SECTION 16950

TESTING ELECTRICAL SYSTEMS AND START-UP

PART 1 - GENERAL

1.1 DESCRIPTION

A. Test and demonstrate, to the satisfaction of the Engineer, all electrical devices in accordance with the following requirements.

B. Prior to energizing distribution equipment, motor starters, motors, etc., thoroughly vacuum clean the equipment with an industrial type vacuum cleaner.

C. All motors, contacts, relays, bus, insulators and other electrical apparatus shall be cleaned and dried out if required and/or needed.

D. Prior to applying voltage to any apparatus or circuit, make insulation resistance tests and, if necessary, dry the apparatus until resistance values conform to the standards of IEEE.

E. In drying out, methods will be such that the insulation temperature of the apparatus does not exceed 90°C.

F. In case of a low resistance circuit insulation, eliminate the problem before the circuit is energized.

G. Make a recheck after apparatus is dry.

H. A record of all insulation values shall be properly recorded and furnished to the Engineer for review.

I. Prior to the start of check out and testing, insure that all equipment is properly and permanently identified according to Section 16010.

J. Before energizing any electrical equipment or apparatus, check and verify that no tools, filings, foreign matter or other materials is left inside equipment or enclosures. Particular attention shall be given to bus conductors, conductors, terminal blocks and windings. All screw and bolt connections and terminal connections shall be checked for tightness prior to final tests and energization. During the checkout and startup period, provide sufficient personnel to aid with the start-up of all electrical equipment, to remove any faults, and to make the necessary adjustments for the proper operation of electrical equipment and installation, including sufficient personnel to aid the operating personnel in their checkout of the electrical equipment and service.

K. Check the bearings of all rotating electrical apparatus and, if required, have supplier fill with the grease or oil as recommended by the manufacturers.

L. A 1000 volt "megger" insulation test shall be available at all times during the testing of power feeders and motor wiring.

M. Motors and motor feeder wires shall be "meggered" from the starters prior to energizing and at the time of final checkout. All power feeders shall be meggered prior to energizing conductors. Submit written results of all megger tests to engineer for approval. Any deficiencies shall be corrected and retested until

satisfactory test results are obtained. Refer to Specification 16050, paragraph 3.2, "Tests", for further information.

N. Three phase motors shall be checked for rotation and, if necessary, reverse the connections at the starter. Single phase and DC motors at motor connection box.

O. All main plant building loops and major equipment grounds shall be tested to remote earth or directly referenced to an extremely low resistance (approximately 1 ohm) reference ground bench mark. Ground testing results shall be properly recorded, witnessed, and reported to the Engineer. Tests shall be made with ground testing ohm meter or "megger" approved by the Engineer for the purpose.

P. The ground resistance of the individual networks shall be measured at two points with the cables at all the test points disconnected.

Q. The cables shall then be reconnected at the test points and a duplicate set of ground resistance measurements shall be made.

R. The entire grounding network resistance to be meggered and certified results provided. Resistance shall not exceed 25 ohms. Drive additional ground rods if necessary.

S. All control circuits shall be functionally checked to see that their operation and sequence are correct. Any adjustable switches such as float switches, limit switches and timers shall be adjusted for proper operation.

T. Maintain written and properly witnessed test and check-out reports and submit these to the Engineer for Owner prior to final acceptance of facilities. The written detailed documentation for all checkout and testing shall be provided to the Engineer prior to the Engineer's Substantial Completion review.

U. Just prior to acceptance of the lighting facilities, clean all lighting fixtures and relamp where required at no additional cost to the Owner.

V. All electrical equipment, wiring, switches and insulators found to be defective or to have failed due to poor workmanship shall be replaced promptly at no additional cost to the Owner.

W. The Contractor shall provide load readings for all equipment, switchgear, motor control centers and panelboards.

X. Panelboard line currents shall be balanced within 10%.

Y. The contractor shall maintain a complete marked up drawing set and all written documentation of all changes at the job site. These documents shall be made available to the Engineer at all times.

END OF SECTION