SECTION 16030 - ELECTRICAL TESTS

City of San Diego, CWP Guidelines

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

A. The WORK of this Section includes testing, commissioning and demonstrating electrical WORK.

B The WORK of this Section includes circuit activation, equipment running and installation of temporary jumpers.

C The WORK of this Section includes correction of defects and retesting.

1.2 RELATED SECTIONS

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 01660 Equipment Testing and Plant Startup
2. Section 13300 Instrumentation and Control
3. Section 16050 Electrical Materials and Methods

1.3 CODES

A The WORK of this Section shall comply with the current editions, with revisions, of the following codes and City of San Diego Supplements:

1. National Electrical Code

1.4 SPECIFICATIONS AND STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

1. NETA National Electrical Testing Association, Section 16T: Electrical Acceptance Tests

1.5 SEQUENCE AND SCHEDULING

A. Electrical testing including functional testing of power and controls not tested under Section 13300 shall be completed before commencement of the 7-day test indicated in Section 01660.

1.6 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted in compliance with Section 01300:

1. Report of testing of electrical WORK.

[1.7 MODIFICATIONS TO NETA TEST REQUIREMENTS

A. The following modifications to NETA test requirements apply to the WORK of this Section:

1. The requirements of 16T, part 1, paragraph 1.1 shall be deleted.

2. The requirements of 16T, part 1, paragraph 1.2 shall be changed to read as follows: "The CONTRACTOR shall engage the services of a. . .".

3. The requirements of 16T, part 4, paragraph 4.4 shall be changed to read as follows: "The CONTRACTOR shall supply. . .".

4. The requirements of 16T, part 4, paragraph 4.6 shall be changed to read as follows: "The CONTRACTOR shall notify the [CONSTRUCTION MANAGER] [ ] days prior to commencement of any testing."

5. The requirements of 16T, part 5, paragraph 5.22 shall be changed to read as follows: "Furnish 12 copies of the complete report to the [CONSTRUCTION MANAGER] no later than 30 days after completion of the project."

6. The requirements of 16T, part 6 shall be replaced with the following: "The work shall include the inspection and testing of all electrical devices, equipment and materials provided by the CONTRACTOR."

7. The requirements of 16T, part 7 shall be deleted and replaced with the following: "The CONTRACTOR shall engage an independent testing firm for the purpose of inspecting, setting, testing, and calibrating the protective relays, circuit breakers, fuses and other applicable devices in accordance with Section [ ]. The testing firm shall strictly conform to the requirements of these testing specifications."

8. The requirements of 16T, part 9 shall be deleted.]

PART 2 -- PRODUCTS

2.1 TEST EQUIPMENT AND MATERIALS

A. Test instruments shall be calibrated to references traceable to the National Bureau of Standards and shall have a current sticker showing date of calibration, deviation from standard, name of calibration laboratory and technician, and date recalibration is required.

PART 3 -- EXECUTION

3.1 TESTING

A. In addition to indicated testing requirements and acceptance criteria, testing shall include the following:

1. Lighting: Switching, including remote control. Circuitry in accordance with panel schedules. Lighting fixtures located to minimize obstruction of illumination by mechanical equipment or building structural elements.

2. Power Instrumentation: Demonstration that voltmeter and ammeter switches are functional and that meters, including kilowatt meters, are installed within catalog accuracy.

3. Demonstration of mechanical and electrical interlocking by attempting to subvert the indicated sequence.

4. Activation of ground fault tripping by operating test features provided with ground current protective systems and by injecting a known, and reasonable, current in the ground current sensor circuit. Where not otherwise indicated, ground fault tripping shall occur at a ground current equivalent to 20 percent of phase current. Current injection is not required of circuit 400 amperes or less.

5. Cable Testing: 480-volt circuits shall be tested for insulation resistance with a 1000-volt megohm meter. Testing shall be done after the 480-volt equipment is terminated. Phase-to-phase A-B, B-C, A-C and phase-to-ground insulation resistance tests shall be performed on each 5 kv, 15 kv, and 25 kv cable prior to termination at equipment but subsequent to stress cone makeup. Test results shall be submitted for review 30 days prior to plant operation and any system testing. Equipment which may be damaged during this test shall be disconnected. Tests shall be performed with other equipment connected to the circuit. The cable must withstand the test high voltage without breakdown, and shall exhibit steady or decreasing leakage current during the high potential test, and have satisfactory comparable megger readings in each megger test. Test results shall identify equipment used and time of test. Cable operating at more than 2,000 volts shall be tested in accordance with ICEA publications S-68-61, S-61-402, S-19-81, and S-68-516. Cable testing and reporting shall be performed by an organization recommended by the Manufacturer of the cable to be tested. The testing organization shall have a record of at least one prior successful project of comparable size and complexity. Testing shall verify the quality of cable terminations. Test results for medium and high voltage cable shall be submitted to the CONSTRUCTION MANAGER 30 days prior to the time schedule for equipment energization.

6. Test ground interrupter (GFI) receptacles and circuit breakers for proper operation by methods recommended by the receptacle Manufacturer.

7. Functional test and testing of electrical components shall be performed prior to subsystem testing and commissioning. Compartments and equipment shall

be cleaned before commencement of functional testing. Functional testing shall include:

Visual and physical check of cables, busswork, circuit breakers, transformers, and connections associated with new and modified equipment.

Setting of protective relays in conformance with results of the Short Circuit Study and testing of relays to assure that relays will trip at the current value and time required by the Study.

Circuit breakers which are specified with adjustable time or pick-up settings for ground current, instantaneous overcurrent, short-time overcurrent, or long-time overcurrent, shall be field adjusted by a representative of the circuit breaker Manufacturer. Time and pickup setting shall correspond to the recommendations of the Short Circuit Study. Setting shall be tabulated and proven for each circuit breaker in its installed position; test results shall be certified and [ ] [7] copies shall be submitted to the CONSTRUCTION MANAGER.

8. Complete ground testing of all grounding electrodes prior to operating the equipment [utilizing a three-point ground test].

B. Subsystem testing shall occur after the proper operation of alarm and status contacts has been demonstrated to the CONSTRUCTION MANAGER and after process control devices have been adjusted. The WORK of this Section includes adjusting limit switches and level switches prior to testing and setting pressure switches, flow switches, and timing relays.

C. After initial settings have been completed, each subsystem shall be operated in the manual mode. Once the manual mode of operation has been proven, automatic operation shall be demonstrated to verify proper start and stop sequence of pumps, proper operation of valves, proper speed control, and similar parameters.

D. Motor operated valves shall be tested after having been phased and tested for correct motor rotation and after travel and torque limit switches have been adjusted by a representative of the valve manufacturer. Tests shall verify status indication, proper valve travel, and correct command control from local and remote devices.

E. Ground resistance tests shall be conducted in the presence of the CONSTRUCTION MANAGER utilizing ground resistance megger "Earth" tester with a maximum of 0-50 scale. Tests shall be conducted utilizing the full of potential method or the three terminal method as described by Biddle or Neta.

F. Subsystems, in the context discussed here, mean individual and groups of pumps, conveyor systems, chemical feeders, air conditioning units, ventilation fans, air compressors, and similar equipment.

3.2 COMMISSIONING

A. Commissioning during the 7-day test as indicated in Section 01660 shall not be attempted until all subsystems have been found to operate satisfactorily; commissioning shall only be attempted as a function of normal plant operation in which plant process flows and levels are routine and equipment operates automatically in response to flow and level parameters or computer command, as applicable. Simulation of process parameters shall be considered only upon receipt of a written request by the CONTRACTOR.

** END OF SECTION **