

**PART 1 GENERAL****1.1 SUMMARY**

- .1 This Section includes general requirements relating to commissioning of the project's components and systems, specifying general requirements to performance verification of components, equipment, sub-systems, systems, and integrated systems.
- .2 Functional and Performance Testing shall be carried out upon completion of construction. Start-up of the system and the Start-up Test Period shall occur in Spring 2014 after opening of the campground for the 2014 season.

**1.2 DEFINITIONS**

- .1 System: The overall process, or a portion thereof, that performs a specific function. A system may consist of two or more subsystems as well as two or more types of equipment.
- .2 Functional Test: A test or tests in the presence of the Departmental Representative to demonstrate that the installed equipment or system meets manufacturer's installation and adjustment requirements and other requirements specified, including, but not limited to, noise, vibration, alignment, speed, proper electrical and mechanical connections, thrust restraint, proper rotation, and initial servicing.
- .3 Performance Test: A test performed in the presence of the Departmental Representative and after any required functional test specified, to demonstrate and confirm that the equipment and/or system meet the specified performance requirements.
- .4 Start-up Test Period:
  - .1 Start-up of the entire facility or any portion thereof includes coordinating operation of the facilities by the Contractor, Subcontractors, facility operating personnel, and manufacturer's representatives for equipment items and systems after all required functional and performance tests have been completed.
  - .2 Start-up of the entire facility or any portion thereof shall be considered complete when, in the opinion of the Departmental Representative, the facility or designated portion has operated in the manner intended for 168 hours without significant interruption. This period is in addition to any training, functional or performance test periods specified elsewhere. A significant interruption will require the start-up then in progress to be stopped and restarted after corrections are made.
  - .3 Complete start-up is a prerequisite to achieving substantial performance.
- .5 Operation Period: The operation period begins when the facility has been successfully started up as defined under Start-up Test Period and has met all substantial performance requirements.
- .6 Significant Interruption: May include any of the following events:
  - .1 Failure of Contractor to maintain qualified on-site start-up personnel as scheduled.
  - .2 Failure to meet specified performance for more than 24 consecutive hours.

- .3 Failure of any critical equipment unit, system, or subsystem that is not satisfactorily corrected within 5 hours after failure.
- .4 Failure of non-critical unit, system or subsystem that is not satisfactorily corrected within 24 hours after failure.
- .5 As may be determined by the Departmental Representative.

### **1.3 SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Request in writing to the Departmental Representative for changes to submittals and obtain written approval at least 8 weeks prior to start of Commissioning.
  - .2 Submit proposed Commissioning procedures to the Departmental Representative where not specified and obtain written approval at least 4 weeks prior to start of Commissioning.
  - .3 Provide additional documentation relating to Commissioning process as required by the Departmental Representative.

### **1.4 CONTRACTOR TESTING AND START-UP RESPONSIBILITIES**

- .1 General
  - .1 Perform all Work for functional and performance tests specified.
  - .2 Demonstrate proper function of all equipment, systems, and control devices.
  - .3 Complete all Work associated with the unit and related processes before testing, including related manufacturer's representative services.
  - .4 Provide all related operating and maintenance manuals, and spare parts and special tools as specified before testing any unit or system.
  - .5 Furnish qualified manufacturer's representatives when required to assist in testing. A representative of the packaged lift station manufacturer will be required for testing and start-up.
  - .6 Utilize the Manufacturer's Certificate of Proper Installation Form, supplemented as necessary, to document all functional and performance procedures, results, problems, and conclusions.
  - .7 Prepare testing plan and schedule and attend pretest (functional and performance) meetings related to test schedule, plan of test, materials, chemicals, and liquids required, facilities' operations interface, and Departmental Representative involvement.
  - .8 Designate and provide one or more persons to be responsible for coordinating and expediting Contractor's testing and start-up duties. The person or persons shall be present during all testing and pre startup meetings and shall be available at all times during the start-up period.
  - .9 Provide water, if required, for functional/performance testing.
- .2 Start-up Test Period:
  - .1 As applicable to the equipment furnished, state in writing that all necessary hydraulic structures, piping systems, and valves have been successfully tested; that all necessary equipment systems and subsystem have been checked for proper installation, started and successfully tested to indicate that they are all operational;

- that the systems and subsystems are capable of performing their intended functions; and that the facilities are ready for start-up and intended operation.
  - .2 Provide all water, power, chemicals, equipment, piping, and other items as required for testing, unless otherwise indicated.
  - .3 Prepare start-up plan and schedule in cooperation with the Departmental Representative. Attend prestart-up planning meetings and arrange for attendants by key major equipment manufacturer representatives as required by the Contract Documents.
  - .4 Designate and provide one or more persons to be responsible for coordinating and expediting Contractor's start-up duties.
  - .5 Make adjustments, repairs, and corrections necessary to complete plant start-up.
  - .6 Provide sampling labour and materials as required and provide laboratory analyses.
  - .7 After the station is operating, complete the testing of those items of equipment, systems, and subsystems, which could not be or were not adequately or successfully tested prior to station start-up.
- .3 Testing preparation:
- .1 Temporary Facilities: Provide all temporary valves, gauges, piping, and other materials and equipment required to conduct testing.
  - .2 Ready-to-test determination will be by the Departmental Representative based at least on the following:
    - .1 Notification by Contractor of equipment and system readiness for testing.
    - .2 Acceptable testing plan.
    - .3 Adequate completion of Work adjacent to, or interfacing with, equipment to be tested.
    - .4 Availability and acceptability of manufacturer's representative, when specified, to assist in testing of respective equipment.
    - .5 Control devices have been tested for function and operation over design range.
    - .6 Equipment and electrical tagging complete.
    - .7 All spare parts and tools on hand.
- .4 Functional testing:
- .1 Begin testing at a time mutually agreed upon by the Departmental Representative and Contractor.
  - .2 Notify, in writing, the Departmental Representative at least 7 days prior to scheduled date of functional tests.
  - .3 Separate items of equipment demonstrated to function properly during subsystem testing might require no further functional test if documentation of subsystem testing is acceptable to the Departmental Representative.
  - .4 Conduct functional test until each individual component item or system has achieved 1 continuous hour of satisfactory operation. Demonstrate all operational features and controls during this period while in automatic modes.
  - .5 If, in the Departmental Representative's opinion, each system meets the functional requirements specified, such system will be accepted as conforming for purposes of advancing to performance testing phase, if required. If, in the Departmental

- Representative's opinion, functional test results do not meet requirements specified, the systems will be considered as nonconforming.
- .6 Performance testing shall not commence until the equipment or system meets functional tests specified.
  - .7 Document test on the manufacturer's certificate of proper installation form.
- .5 Performance testing:
- .1 Begin testing at a time mutually agreed upon by the Departmental Representative and Contractor, as appropriate.
    - .1 The Departmental Representative will be present during test.
    - .2 Notify the Departmental Representative at least 7 days prior to scheduled date of test.
  - .2 Follow approved testing plan and detailed procedures specified.
  - .3 Source and type of fluid, gas, or solid for testing shall be as specified.
  - .4 Unless otherwise indicated, provide all labour, materials, and supplies for conducting the test and taking all samples and performance measurements.
  - .5 Prepare performance test report summarizing test method. Include test logs, pertinent calculations, and obtain manufacturer's certification of performance when specified.
- .6 Acceptance:
- .1 The Departmental Representative will accept equipment and systems as having achieved Substantial Performance and ready for continuous operation only after successful testing and start-up is completed and documented, test and start-up reports are submitted, and manufacturer's services completed for training of facility operating personnel.

**END OF SECTION**