

## 1 GENERAL

- 1.1 Conduct and pay for tests of the following:
  - 1.1.1 Power distribution system including phasing, voltage, grounding and load balancing.
  - 1.1.2 Circuits originating from branch distribution panels.
  - 1.1.3 Lighting and its control.
  - 1.1.4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
  - 1.1.5 Systems: fire alarm system, communications.
  - 1.1.6 High pot testing.
- 1.2 Furnish manufacturers certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturers instructions.
- 1.3 Carry out tests in presence of the Owner representative.
- 1.4 Give advance notice of proposed time of tests so that the Owner can be represented at the tests.
- 1.5 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- 1.6 Submit test results for review by the Owner.
- 1.7 Test all systems in accordance with details in appropriate sections.
- 1.8 Testing methods and test results: in accordance with CSA, Ontario Electrical Code and regulations of the supply authority and other authorities having jurisdiction.
- 1.9 Remove and replace with new materials all conductors that are found to be shorted or grounded.
- 1.10 Conduct dielectric tests, hi-pot tests, insulation resistance tests and ground continuity tests as required by the nature of the various systems and equipment.
- 1.11 With the systems completely connected and lamped, conduct the following tests on the power system:
  - 1.11.1 Control and Switching: test all circuits for the correct operation of devices, switches and controls.
  - 1.11.2 Polarity Tests: test all circuits for correct operation of devices, switches and controls.
  - 1.11.3 Voltage Tests: make a voltage test at the last outlet of each circuit. Maximum drop in potential permitted will be 2% on 120 V, and 208 V branch circuits. 2% on 208 V feeder circuits, and 5% on 600 V feeder

circuits. Correct any deficiency in this respect.

- 1.11.4 Phase Balance: measure the load on each phase at each switchboard, splitter, distribution panelboard and lighting and power panelboard. Report results in writing to Owner. Re-arrange phase connections as necessary to balance the load on each phase as instructed by Owner with the rearrangement being restricted to the exchanging of connections at the distribution points mentioned in this paragraph. After marking any such changes, make available to Owner, drawings or marked prints showing, the modified connections.
- 1.11.5 Supply Voltage: measure the line voltage of each phase at the load terminals of the main breakers and report the results in writing to Owner. Perform this test with the majority of electrical equipment in use.
- 1.11.6 Motor Loading: measure the line current of each phase of each motor with the motor operating under load and report the results in writing to Owner. Upon indications of any imbalance or overload, thoroughly examine the electrical connections and rectify any defective parts or wiring. If electrical connections are correct, overloads due to defects in the driven machines shall be reported in writing to Owner.
- 1.11.7 General Operations: energize and put into operation each and every electrical circuit and item. Make repairs, alterations, replacements, tests and adjustments necessary for a complete and satisfactory operating electrical system.
- 1.12 Carry out tests covering "General Operation" at the time of acceptance of the work.
- 1.13 Test all systems and obtain written confirmation from the manufacturer of each system that all components have been installed correctly and that the system is functioning as intended. Present separate certification for all systems including: fire alarm, power distribution, to Owner.
- 1.14 Provide labour, instruments, apparatus and pay all expenses required for the tests. Owner reserves the right to demand proof of the accuracy of all instruments used.
- 1.15 Co-ordinate the testing of motors with the trades providing the equipment driven by the motors so that they are carried out at the time the driven equipment is put on test. In addition to the motor loading tests, provide labour and instruments to take and record all motor load readings required to supplement the tests on the driven equipment through various load sequences, as required by the trades involved.
- 1.16 Immediately prior to BOD, test the entire electrical system by performing a loss and return of utility power test. Demonstrate the operation of.
  - 1.16.1 High and low voltage service equipment and metering.
  - 1.16.2 Exit and emergency lighting.

- 1.16.3 Fire and intrusion operation during power outage, including remote monitoring system.
- 1.16.4 EMCS system shut down and auto restart, including restabilization of systems after power return. attach printouts as evidence of expected operation on all systems including all air handling systems.
- 1.16.5 User equipment shut-down and auto-restart.
- 1.17 Insulation Resistance Testing:
  - 1.17.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
  - 1.17.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
  - 1.17.3 Check resistance to ground before energizing.

***End of Section***