ELECTRICAL TESTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. Related Sections include the following:

1. Division 26 Section “Electrical General Requirements.”
2. Division 26 Section “Conductors and Cables.”
3. Division 26 Section “Medium Voltage Cables.”
4. Division 26 Section “Grounding and Bonding.”
5. Division 26 Section “Medium-Voltage Transformers.”
6. Division 26 Section “Enclosed Switches.”
7. Division 26 Section “Enclosed Controllers.”
8. Division 26 Section “Switchboards.”
9. Division 26 Section “Panelboards.”
10. Division 26 “Enclosed Bus Assemblies”.
11. Division 26 Section “Fuses.”

1.2 SECTION INCLUDES

A. The Electrical Contractor shall engage the services of a recognized corporately independent N.E.T.A. certified testing firm for the purpose of performing inspections and tests as herein specified

B. The testing firm shall provide all material, equipment, labor, and technical supervision to perform such tests and inspections.

C. It is the intent of these tests to assure that all tested electrical equipment is operational and within industry and manufacturer's tolerances and is installed in accordance with design Specifications.

D. The test and inspections shall determine suitability for energization.

E. Equipment to be tested and inspected shall be the equipment shown on the one line diagram and schedules as required by part three of each individual Specification Section. In addition, all equipment that is part of an emergency distribution system shall be tested.

1.3 REFERENCES

A. All inspections and tests shall be in accordance with the latest version of the following codes and standards except as provided otherwise herein.

1. National Electrical Manufacturer's Association - NEMA

2. American Society for Testing and Materials - ASTM

3. Institute of Electrical and Electronic Engineers - IEEE

4. InterNational Electrical Testing Association - NETA Acceptance Testing Specifications - ATS-1996

5. InterNational Electrical Testing Association - NETA Maintenance Testing Specifications- MTS-1997

6. American National Standards Institute - ANSI C2: National Electrical Safety Code

7. State and Local Codes and Ordinances

8. Insulated Cable Engineers Association - ICEA

9. Association of Edison Illuminating Companies - AEIC

10. Occupational Safety and Health Administration

11. National Fire Protection Association - NFPA

a. ANSI/NFPA 70: National Electrical Code
b. ANSI/NFPA 70B: Electrical Equipment Maintenance
c. NFPA 70E: Electrical Safety Requirements for Employee Workplaces
d. ANSI/NFPA 101: Life Safety Code

1.4 QUALIFICATIONS

A. The testing firm shall be a corporately independent testing 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.

B. The testing firm shall be regularly engaged in the testing of electrical equipment devices, installations, and systems.

C. The lead, on site, technical person and at least 50% of the on site crew shall be currently certified by the InterNational Electrical Testing Association (NETA) or National Institute for Certification in Engineering Technologies in Electrical Power Distribution System Testing.

D. The testing firm shall only utilize technicians who are regularly employed by the firm on a full-time basis for testing services.

E. The Contractor shall submit proof of the above qualifications with bid proposal.

F. The terms used herewithin such as Test Agency, Test Contractor, Testing Laboratory, or Contractor Test Company, shall be construed to mean the testing organization.

G. Acceptable Testing Firms:

1. Northern Electrical Testing; Phone (248) 689-8980.

2. Utilities Instrumentation Services; Phone (734) 482-1450.

3. Emerson/High Voltage Maintenance Corporation; Phone (248) 305-5596.

4. Powertech Services, Inc.; Phone (810) 720-2280.

5. Magna Electric; Phone (248) 667-9492.

6. Power Plus Engineering, Inc. Phone (248) 344-0200.

1.5 PERFORMANCE REQUIREMENTS

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

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

C. The testing firm shall notify the Owner's Representative prior to commencement of any testing.

D. Any system, material or workmanship, which is found defective on the basis of acceptance tests, shall be reported to the Engineer. The Electrical Contractor shall correct all defects.

E. The testing organization shall maintain a written record of all tests and shall assemble and certify a final test report.

F. Safety and Precautions

1. Safety practices shall include, but are not limited to, the following requirements:

a. Occupational Safety and Health Act.
b. Accident Prevention Manual for Industrial Operations, National Safety Council.
c. Applicable state and local safety operating procedures.
d. NETA Safety/Accident Prevention Program.
e. Owner's safety practices.
f. National Fire Protection Association - NFPA 70E.
g. American National Standards for Personnel Protection.

2. All tests shall be performed with apparatus de-energized except where otherwise specifically required.

3. The testing organization shall have a designated safety representative on the project to supervise operations with respect to safety.

1.6 TEST INSTRUMENT CALIBRATION

A. Test Instrument Calibration

1. The testing firm shall have a calibration program, which assures that all applicable test instruments are maintained within rated accuracy.

2. The accuracy shall be directly traceable to the National Institute of Standards and Technology.

3. Instruments shall be calibrated in accordance with the following frequency schedule:

a. Field instruments: Analog - 6 months maximum Digital - 12 months maximum
b. Laboratory instruments: 12 months
c. Leased specialty equipment: 12 months
(Where accuracy is guaranteed by Lessor)

4. Dated calibration labels shall be visible on all test equipment.

5. Records must be kept up-to-date which show date and results of instruments calibrated or tested.

6. An up-to-date instrument calibration instruction and procedures shall be maintained for each test instrument.

7. Calibrating standard shall be of higher accuracy than that of the instrument tested.

B. Field Test Instrument Standards

1. All equipment used for testing and calibration procedures shall exhibit the following characteristics:

a. Maintained in good visual and mechanical condition.
b. Maintained in safe, operating condition.

C. Suitability of Test Equipment

1. All test equipment shall be in good mechanical and electrical condition.

2. Selection of metering equipment should be based on knowledge of the waveform of the variable being measured. Digital multi-meters may be average of RMS sensing and may include or exclude the dc component. When the variable contains harmonics of dc offset and, in general, any deviation from a pure sine wave, average sensing, average measuring RMS scaled meters may be misleading. Use of RMS measuring meters is recommended.

3. Field test metering used to check power system meter calibration must have any accuracy higher than that of the instrument being checked.

4. Accuracy of metering in test equipment shall be appropriate for the test being performed.

5. Waveshape and frequency of test equipment output waveforms shall be appropriate for the test and tested equipment.

1.7 TEST REPORTS

A. A test report shall be generated for each piece of major equipment or groups of equipment and shall include the following:

1. A list of visual and mechanical inspections required by Division 26 Specification Sections in a checklist or similar format.

2. Test reports, including test values where applicable, for all required electrical tests. Clearly indicate where test values fall outside of the limits of recommended values.

3. Summary and interpretation of test results detailing problems located and recommended corrective measures.

4. Record of infrared scan and photos showing potential problem locations.

5. Signed and dated by the testing firm field superintendent stating that all required tests have been completed.

B. Test reports shall be furnished to the Architect/Engineer within 14 days of the completion each test on an ongoing basis. Original copies of the reports shall be furnished directly to the Architect/Engineer by the testing company prior to formal submittal via the Contractors.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 THERMOGRAPHIC SURVEY

A. Visual and Mechanical Inspection

1. Remove all necessary covers prior to scanning.

2. Inspect for physical, electrical, and mechanical condition.

B. Equipment to be Scanned

1. All components of the distribution system down to and including branch circuit panelboards and motor control centers. Return 3 months after equipment has been energized and loaded to do a final scan of all equipment.

C. Provide report indicating the following:

1. Problem area (location of "hot spot").

2. Temperature rise between "hot spot" and normal or reference area.

3. Cause of heat rise.

4. Phase unbalance, if present.

5. Areas scanned.

D. Test Parameters

1. Scanning distribution system with ability to detect 1 C between subject area and reference at 30 C.

2. Equipment shall detect emitted radiation and convert detected radiation to visual signal.

3. Infrared surveys should be performed during periods of maximum possible loading but not less than twenty percent (20%) of rated load of the electrical equipment being inspected.

E. Test Results

1. Interpretation of temperature gradients requires an experienced technician. Some general guidelines are:

   a. Temperature gradients of 37 F to 44.6 F indicate possible deficiency and warrant investigation.
   b. Temperature gradients of 37 f to 59 F indicate deficiency; repair as time permits.
   c. Temperature gradients of 61 F and above indicate major deficiency; repair immediately.

END OF SECTION