

SECTION 26 08 01: ELECTRICAL TESTING

1. GENERAL

- A. This section describes the inspection and testing of electrical system components and equipment installed during new construction or as part of any renovation and improvement project.
- B. Project Engineer of Record/design team to meet with Brown FM-Ops staff to review and develop a detailed listing of all required electrical systems testing, inspection and commissioning (i.e. commissioning of larger, more complex systems).
- C. All testing to be performed by an approved independent testing and inspection agency.
- D. Review the need to perform infra-red testing of major electrical system components and connections prior to the end of the system warranty period, and what major electrical equipment requires factory testing.
- E. Provide a factory-authorized representative to perform start-up and inspection services, including verification of installation and wiring, for all major or complex electrical components including, but not limited to:
 - 1. Emergency generators
 - 2. Automatic transfer switches
 - 3. Emergency lighting inverters
 - 4. Uninterruptable power supplies (UPS)
 - 5. Master lighting control systems for occupancy, time of day control, and daylight dimming
 - 6. Electrical metering and devices communicating with the campus metering system
 - 7. Switchgear, sectionalizing switches, transformers and substations operating over 600 volts
 - 8. Building service entrance switchboards, switchgear and substations rated 400 amps and above
- F. Electrical systems and components requiring field testing and inspection include, but are not limited to:
 - 1. Electrical grounding electrode system (electrical system renovations/new construction)
 - 2. Internal building grounding systems and isolated ground systems
 - 3. Circuit breakers with adjustable-trip dial setting/electrical trip units or arc flash reduction features and all other protective devices with adjustable settings, such as relays
 - 4. Emergency power load shed systems
 - 5. Local lighting control systems for occupancy, time of day control and daylight dimming
 - 6. All building service entrance switchboards and panelboards rated 100 amps and higher
 - 7. Building transformers 30 kVA and larger

8. Wire and cable rated 100 amps and larger or operating over 600 volts
 9. Electrical metering and devices communicating with the campus metering system
- G. Follow recommendations and test procedures as outlined in NETA (International Electrical Testing Association) where standard field test procedures are provided
- H. Verify and correct, as necessary, the following: voltages, tap settings, trip settings, and phasing on all equipment and devices furnished or installed. Secondary voltages to be tested at the bus in the main switchboard, at panelboards, other locations on the distribution systems as necessary. Secondary voltages to be tested under no-load and full-load conditions.
- I. Failure or defects in workmanship or materials revealed by tests or inspection shall be corrected promptly and retested.
- J. Provide acceptance testing reports prior to the date of substantial completion and acceptance demonstrations. Provide acceptance testing reports and the as-left final device settings (for all adjustable-trip circuit breakers, relays and other protective devices) in the Operation and Maintenance Manual.
- K. Calibrate and set all adjustable trip circuit breakers, arc flash reduction controls, protective relays, ground fault detection and other adjustable-trip devices for proper trip settings, to values determined by an electrical coordination study.
- L. Field test circuit breakers and protective relays using secondary injection testing. Calibration to be performed by an approved independent testing and inspection agency.
- M. Test and inspect all circuits and receptacles for proper neutral and grounding connections.
- N. Demonstrate the proper operation of the electrical systems installed below, along with interfaces to other systems, such as building automation system (BAS). Systems include, but are not limited to:
1. Emergency and standby power systems
 2. Load shed systems for normal, emergency and standby power systems
 3. Emergency lighting inverters
 4. UPS
 5. Lighting control systems
 6. Campus metering system and interfaces to electrical equipment and systems
- O. Grounding Systems:
1. Test ground grid systems using the three terminal fall in potential method. Tests to be performed before final site loaming and seeding or paving work has been performed.
 2. Test building grounding systems and circuit grounds to ensure continuity of the ground return paths.
 3. Testing to be performed by an approved independent testing and inspection agency.
- P. Generators, Emergency Lighting Inverters and UPS Unit:
1. Perform load testing and acceptance testing of emergency and standby generators, UPS units and emergency lighting inverters per applicable NFPA 110 and 111 requirements.
 2. Test for proper system operation on power failure.

3. Test interfaces to other systems such as campus metering system and BAS for proper alarm notification, status indication and remote initiation.
 4. Test interfaces to other systems for proper load shed sequence of operation, such as fire pump controllers and BAS
- Q. Lighting Controls:
1. Adjust occupancy sensors for proper operation including time delay, field of view (masking), and for blind spots affecting occupied operation.
 2. Adjust daylight dimming controls for proper operation.
 3. Calibrate and set up time of day scheduling for each lighting zone that has time control.
 4. Test each lighting system zone for proper operation and integration with other systems, such as fire alarm system for lighting over-rides or with building automation system for HVAC occupied/unoccupied control.
 5. For larger, more complex lighting control systems, review the need to test and validate operation of lighting controls.
- R. Medium Voltage:
1. Inspect and test medium volt cables individually prior to final connection to the primary electric service and medium-voltage equipment per NETA guidelines.
 2. Inspect and test medium-voltage switchgear, sectionalizing switches and transformers prior to final connection per NETA guidelines.