SECTION 26 08 13
TESTING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the following:

1. Electrical acceptance tests by Independent Testing Agency.
2. Responsibilities of the Installer.
3. Test all work furnished or installed under Divisions 26, 27 or 28 of the specifications.
4. This testing is part of the owner's level 4 (project acceptance) testing. Provide all required documentation as requested by the Owner.
5. Infrared testing for all equipment, conductors, and terminations during load testing will be provided by Owner's Infrared testing firm. Provide representative color photographs of all locations tested. Test periodically during load testing. Assist and cooperate.
6. Coordinate assist and cooperate with the Owner's Commissioning Agent.
7. Provide all testing not performed by the Commissioning Agent or infrared testing firm. Provide written reports.

B. This specification covers all necessary material, equipment, labor and technical supervision to perform and complete the Electrical Acceptance Tests as required.

C. Acceptance tests as herein specified are defined as those tests and inspections required to determine that the equipment involved may be energized for final operational tests and is in accordance with the Contract documents. Final acceptance of the equipment and/or workmanship will depend upon performance characteristics as determined by the subject tests, in addition to complete operational tests, on all electrical equipment to show that it will perform the functions for which it was designed.

D. These tests are intended to insure that the workmanship, methods, inspections and materials used in erection and installation of the subject equipment shall conform with accepted engineering practices, ANI, and more specifically:

1. Specifications for the electrical work of the project.
2. Manufacturer's instructions.
3. Listing agency requirements.

E. Perform tests specified herein, required by the manufacturer, listed in individual Sections or indicated in the latest version of NETA Standards for Acceptance Testing in accordance with published guides and specifications, specifically NFPA 70B, IEEE, NEMA and other applicable publications.

F. Set and verify protective relays and overcurrent devices are adjusted according to the overcurrent device coordination study on the Architect's instructions.

1.2 RELATED WORK

A. Section 26 00 10 – Basic electrical requirements, is an integral part of this section. Requirements and work indicated in 26 00 10 are not repeated in this Section.

B. Section 26 08 00 – Commissioning – Coordinate testing with the Commissioning Authority.

1.3 COORDINATION

A. Coordinate work under provisions indicated in Section 26 00 10.

1.4 QUALIFICATIONS / QUALITY ASSURANCE

A. Conform to requirements indicated in Section 26 00 10.

B. Employ the services of a recognized Testing Agency, a member in good standing of the International Electrical Testing Association (NETA), to perform the specified tests as hereinafter covered by this section of the specifications.

C. The Testing Agency shall be responsible for all tests and test records. Testing shall be performed by and under the immediate supervision of the test agency and shall be made only by qualified personnel, specifically trained and fully experienced in this type of testing.

D. Give Architect and Owner's Representative three days written notice requesting witness before performing all tests. No test shall be done without acknowledgement from the Construction Manager, General Contractor and Owner's Representative. The Installer shall be responsible for clean-up and visual inspection of the equipment immediately prior to the testing.

E. Manufacturer's representatives shall be advised of all tests on their equipment. Reasonable cooperation shall be extended to permit witnessing by a representative of the manufacturer of the material under test, should the manufacturer so request.

F. The Construction Manager, General Contractor and Architect shall be immediately notified of any unfavorable test results or indication of faulty equipment. No piece of equipment shall be energized until the test data is evaluated and the equipment is proven acceptable.

G. If the tests and inspections should indicate deficiencies, make the necessary adjustments, corrections, modifications and replacements necessary to meet the specified requirements.

H. Upon completion of the remedial work, the Testing Agency shall repeat all the tests on components previously found deficient on the first test or any additional tests if they be required. It shall be the responsibility and obligation of the installer to have all remedial work accomplished as may be required by second and/or additional tests.

I. All equipment used shall be certified as calibrated within the last 12 months.

1.5 REGULATORY REQUIREMENTS AND STANDARDS

A. Conform to requirements indicated in Section 26 00 10.

B. Codes and Standards in addition to Section 26 00 10:

1. NFPA 70B: Electrical Equipment Maintenance.
2. IEEE Testing Guides.
3. ICEA Testing Guides.
4. NEMA Testing Guidelines.
5. NETA Acceptance Testing Specifications (ATS)

1.6 SUBMITTALS

A. Submit as required here in and under Section 26 00 10.

B. Upon completion of the work herein described, submit Four (4) bound sets of Test and Inspection Reports. Provide information required in the specification, owner’s requirements and NFPA 70B including applicable completed forms. Provide two electronic copies on CD or DVD.

C. The report shall indicate deficiencies in the operation of the equipment and installation, fuse sizes, relay settings for protective devices, fault ratings of installed equipment, impedances of equipment and cables to ground, conductor test reports, grounding system, etc.

1.7 EXTRA MATERIALS

A. Furnish under provisions indicated in Section 26 00 10.

1.8 PROJECT RECORD DOCUMENTS

A. Submit under provisions indicated in Section 26 00 10.

B. Update as-built documentation with information gathered during testing.

1.9 OPERATION AND MAINTENANCE DATA

A. Submit under provisions indicated in Section 26 00 10.

1.10 WARRANTY

A. Provide under provisions indicated in Section 26 00 10.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 TEST PROCEDURES AND EQUIPMENT

A. Perform tests after installation but before energizing the equipment. In addition to or as a supplement of the tests indicated in individual sections the tests and procedures apply to all equipment. Test all work furnished or installed..

B. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing specification. Certify compliance with test parameters.

C. Provide written report of all tests and findings.

D. Measure tightness of bolted connections and compare torque measurements with manufacturer's and NRTL's recommended values. Verify that bolt location, when correctly torqued, is marked with permanent marker.

E. Infrared Scanning: During load testing, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
2. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action. Include color photographs.

F. Remove and replace malfunctioning units and test as specified herein.

3.2 TRANSFORMERS

A. Verify transformer taps provide acceptable voltage at utilization equipment connected to substation. Set no load voltage as follows:

1. 480V or 480/277V systems: 492V
2. 208/120V systems: 125V

B. Instrument and Control Transformers:

1. Visually inspect for damage and improper connections.
2. Check polarity and ratio by calibration of current transformers.
3. Check mechanical operation of draw-out mechanisms.

3.3 GROUNDING

A. Ground Resistance:

1. Visually inspect for specified ground connections.
2. Perform Ground Resistance Test at all connections to switchgear, switchboards, and as specified use two point resistance test.
3. Use four-point fall-of-potential method for exterior ground testing.
4. Perform ground resistance testing of raised floor stringer to stringer and stringer to SRG conductor at locations where SRG conductor is connected to raised floor pedestal.

3.4 CIRCUIT BREAKERS

A. Circuit Breakers as Specified:

1. Visually inspect all components for damage.
2. Perform Insulation Resistance Test.
3. Perform Contact Resistance Test.
4. Check calibration of short-time and/or instantaneous devices at rated setting.
5. Check calibration of series over-current or static trip devices at pick-up and at 300 percent of rating.
6. All circuit breakers shall be tested with primary current injection in order to successfully test current transformer and associated wiring.
7. Check operation of circuit breaker and draw-out mechanism.

B. Record trip settings of units and protective relays. Verify settings match those specified in the coordination report.

3.5 SWITCHBOARD/SWITCHGEAR

A. Visually inspect for damage and improper connections.

B. Perform Insulation Resistance Tests.

C. Perform High Potential Test on bus.

D. Check all accessible bus connections and joints for proper torque.

E. Test per latest NETA specifications.

F. Verify proper conductor supports for short circuit withstand requirements and to keep stress off terminations as recommended by NEMA, NRTL and manufacturer.

3.6 METERS AND INSTRUMENTS

A. Visually inspect for damage and improper connections.

B. Check calibration of all indicating instruments

C. Check all meters for proper indication.

D. Check meter switches for proper function and connections.

E. Verify all instrument multipliers.

3.7 CABLES, LOW VOLTAGE (600 VOLTS AND LESS)

A. All cables at main switchgear/switchboards and feeders 200A and higher ampacity and all feeders to panels.

B. Visually inspect for damage and improper connections.

C. Torque test cable connections to manufacturer's recommended values.

D. Perform Insulation Resistance Test.

E. Perform Continuity Test.

3.8 MOTOR CONTROLLERS

A. Visually inspect for damage and improper connections.

B. Test as per applicable items indicated in preceding paragraphs.

C. Test overload relays and verify as to proper size.

3.9 MEDIUM VOLTAGE CABLES (ABOVE 600V)

A. Not Applicable.

3.10 MEDIUM VOLTAGE TRANSFORMERS

A. Not Applicable.

3.11 MEDIUM VOLTAGE SWITCHGEAR

A. Not Applicable.

3.12 MOTORS

A. Test and verify proper phasing connections and rotation.

B. Verify proper motor overloads are installed.

3.13 TEST REPORTS

A. Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION