Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 00 10 – General Instructions.

.2 Section 33 56 13 – Aboveground Storage Tanks

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME)
- .1 ASME-B16.3-98, Malleable-Iron Threaded Fittings.
- .2 ASME-B16.9-2003, Factory-Made Wrought Steel Buttwelding Fittings.

.2 American Society for Testing and Materials International (ASTM)
- .1 ASTM A47/A47M-2004, Standard Specification for Ferritic Malleable Iron Castings.
- .2 ASTM A53/A53M-04a, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
- .3 ASTM B61-02, Standard Specification for Steam or Valve Bronze Castings.
- .4 ASTM B75M-99 (2005), Standard Specification for Seamless Copper Tube.

.3 Canadian Standards Association (CSA International)
- .1 CSA-B139-06, Installation Code for Oil Burning Equipment.
- .2 CSA-B140.0-03, Oil Burning Equipment: General Requirements.

.4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.5 Manufacturers Standardization Society of the Valve and Fitting Industry (MSS)
- .1 MSS-SP-80-2003, Bronze Gate, Globe, Angle and Check Valves.

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 00 10 – General Instructions

.2 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment.

.3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Instructions: submit manufacturer's installation instructions.

.6 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 00 10 – General Instructions.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 00 10 – General Instructions

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Place materials defined as hazardous or toxic in designated containers.

.4 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

Part 2 Products

2.1 UNDERGROUND PIPING SYSTEMS

.1 General

.1 All secondary containment piping system shall be an engineered and totally prefabricated pipe within a pie type containment system. Carrier pipe shall be protected from the exterior environment by the secondary containment. The system supplier shall have experience in the manufacture of secondary contained pipe systems. All straight sections, fittings and other accessories shall be factory prefabricated to job dimensions and designed to minimize number of field connections. Secondary containment joints completed at the factory shall be 100% air-tested. The system shall be manufactured to allow the placement of the leak detections cable in the secondary containment. The containment shall be drainable, dryable to and air pressure testable. Contractor fabricated system, whether built on site or off site, shall not be acceptable.

.2 The secondary containment shall not be exposed to pressures which exceed the maximum for the selected containment material. When product pipe design pressures exceed the maximum allowable pressure for the secondary containment, then either a control system activated by the leak detection alarm station relay or a pressure relief valve shall be utilized. When the leak detection/ location system is used, the normally energized alarm station relay shall be de-energized and break the control circuit which will deactivate the control relays for valves and / or pumps which supply pressure in the carrier pipe.

.3 All secondary containment systems shall be equipped with a leak detection system supplied by the manufacturer of the double containment system.

.4 Trained field representatives of the piping supplier shall provide technical field support during critical periods of installation including final check out of the leak detection system.

.5 The system shall be designed in accordance with the following conditions:

.1 Carrier pipe fluid temperature as per manufacturer’s recommendations.

.2 Carrier pipe pressure as per manufacturer’s recommendations.

.3 Containment pipe test pressure as per manufacturer’s recommendations.

.6 The secondary containment manufacturer shall supply a complete design submittal including layout drawings, leak detection routing, catalogue sheets, material data and pipe stress and end load calculations shall be stamped by a registered Professional Engineer.

.2 Fill and Carrier Pipe

.1 Fill and carrier pipe shall be constructed of flexible material that can be installed in single long runs without the necessity of regular joints either to extend the length of the line or change direction.

.2 Acceptable material in accordance with ULC 971:

.1 NPS 2 and under:

.1 Nylon 12 or,

.2 Filament-wound fiberglass reinforced with integral epoxy liner and exterior coating.

.2 NPS 2 ½ and over:

.1 Filament-wound fiberglass reinforced with integral epoxy liner and exterior coating.

.3 Secondary Containment

.1 The secondary containment shall be an integral part of the primary piping and in accordance with ULC 971. In all cases, the secondary containment piping will not serve as primary piping. The secondary piping shall be designed to channel leakage back to a sump or monitoring point, where it can be detected. The secondary pipe shall tightly fit around the primary pipe and contain small grooves parallel to the pipe axis to channel leakage to a point where it can be detected.

.2 Acceptable material in accordance with ULC 971:

.1 NPS 2 and under:

.1 Nylon 12

.2 Filament-wound fiberglass reinforced epoxy pipe.

.2 NPS 2 ½ and over:

.1 Filament-wound fiberglass reinforced epoxy pipe.

.4 Vent pipe

.1 Does not require secondary containment.

.2 Acceptable material

.1 Filament-wound fiberglass reinforced with integral epoxy liner and exterior coating.

.5 Adhesives.

.1 Designed to make a permanent bond in the primary or secondary containment system.

.2 In accordance with ULC 971 such as polysiloxane modified epoxy.

.3 To be used as required by pipe manufacturer.

2.2 TRANSITION SUMPS

.1 Type 1 – Two piece, top entry

.1 Transition sump constructed of non-corroding polyethylene.

.1 Below grade polyethylene sump

.1 609 mm x 965 mm x 762 mm (WxLxH)

.2 Above grade polyethylene cover

.1 Cover to be weather proof and lockable.

.2 762 mm x 1041 mm x 406 mm (WxLxH)

.3 A leak detection system shall be installed within transition sump.

.2 Type 2 – One piece, side entry

.1 Fiberglass transition sump with fiberglass top.

.2 609 mm x 1016 mm x 762 mm (WxLxH)

.3 A leak detection system shall be installed within transition sump.

.3 All secondary containment shall terminate within transition pit before entering the building.

.4 Flexible entry boots and all associated accessories are required to transition from underground piping to above ground steel piping.

2.3 ABOVEGROUND FUEL PIPING

.1 Shall include all pipe from the transition point of the secondary containment pipe and all pipe located inside the building.

.2 Steel: to ASTM A53/A53M, Schedule 40, continuous weld or electric resistance welded, screwed.

.3 All joints and connections shall be welded.

2.4 FLEXIBLE PIPING

.1 General

.1 Shall be of the same dimension as the piping, not the dimension of the connection to the equipment, with screwed joints on pipes of NPS 2 or less. Install where indicated.

.2 Piping NPS 2 and under:

.1 Flexible pipes made of brass mesh, screwed joints, designed to resist a minimum of 1035 kPa and resist fatigue stress of lateral movements of 13mm amplitude at 50 Hz.

2.5 STEEL PIPE COATING

.1 All exterior exposed piping is to be painted with a corrosion resistant bituminous paint.

2.6 JOINTING MATERIAL

.1 Screwed fittings: teflon tape or pulverized lead paste.

.2 Soldered fittings: silver solder.

2.7 FITTINGS

.1 Steel:

.1 Malleable iron: screwed, banded, Class 150 to ASME-B16.3.

.2 Welding: butt-welding to ASME-B16.9.

.3 Unions: malleable iron, brass to iron, ground seat, screwed, to ASTM A47/A47M.

.4 Nipples: Schedule 40, to ASTM A53/A53M.

.2 Copper:

.1 Piping: soldered type.

.2 Connections to equipment: compression.

2.8 GATE VALVES

.1 NPS 2 and under, screwed bonnet:

.1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body and trim.

.1 Steel Piping: Screwed joints.

.2 Copper piping: Soldered joints.

2.9 GLOBE VALVES

.1 NPS 3 and under, screwed:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body and trim, composition disc suitable for oil service, removable.

2.10 BALL VALVES

.1 NPS 2 and under:

.1 Bronze body, screwed ends, TFE seal, hard chrome ball, 4 MPa, WOG.

2.11 SWING CHECK VALVES

.1 NPS 2 and under, screwed:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat.

2.12 ANTI-SIPHON VALVE

.1 Furnish and install at the high point of the oil suction line a UL listed and labeled Anti-Siphon Valve. Valves that do not have an Underwriters Laboratory certification, listing and label shall not be acceptable. The valve shall automatically shut off the oil flow in the event of a broken or inadvertently left open oil suction line. In the event of a fire, to avoid thermal expansion induced valve failure the Anti-Siphon Valve body material must be bronze. Anti-Siphon Valves supplied with CAST IRON bodies or without a UL labels shall be removed and a UL certified bronze body valve will be installed at the contractor expense. The valve shall be sized to meet the flow and vertical pipe height requirements of the system.

2.13 FIRE VALVES

.1 Quick closing, spring loaded fire safety gas shut-off valve with fusible element which melts at 74º C allowing the valve to close tightly.

.2 Aluminum valve body and bonnet, zinc plated brass adapter, stainless steel stem.

.3 Maximum pressure differential: 34 kPa.

2.14 OIL-WATER SEPARATORS

.1 Die cast aluminum head and steel filter bowl assembly. Powder coated components with locking ring collar capable of operating at a design pressure of 1035 kPa. NPS 1 ½ inlet and outlet with a maximum flow rate of 1.58 L/s.

.2 Install with stop valves and pressure gauges on both sides.

.3 Provide spare filter cartridge.

2.15 FUEL COOLER

.1 Fuel coolers supplied with generators by Division 26.

2.16 AUTOMATIC FUEL OIL TRANSFER PUMP SET AND CONTROL CABINET CP-01, CP-02

.1 Supply two self-contained, automatic fuel oil transfer and monitoring systems to ensure a reliable supply of fuel oil to the emergency generators. The system shall include automatic pump set lead/lag, storage tank and day tank level monitoring, leak monitoring, LCD operator display, manual back-up stations, time and date stamped alarm and event summary, and the system shall include the capability to simultaneously communicate to a Building Automation System (BAS). The control system shall be a microprocessor-based design with field expandable plug-in Input/Output modules.

.2 The automatic fuel oil transfer pump and straining set shall be two positive displacement self-priming, direct driven from motor, mounted on carbon steel stand. Complete with mechanical seal, permanently sealed ball bearings, relief valve, pressure gauge on discharge, 25 mm duplex strainer, check valves on discharge of each pump and flanges allowing easy assembling and easy removal.

.3 Capacities:

.1 [P-01, P-02]

.1 Pumped fluid: No. 2 diesel fuel.

.2 Flow rate: 41.6 LPM 172 kPa of head.

.3 Motor: 1 hp, 600 V, 3 ph., 60Hz, explosion proof motor.

.4 Pump set and Control Cabinet

.1 The Pump Set and Control Cabinet shall be completely pre-wired and tested to ensure job site reliability. The pump set and control cabinet shall be the product of one manufacturer for single source responsibility. Provide a factory assembled steel enclosure with all operator interface control switches, indicators and displays physically separated from any field terminations. Manual Back-up control switches and indicators must be protected from unauthorized operation by a key lockable door with a viewing window.

.5 Control and Monitoring Hardware

.1 The control strategy shall be microprocessor-based. The controller shall be designed so that it will “fail safe” in the event there is a microprocessor failure. Control hardware shall include combination magnetic motor starters with overload protection and circuit breakers. Provide safety interlocks to shutdown both pumps during any of the following conditions: day tank “leak detected” and “high-high” day tank level. These interlocks must continue to ensure safe pump operation even if the controller has failed or is out of service and the pump set is operated in manual “hand” mode.

.6 Operator Interface

.1 The control system shall include a 16 line x 40 character or greater LCD display for pump set status, storage tank level indication, alarm listing, and trouble shooting functions. Provide a tactile feedback, numeric keypad for data entry. Provide dedicated pushbuttons for Alarm Silence and for the Home Page display and a “Hand-Off-Automatic” control switch for each fuel pump. In “Hand” position the pump shall be capable of manual operation in the event of a controller failure. The control system shall monitor the position of each “Hand-Off-Automatic” control switch. Should a switch be put into the “Off” position, the controller shall log the event with a Time/Date stamp and store within the controller memory. Provide an Elapsed Time Recorder (ETR) to measure running time for each pump. Provide a Fuel Oil Overview Display (Home Page) capable of simultaneous viewing of pump set status, day tank status and main storage tank status. The Fuel Oil Overview display shall include the following information:

.1 Lead Pump Selection – Auto/Manual

.2 Pump Status – Off/Run/Standby

.3 Day Tank Status – Normal/High/Low/Low-low

.4 Main Tank Status – Normal/High/Low/Low-low

.5 Three Most Recent Alarms

.7 Alarm and Event Logs

.1 The control system shall include a 200 Alarms, events and operator actions memory minimum. Provide an alarm display page for viewing the most recent 8 alarms/events with scrolling capability to view the complete 200 point alarm/event memory. Each event and alarm condition must be displayed with a distinct, descriptive, English language description and time and date stamp. New alarms shall trigger the common alarm output relay. Events shall be recorded, but shall not trigger an alarm. A dedicated Alarm Silence button shall silence the alarm output. The control system shall record and annunciate the following alarms:

.1 Pump Thermal Overload

.2 Pump Loss of Flow

.3 Pump Set Failure

.4 Day Tank High-High Level

.5 Day Tank High level

.6 Day Tank Low level.

.7 Day Tank Low-Low Level

.2 The control system shall record the following events:

.1 Pump Started

.2 Pump Control Switch in “Off” position

.3 Pump Set Prime Test OK

.4 Pump Selected as Lead.

.8 Day Tank Fuel Oil Supply Applications

.1 Provide automatic, microprocessor-based day tank level control. The lead fuel pump shall be energized when Day Tank oil level falls below 50%. The lead pump shall continue to operate until the day tank level is greater than 80%. Upon the next call for fuel, the lead pump shall be automatically alternated. The control system shall automatically energize the back-up pump upon detecting a low level condition (40% full condition). Both pumps shall then continue to operate until the level of oil reaches the high level point (90% full condition). Upon detection of loss of flow or lead pump thermal overload the control system shall automatically energize the backup pump and de-energize the lead pump.

.9 Automatic Pump Prime and Suction Line Integrity Check

.1 The control system shall include a battery backed, real time clock and must be capable of automatically energizing the lead pump once every day. This is to verify suction piping integrity and pump prime and verify pump operation. Once the lead pump has proven satisfactory operation, the lag pump shall be energized and run through the same test. These tests shall be recorded in the controller memory with a Time/Date stamp for later verification. If either lead or lag pump fails any of these tests, the control system shall generate an audible and visual alarm and log the “Failed Pump” condition.

.10 Main Storage Tank Monitoring

.1 The control system shall include main storage tank level sensor and discriminating leak sensor monitoring. Provide a continuous display of tank content, in both liters and mm of product, within the main storage tank. Tank alarm displays shall not interfere with the display of the tank content. Provide data recall of the instantaneous display of tank content at the time of leak alarm condition. The control system shall include an overfill alarm circuit test pushbutton to provide instantaneous proving of audible and visual alarm circuitry associated with instrument overfill alarm contact. The controller must be field expandable using plug-in input modules to monitor up to 2 storage tanks and 6 discriminating leak sensors. Provide all equipment capabilities specified in this paragraph even if a connecting level and leak sensors will not be used.

.11 Piping And Mounting

.1 Provide duplex pump and straining set that is factory assembled with components piped and mounted on a continuously welded steel plate containment basin with NPS 3 steel side rails. Provide a NPS ½ containment basin plugged drain connection. The basin shall be sized to contain potential leaks from all factory installed piping and components. Pipe shall be schedule 40 ASTM A-53 Grade “A” with ANSI B16.3 Class 150 malleable iron threaded fittings.

.12 Pump Isolation and Check Valves

.1 Provide and mount four (4) pump isolation valves. Locate one (1) valve on the suction and discharge side of each pump. Isolation valves will allow off-line pump maintenance without system loss of availability. Isolation valves shall be ball type valves to provide full flow while open and positive shutoff when closed. Additionally, two (2) check valves shall be provided and mounted, one (1) located on the discharge of each pump.

.13 Fuel Oil Strainer

.1 Provide and mount two (2) simplex strainers with 40 mesh baskets, one (1) located on the suction side of each pump.

.14 Relief Valves

.1 Provide and mount two (2) relief valves sized to relieve the full outlet flow of the pump without causing the pump motor to overload or any component’s pressure rating to be exceeded if the discharge is inadvertently valved off. Relief valves must be externally mounted from the pumps and piped to the return line in the field according to NFPA 30. Pump internal relief valves shall not be accepted.

.15 Compound And Pressure Gauges

.1 Provide and mount a compound gauge on the suction side of the strainer. The gauge shall read –100 kPa vacuum. Provide and mount a pressure gauge on the discharge side of each pump. Each gauge shall be quipped with an isolation ball valve.

.16 Pump Automatic Sequencing Flow Switch

.1 Provide a time delayed flow sensing switch on the discharge of the pump set to bring on the lag pump should the lead pump fail to maintain flow. Flow switch shall be vane operated to actuate a single double throw snap switch. Switch shall be factory wired to the control cabinet for alarm and backup pump operation. Switch shall be rated for 10 Mpa. Provide a flow switch outlet isolation valve for maintaining the flow switch without draining the fuel system.

.17 Communications

.1 The pump set must include an optically isolated communications data highway. The protocol shall allow: Auto/Manual mode change, lead pump selection, sensing and silencing of alarms, change of any configuration parameter, change of timers, etc.

.2 Provide all equipment capabilities specified in this paragraph, even if a connecting BAS system is not included in this project. It must be possible to field upgrade the control system to “dial out” to an alphanumeric pager system via field installable plug-in option modules in the future.

.18 Quality Assurance

.1 The Control Cabinet shall be manufactured and labeled in accordance with CSA C22.2 #14. The assembled control cabinet, as a whole, must be inspected for proper wiring methods, fusing, etc., and must be labeled as conforming to CSA C22.2.

.19 Factory Testing

.1 Pump Sets must be fully tested prior to shipment. Testing shall include both a pressure and vacuum testing period. First, the complete pump set shall be pressure tested to rated pressure using an air pressure source. The test shall confirm that the pump set piping system can maintain rated pressure for 4 hours. Next, the complete pump set shall be brought to a vacuum greater than 85 kPa. The test shall confirm that the pump set piping system can maintain vacuum for 4 hours. Following a pressure and vacuum test the pump set shall be given a full operational test. The pump set shall be connected to a fuel oil supply and return. The pump set shall be operated normally. Motor amps shall be noted at no load and full load for each motor. The motor amps shall be within 10% of rated motor amps. During the test the relief valve shall be set and tested. Operation of pump set instrumentation shall be tested. A copy of the test procedures shall be sent to the Departmental Representative.

.2 A certificate of factory testing, together with a copy of the wiring and arrangement diagrams shall be placed in the control cabinet prior to shipment.

2.17 LEAK DETECTION MONITORING PANEL MP-01

.1 Enhanced CPU processor to support multi-tank and multi-application systems with:

.1 0.1 GPH and 0.2 GPH In-Tank Leak Detection with Magnetostrictive Probes

.2 Electronic line leak detection capabilities

.3 Vapor and groundwater monitoring

.4 Continuous inventory monitoring

.5 Complete inventory reports before and after generator operation

.6 SiteFax auto-dial fax capability

.7 Programmable alarms

.8 Compatible Sensors

.9 Compatible Probes

.10 A complete line of standard leak sensors to monitor double wall tanks, containment sumps and wet and dry wells.

.2 All leak detection and fuel monitoring devices must be connected to this panel.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 PIPING

.1 Install oil-piping system in accordance with CSA-B139-06 and CSA-B140.0.

.2 Assemble piping using fittings to ANSI standards.

.3 Slope piping down in direction of storage tank unless otherwise indicated.

.4 Suction and return piping inside building:

- .1 Steel, with screwed fittings.
- .2 Install filter and gate valve as shown.

.5 Fill, vent outside building:

- .1 Steel piping welded throughout except at tanks where use electrically isolating fittings.
- .2 Grading: slope piping at 1 % minimum back to tanks.

3.3 VALVES

.1 Install valves with stems upright or horizontal unless approved otherwise by Departmental Representative.

3.4 OIL FILTERS

.1 Install as indicated.

.2 At time of acceptance, replace filter cartridge with new.

3.5 FUEL COOLERS

.1 Install and connect to fuel coolers in air stream of radiator fan.

3.6 OIL TRANSFER PUMPS

.1 Install as indicated.

.2 Install gate valves on inlet and discharge connections.

.3 Install pressure gauge at pump discharge.

.4 Install relief valve in pump discharge piping with relief valve discharge pipe to return line to tank.

3.7 OVERFILL AND SPILL PROTECTION

.1 Install a spill and catch basin as per authorities having jurisdiction.

3.8 CLEANING

.1 Flush after pressure test with number 2 fuel oil for a minimum of two hours. Clean strainers and filters.

.2 Dispose of fuel oil used for flushing out in accordance with requirements of authority having jurisdiction.

.3 Check vents from regulators, control valves are terminated in approved location and are protected against blockage and damage.

.4 Entire installation shall be inspected and approved by authority having jurisdiction.

.5 Perform cleaning operations in accordance with manufacturer's recommendations.

.6 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION