - Between each conductor.
  - Between each shield.
- (2) Furnish all equipment necessary to test the completed electrical installation. Test and demonstrate to the engineer's satisfaction that the following conditions exist:
  1. The circuits are properly connected, continuous, and free from short circuits and unspecified grounds.
  2. The connection conforms to the specified wiring layout, or the manufacturer's wiring layout or both.
  3. Each circuit operates as designed.
- (3) The contractor shall request a signal inspection of the completed signal installation. This request shall be made to the project engineer at least three working days before the time of the requested inspection. Department region electric personnel will perform the inspection.
- (4) Approval for turn on will not be granted until the contractor corrects all discrepancies.
- (5) Replace cables containing conductors or shields, or both, that do not conform to this requirement as many times as necessary until they conform. Before the engineer accepts the replacement installation, repeat the testing procedure.
- (6) Operate the completed traffic signal installation for 72 hours consecutively, using the specified signal sequence and all special functions, such as preemption, as the plans show, or as the engineer approves.
- (7) The traffic signal installation is not complete until all the electrical work is complete and electrical systems work properly.
- (8) Operate the completed lighting installation for twenty consecutive nights without failure. Each component that fails shall be repaired or replaced and that component shall again be subject to the twenty-night proper working order test.
- (9) The lighting system is not complete until all electrical work is complete and inspected by the engineer, and all electrical systems work properly.

**651.4 (Vacant)**

**651.5 Payment**

- (1) The department will pay for the work specified in section 651 separately under the various traffic signal, lighting, and ITS bid items, electrical work on rest areas and weigh stations, and miscellaneous electrical work under the contract.