

PART 1. GENERAL

1.1 DESCRIPTION OF WORK

- .1 This Contractor is responsible for coordination with all other trades and for reviewing all other discipline's Contract Documents.
- .2 The Division 33 contractor shall remove the existing tank sensors and monitoring devices. The Division 25 Contractor shall remove controls wiring from these devices back to the existing TAC controllers as indicated.
- .3 The Controls Contractor shall supply and install new controllers, I/O modules, controls wiring, and auxiliary equipment to allow for the connection of three new aboveground oil tanks and equipment as indicated in the Contract Documents to the BMS.
- .4 Division 26 shall supply and install wiring from three new oil tank vacuum switches (supplied and installed by Division 33) to new remote tank monitors (supplied by Division 33 and installed by Division 26). Controls Contractor shall supply and install new controls wiring from the remote tank monitors to new controllers as indicated in the Contract Documents.
- .5 Supply and install wiring for three new oil tank radar level transmitters (supplied and installed by Division 33). Calibrate and program oil tank radar level transmitters as required.
- .6 Supply and install wiring for four flow meters (supplied and installed by Division 33). Calibrate and program flow meters as required.
- .7 Division 33 shall supply and install new aboveground double wall pipe leak monitoring system and cables. Controls Contractor shall supply and install controls wiring from the new system panel to the BMS for alarms as indicated.
- .8 Division 33 shall supply and install new transition sump leak detection system, sensors, and cables. Controls Contractor shall supply and install controls wiring from new system panel to the BMS for alarms as indicated.
- .9 Supply and install new alarm horn/strobes in the boiler plant and building exterior as indicated.

- .10 Supply and install new controls and control wiring for new tank field lighting (flood lights and lighting contactor by Electrical Contractor).
- .11 Division 33 shall supply and install new oil / water separator alarm system, sensor, and wiring. Controls Contractor shall supply and install controls wiring from new system panel to the BMS for alarms as indicated.
- .12 All new equipment shall be a direct extension of the existing LONWORKS FT-10 78kbps control network DDC system.
- .13 All new equipment and systems shall be fully compatible with all new and existing sensors, instrumentation, and monitoring equipment as indicated in the Contract Documents.
- .14 New graphics and programming of the existing system related to this project shall be by the existing controls service provider. This Contractor shall be responsible for acquiring these services and for carrying the associated costs under this Contract.

1.2 DETAILED DESCRIPTION OF WORK INCLUDED

- .1 Detailed control system design for the sequences and alarms as described using products of a standard of manufacture as specified herein. Detailed design shall include finalizing control product for materials involved and production of detailed wiring diagrams and location drawings for all connections required. The diagrams and drawings shall indicate the number and size of conductors required, and location/termination details to the numbered/lettered terminal strips or color coded wire leads involved. All device representation on the diagrams and location drawings shall be labeled as shown on the contract drawings.
- .2 Supply and installation of ancillary control device, relays, transformers, and miscellaneous control materials delivered to the site for installation by this trade or by others.
- .3 It shall be the responsibility of this Contractor to install, wire, program, and make fully operational, the connection of the devices indicated under this contract to the existing DDC system.
- .7 Necessary control, sensor, and monitoring device wiring shall be by this Contractor. Wiring shall be run in conduit or armoured cable as required. Voltage ratings requirements of

control wiring to be coordinated with Division 26. Armoured control cable shall be CSA rated for the environment in which it is installed.

- .8 This Contractor shall be responsible to supply and install conduit and cable from underground ducts or stub ups (by Division 26, reference Contract Drawings) to equipment and devices unless otherwise indicated. Boiler plant conduit shall be EMT, tank field conduit shall be galvanized steel in accordance with Section 26 05 34 - Conduit, Conduit Fastenings, and Conduit Fittings.
- .9 Spare 15A circuits in existing panels to be used for 120V feeds to control devices and panels. Coordinate with Division 26 for panel locations, wiring terminations, and labeling of panel circuits.
- .10 Alarms are to be dialed out to operation and maintenance personnel pagers as coordinated with Departmental Representative.
- .11 Existing application software shall be programmed as required by the existing controls service provider. This Contractor shall be responsible for acquiring these services and carrying the associated costs. Obtain contact information for current controls service provider from Departmental Representative.
- .12 The Owner shall be provided with copies of the source program and documentation necessary for the user to interpret it and make any changes necessary.
- .13 The existing Operator's Work Stations (OWS) linked to the control system shall be programmed by the existing controls service provider complete with graphics, input, output, and alarm screens for all control, sensors, and monitoring devices installed under this contract as per the contract documents. This Contractor shall be responsible for acquiring these services and carrying the associated costs.
- .14 All alarm outputs shall also be sent to the main EMCS post.

1.3 RELATED SECTIONS

- .1 Section 33 30 04 - Transition Sump Leak Detection System.

- .2 Section 33 30 05 - Aboveground Double Wall Pipe Leak Detection System.
- .3 Section 25 30 06 - Oil / Water Separator Alarm System.

1.4 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings:
 - .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit completed control diagrams and location drawings, indicating all device positions, equipment device model numbers, set points, and wiring layouts.
 - .3 Submit technical literature on new components and samples as requested.
 - .4 Submit drawing of controller layout and construction proposed.
- .3 Operation and Maintenance Data and Service:
 - .1 Provide complete operation and maintenance data and control diagrams for incorporation into manual.
 - .2 Provide a plasticized copy of the appropriate record control diagram at each control panel or cabinet location.
 - .3 In addition to warranty and training requirements specified elsewhere, provide a sequence and device performance check every three months during the first year of operation, from date of acceptance. Conduct such tests in the presence of the Owner's service staff and report in writing the results and any resetting made, for each system.

1.5 QUALITY ASSURANCE

- .1 Site Visit: Contractor to visit site and become familiar with the project and all conditions which may affect costs. Ignorance of existing conditions will not be considered as basis for extra claims.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

1.6 TESTING

- .1 This work shall include pre-delivery testing of major subsystems, field testing and adjustment of major subsystems and devices, and of the existing DDC system, and an on-site final operational acceptance test of the complete operational existing DDC system. Performance certification shall be provided by the Contractor.
- .2 Site testing will consist of four phases as detailed below:
 - .1 Phase 1 - Construction and Preliminary Commissioning:
 - .1 The Contractor shall properly install the proposed and approved equipment, check all points for continuity and proper connection, and calibrate all sensors and devices. An all points list shall be forwarded to the Departmental Representative for review prior to start-up for approval.
 - .2 Deficiencies which may inhibit monitoring or control of the systems shall be brought to the attention of the Departmental Representative.
 - .2 Phase 2 - Start-Up:
 - .1 The Owner's representative shall be present as each system is brought on line. The Contractor will be responsible for making this switch over, using his own forces.
 - .3 Phase 3 - Final Start-Up:
 - .1 Prior to inspection, the Contractor must submit completed Verification Reports.
 - .2 The Contractor's field technician, the Owner's representative, and the Departmental Representative shall be present during this phase.
 - .4 The Contractor will simulate power failure and verify proper operation and recovery of systems.
 - .3 Modem operation will be demonstrated if applicable.
 - .4 Verify all I/O points with regards to proper operation. The Departmental Representative will randomly inspect 50% of each point type for input/output response. Any failure will result in termination of inspection and future 100% inspections will be at the Contractor's cost.
 - .5 All deficiencies shall be noted during this phase, and the Contractor shall correct these deficiencies within 7 days.
 - .6 The Departmental Representative and Owner will require testing and verification of all point commissioning. The Contractor is to commit the

necessary resources, manpower, and devices to allow the Departmental Representative to complete commissioning.

.4 Phase 4 - Final Inspection:

.1 This phase shall consist of verifying to Departmental Representative that the deficiencies as outlined in phase three have been rectified. Any remaining deficiencies will be corrected in one week by the Contractor and costs for additional inspection shall be billed to the Contractor.

.3 Material and equipment to be CSA certified. Where CSA certified material and equipment is not available, the Contractor shall submit a certificate from a testing organization adequately equipped and competent to perform such services, and approved by the Contracting Officer, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard or code.

1.7 TRAINING

.1 Requirements for training as specified in Section 25 05 12 - Controls Training.

1.8 EXISTING CONDITIONS - CONTROL COMPONENTS

.1 Submit written request for permission to disconnect existing controls and to obtain equipment downtime before proceeding with Work.

.2 Assume responsibility for control, sensors, and monitoring devices to be incorporated into existing DDC system after written receipt of approval from the Departmental Representative.

.1 Be responsible for repair costs due to negligence or abuse of equipment.

.2 Responsibility for existing devices terminates upon final acceptance as approved by the Departmental Representative.

.3 Remove existing devices and wiring as indicated.

.4 Disconnect existing sensors and wiring and maintain for connection to new equipment as indicated.

PART 2. PRODUCTS

2.1 ACCEPTABLE MATERIAL

- .1 All new equipment shall be a direct extension of the existing LONWORKS FT-10 78kbps control network DDC system.
- .2 All new equipment and systems shall be fully compatible with all new and existing sensors, instrumentation, and monitoring equipment as indicated in the Contract Documents.

2.2 IDENTIFICATION

- .1 Provide labels to identify all new control panels and monitoring devices as follows:
 - .1 Nameplates: 3 mm thick plastic engraving sheet, black face, white core, lettering accurately aligned and engraved into core, permanently attached.
 - .2 Wording on nameplates to be approved by Departmental Representative prior to manufacture.

PART 3. Execution

3.1 INSTALLATION

- .1 Install products using factory trained journeymen certified by the Province of Nova Scotia. Provide all control devices located in existing control panel.
- .2 Install controls, sensors, and ancillary equipment where indicated. Where position is not shown, install in a position best suited for proper operation.
- .3 Submit to Departmental Representative controls and sensors installation details prior to installation.

3.2 COMMISSIONING

- .1 Controls, sensors, and monitoring devices to be properly set up and calibrated for sequences specified.
- .2 Put controls, sensors, and monitoring devices through specified sequences and verify correct operation on site. Make adjustments as required for proper operating condition. Allow

minimum additional two days for a competent technician involved in the project to fully demonstrate the sequences specified to the Departmental Representative.

3.3 GRAPHICS AND ALARMS

- .1 Provide a graphic for each new oil tank system at the operator work station (OWS) located in the boiler plant office (building A5). This graphic should import all the relevant real-time parameters, including:
 - .1 Tank #1 inventory level.
 - .2 Tank #2 inventory level.
 - .3 Tank #3 inventory level.
 - .4 New Pump #14 status.
 - .5 Existing Pump #11 status.
 - .6 Existing Pump #12 status.
 - .7 Existing Pump #13 status.
 - .8 Tank #1 supply oil flow meter line measurement.
 - .9 Tank #1 return oil flow meter line measurement.
 - .10 Tank #2 supply oil flow meter line measurement.
 - .11 Tank #2 return oil flow meter line measurement.
 - .12 Operator manual controls (on/off) for flood lighting.
 - .13 Operator adjustable controls (automatic timed setting) for flood lighting.
 - .14 All primary and secondary alarm states as indicated below.
- .2 Provide primary alarm notification consisting of graphical indications at the OWS, activation of boiler plant and exterior horn/strobes, and notification of the main EMCS post. Primary alarms to include:
 - .1 Tank #1 high level (alarm upon 90% capacity fill).
 - .2 Tank #2 high level (alarm upon 90% capacity fill).
 - .3 Tank #3 high level (alarm upon 90% capacity fill).
 - .4 Tank #1 low level (alarm upon 10% capacity fill).
 - .5 Tank #2 low level (alarm upon 10% capacity fill).
 - .6 Tank #3 low level (alarm upon 10% capacity fill).
 - .7 Tank #1 vacuum loss.
 - .8 Tank #2 vacuum loss.
 - .9 Tank #3 vacuum loss.

- .10 Transition Sump and basement leak sensor activation (alarm in from new sump leak detection system).
- .11 Aboveground double wall pipe leak detection (alarm in from new pipe leak monitoring system).
- .3 Provide secondary alarm notification consisting of graphical indications at the OWS and notification of the main EMCS post. Secondary alarms to include:
 - .1 Tank #1 midlevel indication (alarm upon 50% capacity fill).
 - .2 Tank #2 midlevel indication (alarm upon 50% capacity fill).
 - .3 Monthly inventory throughput loss of 1% or more.
 - .4 Three consecutive throughput losses greater than 200L/day.
 - .5 Pump #11 out of range amperage.
 - .6 Pump #12 out of range amperage.
 - .7 Pump #13 out of range amperage.
 - .8 Pump #14 out of range amperage.
 - .9 Tank #1 supply oil flow meter error indication.
 - .10 Tank #1 return oil flow meter error indication.
 - .11 Tank #2 supply oil flow meter error indication.
 - .12 Tank #2 return oil flow meter error indication.
 - .13 Tank #1 level meter error indication.
 - .14 Tank #2 level meter error indication.
 - .15 Tank #3 level meter error indication.
 - .16 Error indication from pipe leak monitoring system.
 - .17 Error indication from sump leak detection system.
 - .18 Oil / water separator sensor alarm from oil / water separator alarm system.

3.4 SEQUENCE OF OPERATIONS

- .1 Pumps 11 and 14 are to be run continuously. Alternate pumps on a weekly basis.
- .2 Pumps 12 and 13 are to be run continuously. Alternate pumps on a weekly basis.
- .3 Tank #1 and #2 switching sequence:

Upon the tank inventory dropping to the midlevel point (50% capacity fill), the associated pump set shall be stopped as to prohibit oil flow from the tank, and the midlevel alarm for that tank shall be indicated. The alternate pump set shall then be activated to allow oil to be provided by the other tank.

- .4 Floodlighting shall be automatically turned on and off at a predetermined daily "dusk to dawn" schedule. The operator shall be able to adjust this setting and to manually turn the floodlighting on and off through the OWS.

END OF SECTION

PART 1. GENERAL

1.1 SECTION INCLUDES

- .1 Requirements and procedures for training program, instructors, and training materials, for DDC Control System Work.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 25 05 01 - Common Work Results - Controls.

1.3 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit training proposal complete with hour-by-hour schedule including brief overview of content to Departmental Representative 30 days prior to the anticipated date of beginning of training. List name of trainer and type of A/V aids to be used.
- .3 Submit report within one week after completion of training program that training has been satisfactorily completed.

1.4 QUALITY ASSURANCE

- .1 Provide competent instructors thoroughly familiar with aspects of the new controls, systems, and the existing DDC system installed in the facility.
- .2 Departmental Representative reserves right to approve instructors.

1.5 INSTRUCTIONS

- .1 Provide instructions to designated personnel in adjustment, operation, maintenance and pertinent safety requirements of controls and systems installed.
- .2 Training to be project-specific.

1.6 TIME FOR INSTRUCTION

- .1 Two full 8-hour training sessions will be required for this project.

1.7 TRAINING MATERIALS

- .1 Provide equipment, visual and audio aids, and materials for classroom training.
- .2 Supply manual for each trainee, describing in detail data included in each training program. Review contents of manual in detail to explain aspects of operation and maintenance (O&M).

1.8 TRAINING PROGRAM

- .1 Program to begin at date and time mutually agreeable to Contractor and Departmental Representative.
- .2 Train O&M personnel in functional operations and procedures to be employed for systems operation.
- .3 Supplement with on-the-job training during 30 day test period.
- .4 Include overview of system architecture, communications, operation of OWS and peripherals, report generation.
- .5 Include detailed training on operator interface functions for control of mechanical systems, Control Description Logic (CDL's) for each system, and elementary preventive maintenance.
- .6 Equipment maintenance training: provide personnel with training in maintenance of controls equipment, including general equipment layout, trouble shooting, and preventive maintenance.

1.9 ADDITIONAL TRAINING

- .1 List courses offered by name, duration and approximate cost per person per week. Note courses recommended for training supervisory personnel.

1.10 MONITORING OF TRAINING

- .1 Departmental Representative to monitor training program and may modify schedule and content.

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Replacement of Petroleum		Page 3
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END OF SECTION