

**MAINTENANCE TESTING FOR ELECTRICAL SYSTEMS  
26 01 26**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Test electrical systems and equipment.
- B. These tests are required to determine that the equipment involved may be safely energized and operated.
- C. Perform tests by and under the supervision of fully experienced and qualified personnel. Advise each respective manufacturer's representative of tests on their equipment.
- D. Record all test data.
- E. Each section of Division 26 that has products or systems listed herein incorporate this section by reference and is incomplete without the required tests stated herein.

**1.2 REFERENCES**

- A. NFPA 70 - National Electrical Code.

**1.3 SUBMITTALS**

- A. Submit test report forms for review a minimum of 90 days prior to requesting a final review by A/E.
- B. Furnish six individually bound copies of test data. Neatly type and arrange data. Include with the data the date tested, personnel present, weather conditions, nameplate record of test instrument and list all measurements taken, both prior to and after any corrections are made to the system. Record all failures and corrective action taken to remedy incorrect situation.
- C. A/E will retain one copy. Remaining copies will be returned to Contractor for inclusion in the operation and maintenance manuals.

**PART 2 - PRODUCTS**

Not used.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Furnish proposed test procedures, recording forms, list of personnel and test equipment for A/E review.
- B. Follow recommended procedures for testing as published by test equipment manufacturer.

### **3.2 WIRE AND CABLE**

- A. Test insulation resistance of each main feeder and service after the installation is complete but before the connection is made to its source and point of termination.
- B. Test insulation resistance using Biddle Megger or equivalent test instrument at a voltage not less than 1,000 volts DC. Measure resistance from phase-to-phase and phase-to-ground. In circuits where insulation test value is lower than 1 megohm, remove and replace conductor and retest.
- C. Visually inspect connections of every branch circuit for tightness.
- D. Insure that grounding conductor is electrically continuous.
- E. Test branch circuits against grounds, shorts or other faults.
- F. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- G. Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment.
- H. Test the system for stray currents, ground shorts, etc. If stray currents, shorts, etc., are detected, eliminate or correct as required.

### **3.3 WIRING DEVICES**

- A. Operate switches at least twice.

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- B. Test every convenience outlet with plug-in device for proper phasing and grounding.
- C. Demonstrate operation of lighting circuits and lighting control systems.

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**3.4 ELECTRICAL SWITCHGEAR (To include all switchgear: switchboards, panelboards, transformers, switches etc.)**

- A. Before Energization:
  - 1. Visually inspect connections for tightness and correctness.
  - 2. Verify proper fusing.
  
- B. After Energization:
  - 1. Verify proper voltage with system operating at load conditions.
  - 2. Verify proper operation.
  - 3. Operate every circuit breaker, switch and contactor.
  - 4. Modify tap settings on transformers as required.
  - 5. Measure line amperes with system operating at load conditions.
  - 6. Modify circuit breaker and relay settings as required.
  - 7. Megger meter centers for opens, shorts and grounds.
  - 8. Thermographic Tests:
    - a. With system operating at load conditions, perform thermographic test on switchgear, bus duct, control centers, distribution panelboards, lighting panelboards and equipment feeders using an infrared temperature scanning unit. Provide thermograph tests performed by General Electric Instrumentation Division.
    - b. Tighten or correct connections with higher temperatures than acceptable. After corrections have been made, perform thermograph test to confirm that problems have been corrected.
  
- C. Operate all equipment and control systems through intended sequence. Record all data pertaining to system operation.
  - 1. Contactors.
  - 2. Starters.
  - 3. Electrically operated circuit breakers.
  - 4. Measure noise level 3 feet from mechanical room where variable frequency drive starters are installed.
  - 5. Perform motor control center mechanical operator tests in accordance with manufacturer's instructions.
  - 6. Exercise each starter through entire operating sequence. Demonstrate that protective features such as phase failure, undervoltage and phase reversal are properly operating.
  - 7. Rotating Equipment:
    - a. Verify proper voltage and phasing.
    - b. Modify phasing as required for proper rotation.
    - c. Measure line amperes (starting and running) and rpm.
    - d. Demonstrate running of motors and operation of controls and interlocks.

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**3.5 GROUND FAULT**

- A. Factory test switchboards at the manufacturer's factory prior to shipment as specified herein:
  - 1. Furnish a ground fault protection system test for circuit testing and verification of the tripping of the ground fault relays at the factory location. Pass predetermined values of current through the relay sensors and measure the relay tripping time for each phase and the neutral sensor (if one is required). Compare the measured time-current relationships to the tri-characteristic curves for each relay. If the relay trips outside the range of values indicated on the curve, replace or recalibrate the relays. Include a polarity verification of the interconnection of the ground sensor circuits as a part of the test.
  - 2. Have the proper voltages applied to their circuits and satisfactory operation demonstrated for additional auxiliary, pilot, control relays, electrically operated breakers, shunt-trip operated breakers, switches, etc.
  - 3. Furnish in accordance with NFPA 70 Section 230-95(c), test results certified by the switchboard manufacturer. One reviewed copy to be available at the job site for review by the authorities having jurisdiction.
  - 4. Upon completion of the factory ground fault protection system tests, the current and time adjustment on each relay are to be set on their minimum values.
  
- B. After construction work is complete and prior to energizing switchboards, field test ground fault protection system; provide reset to manufacturer's recommended setting for both current and time by General Electric Engineering and Service.
  - 1. The test procedure is to be similar to that specified for the factory test.
  - 2. Notify A/E in writing at least two weeks prior to the day of the field test. A/E may witness the field test if he so desires.
  - 3. Furnish all field test results certified by the testing company listed hereinbefore.

**3.6 SECONDARY GROUNDING**

- A. Test service entrance ground resistance.
- B. Provide additional made-electrodes if resistance is more than 3 ohms.
- C. Test grounding system resistance within building at a minimum of ten locations.

**3.7 UNINTERRUPTIBLE POWER SYSTEMS**

- A. Test system on full load for compliance of load carrying capability and duration.

**3.8 AUTOMATIC TRANSFER SWITCH**

- A. A complete outage test under load for transfer “to” and “from” normal power to standby power system.

**3.9 SOUND SYSTEM**

- A. Test the system to determine that it is free from grounds, open and short circuits.
- B. Verify output volume meets Owner's requirements.

**3.10 SOUND/CLOCK PROGRAM SYSTEM**

- A. Test the system to determine that it is free from grounds, open and short circuits.
- B. Verify output volume meets Owner's requirements.
- C. Verify slave clocks respond to master controls.

**3.11 FIRE ALARM SYSTEM**

- A. Test system in accordance with manufacturer's recommendations in presence of manufacturer's and Owner's representatives:
  - 1. Operate initiating devices.
  - 2. Assure indicating devices operation.
  - 3. Assure system functions.
  - 4. Assure system interfaces with other systems.
- B. Test the system to determine that it is free from grounds, open and short circuits.
- C. If provided, test output and reception of emergency signal at remote or local monitoring service.

**END OF SECTION**

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