

## PART 1 - GENERAL

## 1.01 SUMMARY

## A. Section Includes:

1. This Section specifies the Contractor's inspections and tests, which are a part of the Contract Work. Testing shall include the following:
  - a. Medium Voltage Switchgear and Unit Substation.
  - b. Distribution Switchboard Assemblies.
  - c. Cables - Medium voltage - 15kV.
  - d. Cables - Low voltage - 600V.
  - e. Transformers - Low voltage
  - f. Switches - Low voltage.
  - g. Circuit Breakers - Low voltage - Insulated case.

B. The Contractor shall perform routine insulation resistance, continuity, and phase rotation tests for all distribution and utilization equipment prior to and in addition to tests performed by the testing firm specified herein.

C. The Contractor shall supply a suitable and stable source of electrical power to each test site. The testing firm shall specify the power requirements.

D. The Contractor shall notify the testing firm when equipment becomes available for acceptance testing. Work shall be coordinated to expedite project scheduling.

E. The testing firm shall notify the Consultant 48 hours prior to the commencement of any testing.

F. Any system, material or workmanship which is found to be defective on the basis of acceptance testing shall be reported to the Consultant.

G. The testing firm shall maintain a written record of all tests and, upon completion of the project, shall assemble and certify a final test report.

## H. Related Sections:

1. Section 26 05 13: Medium Voltage Cables
2. Section 26 05 19: Low Voltage Power Conductors and Cables
3. Section 26 05 26: Grounding and Bonding for Electrical Systems
4. Section 26 11 16: Secondary Unit Substations
5. Section 26 22 00: Low-voltage Transformers

6. Section 26 24 16: Panelboards
7. Section 26 41 00: Facility Lightning Protection

## 1.02 REFERENCES

- A. American National Standards Institute (ANSI)
  1. ANSI C2 - National Electrical Safety Code.
- B. International Electrical Testing Association (NETA)
  1. ANSI/NETA ATS-2009 - Standard for Acceptance Testing Specification.
  2. ANSI/NETA MTS-2007 - Standard for Maintenance Testing Specification.
- C. National Fire Protection Association (NFPA)
  1. NFPA 70 - The National Electrical Code.
  2. NFPA 70B - Electrical Equipment Maintenance.
  3. NFPA 70E - Standard for Electrical Safety in the Workplace.
- D. Occupational Safety and Health Administration (OSHA) Regulations.
- E. Manufacturer's instruction manuals.
- F. Equipment shop drawings for equipment installed on the project.

## 1.03 SUBMITTALS

- A. Qualifications of the Testing firm, including current OSHA accreditation or NETA member status.
- B. Qualifications of the engineers and technicians to be assigned to perform the work of this section.
- C. Test reports for each piece of equipment on the project tested, typed, bound and labeled. The report shall include:
  1. Summary of project.
  2. List of test equipment used, including manufacturer, model number and serial number, and the most recent calibration date for each piece of test equipment.
  3. Listing of equipment tested.
  4. Test results.
  5. Recommendations.
- D. Furnish copies of the complete test report to the Consultant within 7 days of the completion of testing.

#### 1.04 QUALITY ASSURANCE

- A. Perform electrical testing in accordance with NETA Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems and the manufacturer's instructions.

#### 1.05 QUALIFICATIONS

- A. Engage an experienced firm specializing in testing and adjusting of systems and equipment specified in this Section. Firm shall have performed Inspection and Testing on projects similar in cost, material, design, and extent to the work indicated in this Section, and Inspection and Testing work has resulted in demonstrated successful operation of the installed equipment.
- B. The testing firm shall be corporately and financially independent test organization which can function as an unbiased testing authority, professionally independent of the manufacturers, suppliers, and installers of equipment or systems evaluated by the testing firm.
- C. The testing firm shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907, or be a Full Member Company of the International Electrical Testing Association (NETA).
- D. The lead on-site technical person shall be currently certified by NETA in electrical power distribution system testing.
- E. The testing firm shall utilize engineers and technicians who are regularly employed by the firm for testing services.

#### 1.06 PRE-TESTING CONFERENCE

- A. Convene one week prior to commencing work of this Section, under provisions of General Conditions.

### PART 2 - MATERIALS - Not used

### PART 3 - EXECUTION

#### 3.01 INSPECTION

- A. Installations will be subject to review by the Engineer. Where equipment, material or workmanship does not conform to the requirements of the specifications or the Contract Documents, the work shall be corrected to the satisfaction of the Engineer at no additional cost to the owner.

#### 3.02 TESTING FIRMS

- A. American Electrical Testing Company
- B. Elemco Testing Company.
- C. High Voltage Maintenance Corporation.

- D. M & L Power Systems Maintenance, Inc.
- E. Other NETA full member companies may be located by contacting the NETA office at (888) 300-6382 or <http://www.netaworld.org>.

### 3.03 EXAMINATION

- A. Verify that systems are complete before commencing work. Ensure the following conditions:
  - 1. Proper anchorage, required area clearances and proper alignment.
  - 2. Inspect for physical damage, insulation contaminants, condensation or debris.
  - 3. Compare equipment name plate information with the latest one-line diagram and latest shop drawings with Engineer's Action Stamp; report discrepancies.
  - 4. Verify fuse and/or circuit breaker sizes and types correspond to drawings.
  - 5. Verify the location and condition of all safety grounds.
- B. Submit field reports. Report defects and deficiencies noted during the performance of services which prevent system testing.
- C. Beginning of work means acceptance of existing conditions.

### 3.04 PREPARATION

- A. Safety and Precautions: Safety practices shall include, but are not limited to, the following requirements:
  - 1. Occupational Safety and Health Act.
  - 2. Applicable state and local safety operating procedures.
  - 3. NFPA 70E.
  - 4. American National Standards for Personnel Protection.
- B. All tests shall be performed with equipment de-energized. Safety grounds shall be installed where required, except where such grounds conflict with testing requirements.
- C. The testing firm shall have a designated safety representative on the project to supervise the testing operations with respect to safety.
- D. Provide instruments required for testing and adjusting equipment and systems. Make instruments available to the Consultant and Resident Engineer to facilitate spot checks during tests.

### 3.05 INSPECTION AND TESTING

- A. Switchgear and Switchboard Assemblies:
  - 1. Test in accordance with NETA ATS Section 7.1.1 and 7.1.2.

- B. Cables – Medium voltage – 15kV maximum:
  - 1. Test in accordance with NETA ATS Section 7.3.3.
- C. Cables - Low voltage - 600V maximum:
  - 1. Test in accordance with NETA ATS Section 7.3.2.
- D. Transformers:
  - 1. Test in accordance with NETA ATS Section 7.2.1.
- E. Switches - Low Voltage
  - 1. Test in accordance with NETA ATS Section 7.5.1.
- F. Circuit breakers - Low voltage - Insulated case:
  - 1. Test in accordance with NETA ATS Section 7.6.1.1.
- G. Grounding System:
  - 1. Test in accordance with NETA ATS Section 7.13.

### 3.06 SCHEDULE

- A. New equipment requiring inspection and electrical testing:
  - 1. Medium voltage switchgear and unit substation including all circuit breakers, relays and accessories.
  - 2. Low voltage distribution switchboards.
  - 3. Panelboards.
  - 4. All medium voltage cables.
  - 5. All 600V conductors No. 2 AWG and larger.
  - 6. All molded case circuit breakers, 100A and larger.
  - 7. All dry type low voltage transformers.
  - 8. Fusible and non-fusible switches.
  - 9. Ground systems.

END OF SECTION