SECTION 26 08 13
MEDIUM VOLTAGE EQUIPMENT ACCEPTANCE TESTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Basic requirements for acceptance testing.

1.2 QUALITY ASSURANCE

A. Referenced Standards:

1. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
   a. 400, Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems.
   b. 400.2, Guide for Field Testing of Shielded Power Cable Systems Using Very Low Frequency (VLF) (less than 1 Hz).
2. InterNational Electrical Testing Association (NETA):
   a. ATS, Standard for Acceptance Testing Specifications for Electric Power Equipment and Systems.
3. Nationally Recognized Testing Laboratory (NRTL).
4. Telecommunications Industry Association/Electronic Industries Alliance/American National Standards Institute (TIA/EIA/ANSI):
   a. 455-78-B, Optical Fibres - PART 1-40: Measurement Methods and Test Procedures - Attenuation.
   b. NEMA WC 74/ICEA S-93-639, 5-46 kV Shielded Power Cable for Use in the Transmission and Distribution of Electric Energy.

B. Qualifications:

1. Testing firm:
   a. An independent firm performing, as the sole or principal part of its business for a minimum of 10 years, the inspection, testing, calibration, and adjusting of systems.
   b. Must have an established monitoring and testing equipment calibration program with accuracy traceable in an unbroken chain, according to NIST.
2. Field personnel:
   a. Minimum of one year field experience covering all phases of electrical equipment inspection, testing, and calibration.
   b. Relay test technician having previous experience with testing and calibration of relays of the same manufacturer and type used on project and proficient in setting and testing the types of protection elements used.
   c. Supervisor certified by NETA or NICET.
      1) As an alternative, supervising technician may be certified by the equipment manufacturer
3. Analysis personnel:
   a. Minimum three years combined field testing and data analysis experience.
   b. Supervisor certified by NETA or NICET.
      1) As an alternative, supervising technician may be certified by the equipment manufacturer.

1.3 SUBMITTALS

A. Shop Drawings:

1. Equipment Monitoring and Testing Plan.

B. Informational Submittals:

1. Cable test reports from the manufacturer in accordance with ANSI/NEMA WC 74/ICEA S-93-639 and NETA ATS:
   a. Voltage Withstand Tests
   b. Partial Discharge Tests
   c. Insulation/Conductor Resistance Tests
2. Prior to energizing equipment:
   a. Coordinated phasing diagram.
   b. Photocopies of continuity tests.
   c. VLF Medium Voltage Test Report.
3. Within two weeks after successful completion of Demonstration Period (Commissioning Period):
   a. Single report containing information including:
      1) Summary of Project.
      2) Information from pre-energization testing.
      3) Testing and monitoring reports.

PART 2 - PRODUCTS

2.1 FACTORY QUALITY CONTROL

A. Provide Electrical equipment with all factory tests required by the applicable industry standards or NRTL.

PART 3 - EXECUTION

3.1 SPECIFIC EQUIPMENT TESTING REQUIREMENTS

A. Switchgear and Switchboards:

1. Perform inspections and tests per NETA ATS 7.1.
2. Components: Test all components per applicable paragraphs of this Specification Section and NETA ATS.

B. Transformers - Small Dry Type:

1. Perform inspections and tests per NETA ATS 7.2.1.1.
2. Perform the following additional tests:
   a. Record phase-to-phase, phase-to-neutral, and neutral-to-ground voltages at no load after energizing, and at operating load after startup.
3. Adjust tap connections as required to provide secondary voltage within 2-1/2% of nominal under normal load after approval of Engineer.
4. Record as-left tap connections.

C. Transformers - Large Dry Type:

1. Perform inspections and tests per NETA ATS 7.2.1.2.
2. Components: Test all components per applicable paragraphs of this Specification Section and NETA ATS.
3. Perform the following additional tests:
   a. Record phase-to-phase, phase-to-neutral, and neutral-to-ground voltages at no load after energizing, and at operating load after start-up.
4. Adjust tap connections as required to provide secondary voltage within 2-1/2% of nominal under normal load.

5. Record as-left tap connections.

D. Cable - Low Voltage:

1. Perform inspections and tests per NETA ATS 7.3.2.

E. Cable – 15 kV Medium Voltage:

1. Perform inspections and tests per manufacturer's recommendations.
2. Prior to energization, perform a Very low frequency (VLF) test following IEEE 400.2 Guide for Field Testing of Shielded Power Cable systems for baseline data for future VLF maintenance testing:
   a. VLF testing shall include:
      1) Withstand test to evaluate whether the cable can handle the test voltage (See IEEE 400.2 Table 3).
         a) Cable System Testing Voltage: 15kV (Phase to Phase).
         b) Installation Test Voltage: 19kV RMS (Phase to Ground).
         c) Withstand Test Duration: 30 minutes.
      2) Tangent delta test, including differential tangent delta and tangent delta stability, for baseline comparison:
         a) Line to Ground Voltage: 7.2kV.
         b) Applies Test Voltages: 3.6kV, 7.2kV, 10.8kV, 14.4kV.
         c) Test Duration: 3 Minutes at each voltage.
   b. VLF testing shall be completed by technicians trained to use testing equipment with at least three years of experience in performing VLF testing on medium voltage cables.
3. Results for new cable shall be compared to Table G.2 in IEEE 400.2.
   a. Acceptable Condition:
      1) Tangent Delta Stability at 7.2kV: <0.1
      2) Tip Up: <5
      3) Tangent Delta at 7.2kV: <10
   b. Discrepancies between field test results and Table G.2 shall be notated and discussed with testing equipment manufacturer to determine validity of results.
4. Grounding:
   a. Perform inspections and tests per manufacturer's recommendations.
   b. Components: Test all components per applicable paragraphs of this Specification Section and manufacturer's recommendations.

F. Grounding:

1. Perform inspections and tests per NETA ATS 7.13.
2. Components: Test all components per applicable paragraphs of this Specification Section and NETA ATS.

END OF SECTION