# PART 1. GEneral

## Scope

### The instrument and equipment testing confirms in detail that the field instruments and other equipment are supplied and installed in accordance with the Contract Documents. Testing includes:

#### Confirmation that the units have been correctly installed.

#### Confirmation that the units have been correctly calibrated.

#### Confirmation that all discrete and analog signals (both new and existing) to be transmitted to and from the units are available and functioning correctly.

#### Verification that the units are capable of working as specified.

#### Verification that all panel Fat deficiencies have been completed.

#### Complete plant PAC panel I/O check to verify field wiring from field device to PAC I/O.

#### Complete vendor PLC panel I/O check to verify field wiring from field device to PAC I/O.

#### Verification that all interlocks are functioning as intended and in the correct mode of operation.

#### Acceptance of work done by the Contractor.

### The instrument and equipment testing is to be conducted / witnessed by the facility Start Up Team consisting of the Consultant, the Region’s System Integrator, Region PCS Group and Region Operations Group and instrument suppliers as required.

### The Start Up Team consisting of the Consultant, the Region’s System Integrator, Region PCS Group and Region Operations Group will jointly develop the SAT & Start Up Plan at the pre-construction meeting. The Consultant will be responsible for developing and issuing the high level SAT and Start Up Plan based on the pre-construction meeting discussions.

### The Start Up Team is to review the SAT & Start Up Plan and revise, if necessary, at a pre-equipment and instrument testing meeting. The Contractor will be responsible for expanding and providing details for the SAT & Start Up Plan to clearly identify the proposed test procedure.

### Where it is identified that the requirements of the Contract have not been met, the Contractor shall rectify all deficiencies immediately to allow re-testing during the same test phase.

### Testing will be deemed complete when all features, functions and information required in the Contract Documents have been verified as present and functioning, and documented as accurate within the anticipated operating range for the process being monitored.

### Region PCS Scope:

#### Region PCS will ensure computer servers/workstations are provided to System Integrator for installation of software provided under the contract.

#### Region PCS will ensure network switches are programmed/configured. The Contractor will be required to supply and/or install switches as specified in the contract.

## Related Sections

### Section 01810A – Equipment Testing and Facility Commissioning

## Submittals

### Submit the following documents prior to conducting the Instrument Acceptance Testing:

#### Calibration Procedure(s) to be followed in the test. The calibration method and tools will not cause greater than +/- 0.5% error in any test;

#### Any special Procedure(s) to be followed in the test;

#### Identify site verification, set-up and calibration to be done by the equipment manufacturers.

### Document test results using the forms in Section 01810A – Equipment Testing and Facility Commissioning.

### Update shop drawings, Instrument Data Sheets, calibration reports and “As Built” drawings including: P&ID, control schematics and electrical drawings as required to match field conditions.

## Measurement and Payment

.1 All costs associated with the work of this Section shall be included in the price for Item No. A13.08 in the Bid Form.

## Testing Schedule

### Submit testing procedures and schedules of work no less than one (1) month prior to the projected test date for the individual component. This will include specific dates for when the various test procedures are to be carried out and identified assistance from Region’s staff.

### Review of the PAC panel on site to ensure that all panel FAT deficiencies have been corrected is to be completed prior to any filed wiring being completed. This review is to be coordinate with the Consultant and the sing off sheet completed.

### The Contractor is to conduct their own I/O check and instrument and equipment verification. Contractor completed and signed off I/O Checksheets and instrument and equipment verification sheets are to be completed and submitted to the Consultant for review.

### Contractor I/O check is not to be completed until no less that 90% of all I/O is wired to each PAC.

### The Consultant may, at their discretion, choose to witness a subsequent I/O check and instrument and equipment verification with the Contractor. Contractor and all required sub contractors will participate as required.

### Contractor/Consultant completed and signed off I/O Checksheets and Equipment/Instrument verification sheets are to be submitted to the Region for review minimum two (2) weeks prior to scheduling the Region to witness their I/O check and instrument and equipment verification.

### Following the Contractor’s own I/O check and instrument and equipment verification and the Consultant review, the Region is to witness an I/O check and instrument and equipment verification with the Contractor and Consultant. Contractor and all required sub contractors will participate as required.

### In some cases, testing may be scheduled outside normal business hours to accommodate operating issues and/or low flow conditions.

### Testing may be interrupted by the Region’s staff for emergency process operation.

### Submit test results to the Contract Administrator at the end of each day of testing. Final test reports are to be accepted ad signed off by the Consultant, the Region’s System Integrator and Region PCS Group.

# PRODUCTS (not used)

# EXECUTION

## General

### Contractor is to coordinate between the Region, Consultant and equipment suppliers to provide necessary support during the FAT, SAT and commissioning.

### Provide qualified electrician and/or instrument technician with a minimum 5 years experience to assist in testing and quickly repairing minor deficiencies for re-testing in the same test phase.

### Have the following documents on hand prior to conducting Instrument and Equipment Acceptance Testing:

#### Reviewed shop drawings, including data sheets, for each instrument installed (multiple copies for multiple installations);

#### “For Construction” P&IDs, process narratives, control schematics and electrical drawings;

#### Configuration and calibration certificates from the manufacturer(s) for each calibrated instrument, where specified in the Contract Documents;

#### PAC panel FAT report identifying deficiencies identified during the panel FAT process.

#### Results of factory performance tests, where specified in the Contract Documents;

#### Instrument field calibration reports, where specified in the Contract Documents;

### Inspect and document that each instrument/equipment matches the reviewed shop drawing. The inspection shall include, but not be limited to the following (as applicable):

#### Verifying that instrument product details match shop drawings and Contract Documents, (including Instrument Data Sheets);

#### Confirming soundness of instrument, i.e. without damaged parts;

#### Confirming completeness in all respects as specified for instrumentation;

#### Confirming correctness of setting, alignment, and relative arrangement;

#### Confirm that all PAC panel FAT deficiencies have been corrected.

#### Inspecting power, signal, and grounding wiring identified on the control schematics and documenting the results. All wiring to be verified for continuity.

## I/O Loop Check

### I/O loop check is to be performed for the complete loop where possible by exercising the field device and monitoring the input at the PAC. Some I/O loops may be confirmed during the instrument and equipment calibration and testing when approved by the Consultant.

### Where an instrument loop cannot be checked with the instrument functioning, a current generator shall be used to verify the continuity of the analog loop.

### Where a digital loop cannot be checked with the field device, jumpering is permitted to verify the continuity of the digital loop.

### PAC output loops shall be verified by forcing the corresponding output from PAC program.

### I/O loop check is accepted and signed off when all I/O points pass lop checks.

### Use 01810A Equipment Testing and Commissioning Forms, 01810A-23 Pre-SAT Analog I/O Loop Check and 01810A-24 Pre-SAT Digital I/O Loop Check to document test results. Electronic copies will be provided.

## Instrument Acceptance

### Devices are also to be tested for their repeatability, accuracy and operation by varying the process and simultaneously measuring and recording the information displayed by:

#### An independent measuring instrument;

#### The local transmitter indicator;

#### All remote digital/mechanical indicators;

#### The 4-20mA (or digital value) measured at terminal blocks in PAC panels and operator panels.

### Compare test results against the instrument calibration reports and planned PAC analog input range. As an example, flow sensors will require testing using a “draw and fill” test of a local container.

### Where no field calibration has been done, perform a calibration test. Go up, down, then back up the instrument range, testing at five (5) points each time: 0%, 25%, 50%, 75% and 100%.

### The instrument switches, such as pressure switches or building flood alarms, are to be tested for their accuracy and operation by varying the process conditions (for example: high then low pressure) and simultaneously measuring and recording the information displayed by:

#### An independent measuring instrument;

#### The instrument switch;

#### All remote lights and indicators;

#### The digital input status measured at both the RPU and operator panels’ terminal blocks.

### Test results are to be compared against the instrument calibration/setting reports and planned PAC discrete input setting.

### Verify that all instrument/equipment interlocks function as intended.

### ISO calibration labels to be applied to instrument following successful calibration and testing.

## Testing Tools and Equipment

### Protect instruments and equipment that may be damaged by testing. If damages occur, the respective parties shall be fully responsible for replacement of damaged parts and/or components.

### Use calibration tools that will not cause greater than +/- 0.5% error in any test. The accuracy of the calibration tools must be traceable to Standards Council of Canada National Standard of Canada. The Contractor shall use electronic calibration equipment that will provide a form of electronic documentation, transferable in a standard spreadsheet format.

### Follow the applicable Region’s safety requirements. Provide the proper safety equipment for entering (manholes and other) confined spaces, and hazardous gas locations.

**END OF SECTION**