METROLINX

Fuel Oil System Specification

Specification 23 11 13

Revision 01

September 2025

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Metrolinx,

an Agency of the Government of Ontario

Amendment Record Sheet

Amendment in Clause No.	Date of Amendment	Description of Changes
1.9.1	September 2025	Updated paragraph to identify specific regulation shall be complied with for clarity.
1.9.3 a)	September 2025	Removed requirement for ISO certification qualification for manufacturers.
3.7.4	September 2025	Added to paragraph to include requirement for leakage test detection report referenced in Part 1.
3.13.1	September 2025	Clarified where oil retention pans shall be provided.

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1. GENERAL

1.1. SCOPE OF WORK

1.1.1. Provide diesel generator fuel oil systems as required, scheduled, and specified herein.

1.2. DESIGN REQUIREMENTS

1.2.1. Fuel oil system work shall be designed, installed, and tested in accordance with requirements of:

a) CAN/CSA B139, Installation Code for Oil Burning Equipment;

b) Technical Standards and Safety Authority (TSSA); and

c) Other authorities having jurisdiction, including and governing Provincial regulations.

1.3. RELATED WORKS

1.3.1. Section 20 05 05 - Mechanical Work General Instructions.

1.3.2. Section 20 05 10 - Basic Mechanical Materials and Methods.

1.3.3. Section 20 05 40 – Mechanical Work Commissioning.

1.3.4. Section 25 05 10 – BAS Performance Specification.

1.3.5. Electrical Divisions Specification Sections with respect to engine generator sets.

1.4. REFERENCE STANDARDS

1.4.1. Standards and codes shall be latest editions adopted by and enforced by local governing authorities.

1.4.2. Technical Standards and Safety Authority (TSSA).

1.4.3. CSA B139 Series Installation Code for Oil-Burning Equipment.

1.4.4. CSA C282, Emergency Electrical Power Supply for Buildings.

1.4.5. ULC/ORD C842, Guide for the Investigation of Valves for Flammable and Combustible Liquids.

1.4.6. CAN/ULC-S601, Standard for Shop Fabricated Steel Aboveground Tanks for Flammable and Combustible Liquids.

1.4.7. CAN/ULC-S602, Aboveground Steel Tanks for Fuel Oil and Lubricating Oil.

1.4.8. CAN/ULC-S661, Standard for Overfill Protection Devices for Flammable and Combustible Liquid Storage Tanks.

1.4.9. CAN/ULC-S663, Standard for Spill Containment Devices for Flammable and Combustible Liquid Aboveground Storage Tanks.

1.4.10. Government of Canada Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

1.5. TRAINING

1.5.1. Training shall be a full review of all components, including but not limited to a full operation and maintenance demonstration, with abnormal events.

1.5.2. Include for 6 training sessions of maximum 7 hours duration per session for 7 Metrolinx people per session.

1.5.3. Refer to Section 20 05 05 for additional general requirements.

1.6. WARRANTY

1.6.1. Products shall be guaranteed by manufacturer, for a minimum of 2 years after acceptance by Metrolinx.

1.6.2. Refer to requirements within Section to any extended warranties.

1.7. DELIVERY, STORAGE AND HANDLING.

1.7.1. Handle and store products in accordance with manufacturer's instructions, in locations approved by Metrolinx. Include one copy of these instructions with product at time of shipment.

1.8. SUBMITTALS

1.8.1. Refer to submittal requirements in Section 20 05 05.

1.8.2. Submit shop drawings/product data sheets for products specified in this Section, except aboveground piping and unions. Include an identified schematic piping diagram with shop drawing and product data sheet submission.

1.8.3. Submit motor product data and certified performance curves with pump shop drawings.

1.8.4. Submit Manufacturers Certificate of Compliance for material requirements of these specifications.

1.8.5. Submit factory test reports and certifications, including functional test reports for pumps, and test reports and results for control panels for proper operation, electrical connection, and function.

1.8.6. Submit a signed start-up and commissioning report from fuel oil pump set supplier certifying proper and correct installation of pump set, as specified in Part 3 of this Section.

1.8.7. Submit a signed leak detection system report as specified in Part 3 of this Section.

1.8.8. Submit, in name of Metrolinx, a signed copy of day tank manufacturer's standard limited minimum 30-year workmanship and material defect warranty.

1.8.9. Submit, in name of Metrolinx, a signed copy of storage tank manufacturer's standard limited minimum 30-year workmanship and material defect warranty.

1.8.10. Product Data

a) Submit product data sheets indicating:

1) Technical data, supplemented by bulletins, component illustrations, detailed views, technical descriptions of items, and parts lists;

2) Performance criteria, compliance with reference standards, characteristics, limitations, and troubleshooting protocol;

3) Product transportation, storage, handling, and installation requirements; and

4) Product identification in accordance with Metrolinx requirements.

1.8.11. Shop Drawings

a) Submit shop drawings for products indicating:

1) Capacity and ratings;

2) Mounting details to suit locations shown, indicating methods and hardware used; and

3) Control components and control wiring schematic.

1.8.12. Commissioning Package

a) Submit the following in accordance with Sections 20 05 05 and 20 05 40:

1) Commissioning Plan;

2) Commissioning Procedures;

3) Certificate of Readiness;

4) Complete test sheets specified in Section 20 05 40 and attach them to the Certificate of Readiness; and

5) Source Quality Control Inspection and test results, and attach to the Certificate of Readiness.

1.8.13. Commissioning Closeout Package

a) Submit the following in accordance with Section 20 05 05:

1) Deficiency Report;

2) Commissioning Closeout Report; and

3) Submit the following for each Product for incorporation into the Operation and Maintenance Manuals in accordance with Section 20 05 05:

i) Identification: manufacturer's name, type, year, serial number, number of units, capacity, and identification to related systems;

ii) Functional description detailing operation and control of components;

iii) Performance criteria and maintenance data;

iv) Safety precautions;

v) Operating instructions and precautions;

vi) Component parts availability, including names and addresses of spare part suppliers;

vii) Maintenance and troubleshooting guidelines/protocol;

viii) Product storage, preparation, handling, and installation requirements; and

ix) Commissioning Report.

1.9. QUALITY ASSURANCE

1.9.1. Fuel oil system work shall be performed by journeyman tradesmen licensed under Ontario Regulation .215/01 Fuel Industry Certificates.

1.9.2. Apply for, on TSSA forms, approval of fuel oil system design by TSSA prior to work beginning at site and prior to ordering any equipment. Submit completed TSSA Form and copies of shop drawings/product data sheets as required to TSSA and obtain an approval certificate. Include for TSSA review and approval process.

1.9.3. Manufacturers Qualifications

a) Manufacturer of product shall have produced similar product for a minimum period of thirty years. When requested by Consultant, an acceptable list of installations with similar product shall be provided demonstrating compliance with this requirement; and

b) Where manufacturers provide after installation onsite inspection of product installations, include for manufacturer's authorized representative to perform onsite inspection and certificate of approvals.

1.9.4. Installers Qualifications

a) All installation work shall be performed by a licensed Mechanical Contractor;

b) Installers of equipment, systems, and associated work shall be qualified and experienced installers of respective products and work in which they are installing; and

c) Where manufacturers provide training sessions to installers and certificates upon successful completion, installers to have obtained such certificates and submit copies with shop drawings.

1.9.5. Regulatory Requirements

a) Products and work to comply with applicable local governing authority regulations, bylaws, and directives; and

b) Include required inspections and certificate of approvals of installation work from local governing authorities.

2. PRODUCTS

2.1. PIPE, FITTINGS AND JOINTS

2.1.1. Franklin Fueling Systems APT XP SC-Serie, or approved equivalent, pipe, and fittings in accordance with following requirements:

a) Pipe and fittings shall be cUL listed for fuel being carried;

b) Flexible, secondary contained direct bury pipe with primary layer constructed of Nylon 12 and not containing polyethylene;

c) Swivel and non-swivel clamshell termination fittings constructed of solid brass, complete with grey iron clamps with blue powder coating; and

d) Swage termination fittings constructed of stainless steel, complete with a stainless-steel collar.

2.1.2. Black Steel - Screwed

a) Schedule 40 mild black carbon steel, ASTM A53, Grade B, complete with malleable cast iron Class 150 threaded fittings to ANSI B16.3, and screwed joints.

2.1.3. Galvanized Steel - Screwed

a) Schedule 40 carbon steel, ASTM A53, Grade B, galvanized, complete with galvanized malleable cast iron Class 150 threaded fittings to ANSI B16.3, and screwed joints.

2.2. PIPING UNIONS

2.2.1. Screwed Steel Piping

a) Malleable iron, ground joint, brass to iron or bronze to bronze seat screwed unions and union elbows with a minimum pressure rating of 1725 kPa (250 psi) steam at 260 °C (500 °F).

2.2.2. Welded Steel piping

a) Forged carbon steel slip-on type raised face welding flange unions to ASTM A105, 150 lb Class.

2.3. SHUT-OFF VALVES

2.3.1. CSA certified and either cUL or ULC listed to ULC/ORD C842, Class 600, 4140 kPa (600 psi) WOG-rated full-port ball valves, each complete with a forged brass or bronze body and cap, blowout-proof stem, solid forged brass chrome-plated ball, Teflon or PTFE seat, threaded ends, and removable lever handle.

2.3.2. Standard of accepted manufacturers are:

a) Morrison Bros. Co. Fig. 691 Series;

b) Jomar T-100NE Series;

c) Kitz Corp. Code 68M;

d) Apollo Valve #77F-100 Series; or

e) Approved equivalent.

2.4. SWING CHECK VALVES

2.4.1. Class 125, 1380 kPa (200 psi) WOG-rated horizontal swing check valves, each complete with a "Y" pattern bronze body, hinged brass disc, easy access screw-in cap, and screwed ends.

2.4.2. Standard of accepted manufacturers are:

a) Toyo Valve Co. Fig. 236;

b) Milwaukee Valve Co. #509T;

c) Kitz Corp. Code No. 22;

d) Morrison Bros. Fig. 246A; or

e) Approved equivalent.

2.5. VERTICAL LIFT CHECK VALVES

2.5.1. Class 150, 1380 kPa (200 psi) WOG-rated bronze vertical lift check valves, each complete with screwed ends and a bronze disc.

2.5.2. Standard of accepted manufacturers are:

a) Toyo Valve Co. Fig. 231;

b) Milwaukee Valve Co. #548T;

c) Kitz Corp. Code No. 36;

d) Apollo Valve #61-600; or

e) Approved equivalent.

2.6. DRAIN VALVES

2.6.1. Minimum 2070 kPa (300 psi) WOG-rated, 20 mm (¾") diameter straight pattern full port bronze ball valves, each complete with a threaded outlet suitable for coupling connection of 20 mm (¾") diameter hose, and a cap and chain.

2.6.2. Standard of accepted manufacturers are:

a) Toyo Valve Co. Ltd. Fig. 5046;

b) Dahl Brothers Canada Ltd. Fig. No. 50.430;

c) Kitz Corporation Code No. 58cc; or

D) Approved equivalent.

2.7. PRESSURE RELIEF VALVES

2.7.1. ASME tested, rated, and certified, bronze or cast-iron bronze fitted, 1725 kPa (250 psi) rated pressure relief valves, each capable of relieving full output of equipment it is associated with, and each factory set at 415 kPa (60 psi) unless otherwise specified.

2.7.2. Standard of accepted manufacturers are:

a) Xylem Bell & Gossett 3301/4100, or 790/1170;

b) Dresser Industries "CONSOLIDATED";

c) Spirax Sarco Ltd. SVI Series;

d) McDonnell & Miller Models 250 and 260;

e) Apollo Valve 10-600 Series; or

f) Approved equivalent.

2.8. PIPING BACK PRESSURE REGULATOR

2.8.1. Fisher (Emerson Process Management) Fig. No. 98L-32 or approved equivalent, 25 mm (1") diameter, suitable for use with #2 diesel fuel at 0.378 l/s (5 gpm), complete with a cast iron body, stainless steel trim, and 14 to 50 kPa (2 to 7.25 psi) spring range.

2.9. FUEL OIL FILTER

2.9.1. Cartridge type ULC listed and labelled fuel oil filter with cast iron tapped with threaded pipe connections to suit oil supply pipe sizes shown, screw-on steel bowl, and reusable Monel wire mesh element.

2.9.2. Standard of accepted manufacturers are:

a) General Filters Inc.;

b) Westwood Products;

c) Raycor Marine Series (UL); or

D) Approved equivalent.

2.10. FIRE VALVE

2.10.1. Morrison Bros. Co. Fig. 446 or approved equivalent, emergency shut-off and fire-safe valve, either cUL or ULC listed to ULC/ORD C842 for this application with 73°C (165°F) fusible link activating a spring closure, and constructed of Type 316 stainless steel body, Type 303 stainless steel for cap, shaft, tail fitting, poppet and nut, Type 304 stainless steel lever arm, 356-T6 aluminum handle, 17-7 stainless steel spring, and Viton O-ring and disc.

2.10.2. Standard of accepted manufacturers are:

a) Morrison Bros. Co. Fig 446 for 13 mm (1/2"), 19 mm (3/4") or 25 mm (1") female NPT threaded connections;

b) OPW Model 178S for 51 mm (2") female NPT threaded connections; or

c) Approved equivalent.

2.11. FLOW RELIEF VALVE

2.11.1. Fulflo "FVS" Series or approved equivalent, line-sized relief valve, selected by manufacturer for the intended application, capable of relieving full pump set capacity at 160 kPa (10') water pressure differential minimum and complete with cast steel body with threaded ends and stainless steel spring.

2.12. ANTI-SIPHON VALVE

2.12.1. ULC listed and labelled, adjustable, anti-siphon valve, able to function in vertical or horizontal position, with built-in thermal expansion relief valve, and suitable in all respects for fluid medium.

2.12.2. Standard of accepted manufacturers are:

a) Morrison Bros. Fig. 910;

b) Franklin Fueling Systems (EBW) Models 605, 606, 616 or 636; or

c) Approved equivalent.

2.13. DOUBLE-WALL DAY STORAGE TANK

2.13.1. Factory tested, ULC-listed and labelled full 360° double wall aboveground fuel oil storage tank manufactured in accordance with CAN/ULC S602, sized as indicated on drawings, and complete with:

a) Vacuum gauge and switch to monitor interstitial space between primary tank and secondary containment, with a remote audible/visual alarm and ability to interface with monitoring and leak detection system;

b) Primary tank with integral secondary containment constructed of carbon steel to either ASTM A635 or ASTM A659, blast cleaned and finished with epoxy coating, and capable of containing 100% of inner tank capacity;

c) Venting to requirements of ULC S602;

d) Factory-provided grounding lug; and

e) All required pipe connection tappings.

2.13.2. Standard of accepted manufacturers are:

a) Clemmer Steelcraft Technologies Inc.;

b) DTE Industries (2010) Limited; or

c) Approved equivalent.

2.14. DAY STORAGE TANK ACCESSORIES

2.14.1. Dover Corp./OPW Division or approved equivalent, caps as follows:

a) Fill cap - OPW #83 Series screw-on, standard, lockable fill cap unit; and

b) Vent cap - OPW #23 Series aluminum vent cap with 40-mesh wire screen.

2.14.2. Suction connection(s) double poppet angle check valve with top cap, and submerged suction drop tube.

2.14.3. CSA and cUL listed float type level alarm and control switch, Albany Model LEVCON series or approved equivalent, with stainless steel floats and explosion-proof housing. Switch to include set points for Low Level, Low-Low Level, High-Level, and High-High Level.

2.14.4. CSA and cUL listed single-point float-type alarm and control switch, Albany LEVCON series or approved equivalent, with stainless steel float and explosion-proof housing. Switch to signal Critical High Level and be configured in accordance with CSA B139 and TSSA.

2.15. ABOVEGROUND DOUBLE WALL STORAGE TANK

2.15.1. Aboveground, full 360° double wall storage tank, in accordance with drawing schedule and detail, and following minimum requirements:

a) Designed, tested, listed, and labelled as a vacuum-monitored double-wall aboveground tank, all in accordance with ULC S601;

b) Suitable for indoor use and designed for static head up to 25 m (82');

c) Primary tank and secondary containment constructed of carbon steel and blast cleaned with one coat primer and finish painted with one coat enamel;

d) Vacuum gauge and switch to monitor interstitial space between primary tank and secondary containment, with a remote audible/visual alarm and ability to interface with building automation system or leak detection system;

e) Venting in accordance with requirements of ULC S601 and UL 2583 certified;

f) Factory-installed vent for secondary containment in accordance with ULC S601;

g) Integral welded tank supports designed to support full load of tank and contents;

h) Factory-provided anchors to anchor tank to concrete pad, when required;

i) Factory-provided grounding lug; and

j) Galvanized steel stair and platform assembly with handrails, supplied loose.

2.15.2. Standard of accepted manufacturers are:

a) Steelcraft Inc. Clemmer Containment Division;

b) DTE Industries (2010) Limited; or

c) Approved equivalent.

2.16. ABOVEGROUND STORAGE TANK ACCESSORIES

2.16.1. ULC listed and labelled top fill spill container, Morrison Bros. Fig. 516, 19 l (5 US gal) or approved equivalent, with hinged and lockable cover, and powder-coated body and lid.

2.16.2. Suction connections double poppet angle check valve with top cap, and submerged suction drop tube. Cap and adaptor sized in accordance with drawing schedule.

2.16.3. Whistle-type vent cap to produce audible indication when tank is full.

2.16.4. Overfill prevention valve, Morrison Bros. 9095 Series, or approved equivalent, ULC listed and labelled to CAN/ULC S661, set to automatically close at 95% full level of tank and constructed of anodized aluminum body, brass plunger, and dashpot, and stainless steel shaft, linkages and hardware, and complete with adaptors sized as required.

2.16.5. Magnetostrictive probe, Veeder-Root or approved equivalent, in-tank inventory control probe, sized for the application, complete with fuel float kit and AST mounting kit, and able to interface with monitoring and leak detection system.

2.16.6. CSA and cUL listed float type level alarm and control switch, Albany Model LEVCON series or approved equivalent, with stainless steel floats and explosion-proof housing. Switch to include set points for Low Level, Low-Low Level, High Level, and High-High Level.

2.16.7. CSA and cUL listed single point float type alarm and control switch, Albany LEVCON series or approved equivalent, with stainless steel float and explosion-proof housing. Switch to signal Critical High Level and be configured in accordance with CSA B139 and TSSA.

2.16.8. Tank mounting level clock gauge, Morrison Bros, or approved equivalent, constructed of aluminum and complete with following requirements:

a) Swivel base allowing 360° rotation after installation;

b) Anti-fog design for clear view of liquid level reading;

c) Clock face indicating metres and centimetres, showing customized level specifically for tank provided;

d) Clock face indicating litres;

e) High level (90% to 100% full) indicated by red zone indicator; and

f) Stainless steel float and cable with 50 mm (2") drop tube.

2.16.9. ULC listed remote mounting level gauge with dual scale (SI and Imperial) direct reading scale.

2.16.10. ULC listed, quick-opening, lockable, weather-tight, non-metallic fill monitoring console with following requirements:

a) LED indicating lights for level of fill process in tank at 25%, 50%, 75% and 90%, warning (check main tank secondary containment before filling), 95% high level, Power ON and Fill Line Open;

b) Dry contacts for communications provided on 25% low level, 95% high level, containment warning light, fill close protection, fill line open, power on, solenoid valve open and secondary containment bypass switch;

c) Audible alarm at 90% tank full level with mute switch, and key-activated secondary bypass switch and fill activate switch;

d) Caution decal affixed at fill point: "This tank is equipped with a positive shut-off valve to prevent tank overfill. If valve closes, follow disconnect procedure in spill containment device;" and

e) ULC listed, normally closed fill line solenoid valve mounted in NEMA 4 panel, programmed to open on activation of "fill activate" switch on fill console and automatically close at 95% full level of tank; pressure relief line shall be supplied to relieve excess pressure and drain fuel in fill line between tight fill collar hose connection and solenoid shut off valve in event of tank being filled to 95% level.

2.16.11. ULC-listed and labelled overfill alarm and acknowledgement switch manufactured in a watertight, weatherproof enclosure for installation in an outdoor environment, complete with alarm horn rated at 95 dB at 3 m (10'), red pilot light for visual indication of alarm, acknowledgement/mute switch to mute alarm horn, test switch to turn on alarm horn and illuminate red pilot light, white pilot light for visual indication of power, all accessories required for a complete installation, and ability to interface with monitoring and leak detection system via an internal relay.

2.16.12. Equipment (such as sensors, etc.) for interconnection with monitoring and leak detection system shall be compatible in all respects with monitoring and leak detection system.

2.17. MONITORING AND LEAK DETECTION SYSTEM (FOR SYSTEMS OF 4 OR MORE TANKS)

2.17.1. Veeder-Root TLS-350 or approved equivalent, ULC listed to CAN/ULC S675.1 and CAN/ULC S675.2, complete with accessories required for a complete installation and following capabilities:

a) Console: wall-mounted, LCD display, 24-button front panel keyboard, audible and visual alarm functions, and modules required to monitor system components;

b) Security: customizable user login;

c) Leak Detection: ability to interface with and monitor multiple types of sensors and provide an audible and visual alarm;

d) In-Tank Probes: ability to interface with and monitor multiple in-tank probes to determine fluid level measurement and in-tank leak detection, and provide audible and visual alarms;

e) Containment Sump and Pan Monitoring: ability to interface with and monitor multiple containment sump and pan sensors and provide an audible and visual alarm.

f) Environmental Compliance Reports: ability to provide a record of the last three occurrences of each type of alarm or warning condition detected by the system;

g) Product Inventory Control (Tank Gauging): ability to generate an inventory increase report after a delivery of product has taken place;

h) Fuel Management and Reporting: tracks and maintains a rolling database of average daily usage for each tank and calculates the number of days of product remaining;

i) Inventory Management Reports: ability to monitor inventory in metric or imperial units and produce either automatic or manual reports for each individual tank connected to the system; and

j) Communications: System to include the following capabilities as confirmed with Metrolinx and reviewed with Consultant:

1) Ability to communicate locally or remotely through an RS-232 port or internal modem;

2) Serial Communications: an RS-232 communications interface for data transmission to a local computer, printer, or modem;

3) Ethernet Capability: internal Ethernet card to provide TCP/IP communications; and

4) Wide Area Network Software (Remote Monitoring or Remote Connectivity): ability to directly communicate with the system via RS-232 or remotely via dial-up network, Internet or LAN/WAN and software to allow for remote system configuration, download to the system and transmission of alarm conditions to a remote computer.

k) Remote Printer: ability to interface with a remote printer;

l) Reporting: reports available through local or remote communications;

m) I/O Devices and/or I/O Combination Module: ability to accept input from an external device and enable a relay to control an external device; and

n) Alarms: provides audible and visual alarms for all system programmed alarm conditions, including, but not limited to, following:

1) Volume;

2) Ullage;

3) Fuel level;

4) Water level;

5) Fuel Temperature;

6) Program Alarm;

7) Interstitial Leak Alarm;

8) High Water Level;

9) Overflow Alarm;

10) Low Fuel Level Alarm;

11) High Fuel Level Alarm;

12) Invalid Level;

13) Sensor Failed;

14) Fuel Delivery Needed;

15) Leak Test Fail;

16) Monthly Test Needed; and

17) Theft.

o) Set-up Parameters: entered at time of system start-up, but also updateable to accommodate future changes and the use of a security code to prohibit unauthorized access to system parameters;

p) Diagnostics/Troubleshooting: diagnostic information shall be generated by the system itself, and user is unable to change or enter diagnostic information in any way; and

q) Interface with building automation system.

2.18. MONITORING AND LEAK DETECTION SYSTEM (FOR SYSTEMS OF 2 TO 4 TANKS)

2.18.1. Veeder-Root TLS4i or approved equivalent, ULC or cUL listed, constructed of #16 gauge powder-coated steel, complete with all accessories required for a complete installation and following capabilities:

a) Console: wall-mounted, colour touch screen display with a graphic user interface, audible and visual alarm functions, and modules required to monitor the system components;

b) Security: customizable user login;

c) Leak Detection: ability to interface with and monitor multiple types of sensors and provide an audible and visual alarm;

d) In-Tank Probes: ability to interface with and monitor multiple in-tank probes to determine fluid level measurement and in-tank leak detection, and provide audible and visual alarms;

e) Containment Sump and Pan Monitoring: ability to interface with and monitor multiple containment sump and pan sensors and provide audible and visual alarms;

f) Custom Alarms: ability to provide custom alarms;

g) Inventory Management Reports: ability to monitor inventory in metric or imperial units and produce either automatic or manual reports for each individual tank connected to the system;

h) Reporting: reports available through local or remote communications;

i) Communications: System to include following capabilities as confirmed with Metrolinx and reviewed with Consultant:

1) Ability to communicate locally or remotely through an RS-232 port or internal modem;

2) Serial Communications: an RS-232 communications interface for data transmission to a local computer, printer, or modem;

3) Email: ability to send outbound messages (alarms, etc.) to email addresses;

4) Ethernet Capability: internal Ethernet card to provide TCP/IP communications;

5) Wide Area Network Software (Remote Monitoring or Remote Connectivity): ability to directly communicate with the system via RS-232 or remotely via dial-up network, Internet or LAN/WAN and software to allow for remote system configuration, download to the system and transmission of alarm conditions to a remote computer.

j) Remote Printer: ability to interface with a remote printer;

k) Alarms: provides audible and visual alarms for all system programmed alarm conditions, including, but not limited to following:

1) Volume;

2) Fuel Level;

3) Interstitial Leak Alarm;

4) High Water Level;

5) Overflow Alarm;

6) Low Fuel Level Alarm; and

7) High Fuel Level Alarm.

l) Interface with building automation system.

2.19. BASIC MONITORING AND LEAK DETECTION SYSTEM (FOR SINGLE TANK)

2.19.1. Morrison Bros. Co. Model 918AC System Interface or approved equivalent, ULC or cUL listed, with a NEMA 4X weather-proof, lockable box, and following requirements:

a) Operating temperature range from -40 °C to 60 °C (-40 °F to 140 °F);

b) Both audible and visual indication of input switch activation;

c) Intrinsically safe input modules expandable up to 4 input channels;

d) Electromechanical output modules expandable up to 4 output relays;

e) Configurable audio alarm (95 dBA at 305 mm [2'] horn) and auto silence on/off selectable by channel;

f) Normally open (NO) or normally closed (NC) selectable on input and output;

g) Output relay activation selectable to one or more input channels; and

h) Fail-safe mode selectable to indicate power outage at console.

2.20. FILL CAP ENCLOSURE

2.20.1. Morrison Bros. Fig. 715 Series or approved equivalent, packaged fuel oil tank fill cap enclosure, factory assembled and tested, flush wall mounted, ULC listed to CAN/ULC S663, 26 l (7 US gal) capacity containment cabinet with connection location to suit piping layout, vented, weatherproof, lockable, box and door constructed of #14 gauge steel and powder coated with bottom of box sloped to drain, and complete with:

a) Manual hand pump assembly constructed of steel with Teflon seals and Viton O-rings, reinforced polyurethane tubing, and brass check and ball valves;

b) ULC-listed brass ball valve;

c) Quick disconnect aluminum check valve/coupler with dust plug;

d) Dry disconnect, hardcoated aluminum with stainless steel piston, Viton gaskets, and aluminum dust cap; and

e) Weatherproof, readily visible decal affixed to cover those details, step-by-step tank filling procedure and tank calibration chart.

2.21. TRANSITION SUMP

2.21.1. Equal to PW Model PTS-4021 or approved equivalent, 2-piece polyethylene sump and top, with weatherproof lockable cover and exterior anchoring system.

2.22. FUEL OIL TRANSFER PUMP SET

2.22.1. Packaged Albany DUCON Series or approved equivalent, duplex fuel oil transfer pump set in accordance with drawing schedule, complete with power and control panel supplied loose for field installation. Pump set to include 2 positive displacement self-priming heavy-duty rotary helical gear-type pumps, each pump shall be flange-mounted and direct-driven through a flexible coupling by a TEFC motor with coupling safety guard. Pumps shall be cast iron, steel-fitted construction with Buna mechanical seal and self-lubricating carbon shaft bearings.

2.22.2. Pump set shall be complete with, but not limited to, following:

a) Cast iron basket-type suction strainer with 60 mesh stainless steel screens;

b) Two relief valves;

c) Full port ball-type isolating valves at unit inlet, outlet to isolate each pump;

d) Two lift-type check valves (each pump outlet);

e) Two in-line type check valves (each pump inlet);

f) One combination high/low-pressure switch (common discharge);

g) One flow sensing switch (optional at common discharge header to activate lag/standby pump);

h) One full-port ball-type isolating shut-off valve and ULC-listed flexible hose assembly, mounted at common discharge header;

i) One cUL-listed emergency shut-off and firesafe valve mounted at assembly inlet in accordance with CSA B139;

j) Two liquid-filled pressure gauges with needle-type isolating valves;

k) Two liquid-filled compound suction gauges with needle-type isolating valves; and

l) Necessary piping (Schedule 80 heavy duty) to allow for a complete duplex assembly.

2.22.3. Assemble pump set on a ¼" fabricated steel base (epoxy lined) with a 50 mm (2") drip lip all around to extend under all pumps, valves, strainer, and fittings at pumps, and include leak detection sensor.

2.22.4. Pressure sensor, supplied with pump set, and wired to control panel to signal a pressure variation from normal system pressure, causing a system fault which shall shut down pumps and alert operator. Control system shall override low pressure.

2.22.5. Equipment supplied to adhere to latest requirements of CAN/CSA B139 Installation Code for Oil Burning Equipment and all TSSA Codes and Amendments.

2.22.6. Duplex fuel oil management control panel, Albany DUCON series or approved equivalent, factory pre-wired panel consisting of microprocessor-based programmable logic control strategy, minimum NEMA 2 enclosure, ULC/CSA listed, and complete with, but not limited to, following;

a) Disconnect switches;

b) Magnetic motor starters;

c) H-O-A selector switches;

d) Pilot lights for "Power On," motor "Run," and motor "Trip;"

e) Terminal strip;

f) Pump failure, pilot light, and manual reset;

g) High and low pressure cut-outs/red pilot light/reset;

h) Provision for main tank status (high level, low level, and leak detection) and day tank status (high level, critical high level, low level, and leak detection) with red pilot lights and dry alarm contacts for each;

i) Pump set basin leak detection signal and red pilot light; and

j) Provision for all alarms to signal at BAS.

2.22.7. Assembled fuel oil pump control cabinet as a whole shall be cUL/CSA certified, manufactured, and labelled in accordance with CSA C22.2 #14.

2.22.8. Standard of accepted manufacturers are:

a) Albany Pump Co.;

b) Viking Pump of Canada Ltd.; or

c) Approved equivalent.

2.23. OIL RETENTION PANS

2.23.1. Pump set shall be assembled on a ¼" fabricated steel base (epoxy lined) with a 50 mm (2") drip lip all around.

2.24. SUMP/PAN LEAK SENSORS

2.24.1. Discriminating sump/pan leak sensor with mounting kit, able to interface with monitoring and leak detection system, and capable of providing an audible and visual alarm for following conditions:

a) "Fuel" alarm when hydrocarbon is detected at any height on the sensor, even floating on another liquid;

b) "Liquid Warning" alarm when fluid other than a hydrocarbon is detected and reaches 25 mm (1") high; and

c) "High Liquid Alarm" alarm when liquid reaches 203 mm (8") on a dispenser pan sensor or 254 mm (10") on a sump sensor.

2.24.2. Non-discriminating sump/pan leak sensor with mounting kit, able to interface with monitoring and leak detection system, and capable of providing an audible and visual alarm for following conditions:

a) "Liquid Alarm" when liquid, either hydrocarbons or water, is detected; and

b) "Sensor Out" when sensor is no longer in the correct mounting position.

2.24.3. Where possible, sensors shall be of same manufacturer as monitoring and leak detection system.

3. EXECUTION

3.1. DEMOLITION

3.1.1. Perform required fuel oil piping system demolition work. Refer to general demolition requirements specified in Section 20 05 35.

3.2. PIPING INSTALLATION REQUIREMENTS

3.2.1. Provide required fuel oil system piping.

3.2.2. Install fuel oil piping in accordance with latest requirements of CAN/CSA B139 and TSSA.

3.2.3. Pipe shall be as follows:

a) Underground: equal to Franklin Fueling Systems APT XP SC-Series pipe and fittings;

b) Aboveground inside building: Schedule 40 mild black steel pipe and fittings, screwed for pipe to 65 mm (2-½") diameter; and

c) Aboveground outside building (fill and vent piping only): Schedule 40 galvanized steel pipe and fittings, screwed or Schedule 40 mild black steel pipe and fittings, screwed.

3.2.4. Conform to following requirements for underground piping:

a) Installers shall be certified by piping system manufacturer to install that particular brand of pipe and fittings;

b) Install pipe and fittings in accordance with manufacturer's instructions and recommendations;

c) Bed piping on a minimum of 150 mm (6") of clean sand compacted to maximum Proctor density, and first 150 mm (6") of backfill over pipes shall be clean sand, hand compacted;

d) Bury piping a minimum of 600 mm (24") below finished grade level; and

e) When installation is complete but prior to any protective covering and/or backfilling, test piping for leakage in accordance with Section entitled Basic Mechanical Materials and Methods and ensure leakage tests are witnessed.

3.2.5. Ensure that fuel dispensing and storage areas are sloped away from storm water catch basins and vegetated areas, and that emergency collection sumps or controls are provided in these areas (i.e. oil stop valves, collection sump, berm area, etc.)

3.2.6. Unless otherwise specified or shown, slope piping down to storage tanks.

3.2.7. Provide screwed unions or weld-on flanges in piping at all connections to valves, strainers, and similar piping system components which need maintenance or repair, at all equipment connections, in runs of piping exceeding 9 m (30') at 4.5 m (15') intervals to permit removal of sections of piping, and wherever else indicated on drawings.

3.2.8. Refer to Part 3 of Section entitled Basic Mechanical Materials and Methods for general valve installation requirements. Provide shut-off valves in piping in accordance with latest requirements of CSA B139 Series and TSSA, and wherever else shown on drawings.

3.2.9. Provide a check valve in discharge piping of every pump, and elsewhere in piping where shown on drawings. Where check valves are required in vertical piping, they shall be suitable in all respects for application.

3.2.10. Provide a drain valve at base of each piping riser, in drain connections to equipment, in low points of horizontal piping that cannot be drained to a tank, and wherever else shown and/or specified.

3.2.11. Provide factory-set pressure relief valves. Confirm relief settings. Do not pipe relief valves to drain. Pipe relief valves to oil return piping or to tank.

3.2.12. Connect engine-generator set with supply and return piping as shown. Install flexible fuel oil piping connections supplied loose with engine-generator set.

3.2.13. Provide a flow relief valve in fuel oil piping loop. Install and adjust valve in accordance with manufacturer's instructions.

3.2.14. Provide fuel oil fusible link fire valve in piping. Ensure valves are easily accessible and provide a red-white "EMERGENCY FUEL OIL SHUT-OFF" sign at each valve location.

3.3. INSTALLATION OF FUEL OIL FILTER

3.3.1. Provide a filter in fuel oil supply piping. Ensure proper clearance is maintained in piping deviation for filter bowl removal, and unions are provided in piping connections.

3.4. INSTALLATION OF ANTI-SIPHON VALVE

3.4.1. Provide an anti-siphon valve for each tank. Install in accordance with manufacturer's instructions.

3.5. INSTALLATION OF DOUBLE-WALL DAY STORAGE TANK

3.5.1. Provide a fuel oil day storage tank in Generator Room. Connect with piping.

3.5.2. Install fuel oil day storage tank in accordance with requirements of CSA B139 and applicable TSSA requirements.

3.5.3. Supply tank float switches as indicated and install in a valved piping column external to tank. Confirm exact switch locations in relation to levels in tank prior to installation.

3.5.4. Extend tank vent piping to atmosphere and terminate with a vent cap.

3.6. INSTALLATION OF ABOVEGROUND DOUBLE WALL STORAGE TANK

3.6.1. Provide an aboveground double-wall storage tank.

3.6.2. Install tank in accordance with manufacturer's recommendations, CSA B139, and applicable local fire and environmental codes. Obtain local permits, as required, prior to installation.

3.6.3. Clearly mark tank on all sides with warning signs: "FLAMMABLE" or "COMBUSTIBLE", "NO SMOKING", tank volume, product identification, and other signs as required by applicable codes.

3.6.4. Connect tank with fuel oil system piping. Extend vent piping to atmosphere and terminate in a whistle-type vent cap. Ensure whistle-type vent cap is located where it can be heard at fill cap location.

3.6.5. Provide fill piping in tank terminated 150 mm (6") above bottom of tank, complete with approved double poppet foot valve, and extend full pipe to exterior wall as shown. Terminate fill pipe in a fill cap and spill containment box. Confirm exact termination point.

3.6.6. Provide fill piping in tank terminated 150 mm (6") above bottom tank, complete with approved double poppet foot valve and extend fill pipe to exterior wall as shown. Conceal pipe in wall and terminate with a fill cap in a wall-mounted spill collector. Provide enclosure and install in accordance with manufacturer's instructions. Make bottom of enclosure oil-tight. Hand 2 identified enclosure keys to Consultant.

3.6.7. Provide a tank-mounted level gauge. Install in accordance with manufacturer's instructions.

3.6.8. Provide a remote level gauge for tank and wall mount. Install in accordance with manufacturer's instructions. Connect gauge to tank with copper gauge tubing in accordance with gauge manufacturer's recommendations and instructions. Confirm exact location prior to installation.

3.6.9. Install spill containers and other accessories, supplied loose with tank, in accordance with manufacturer's instructions.

3.7. INSTALLATION OF MONITORING AND LEAK DETECTION SYSTEM

3.7.1. Provide a monitoring and leak detection system and mount console.

3.7.2. Install in accordance with manufacturer's instructions and wiring diagrams, and by an installer certified under manufacturer's certification program.

3.7.3. Provide required modules and/or communication cards to allow system to function as required.

3.7.4. Supervise test of the leak detection system and certify in writing that the tank has been properly installed and connected in accordance with manufacturer's recommendations and instructions. Submit and include a copy of report with Operating and Maintenance manuals.

3.8. INSTALLATION OF SENSORS AND ACCESSORIES FOR STORAGE TANKS

3.8.1. Provide required aboveground storage tank accessories. Install in accordance with manufacturer's instructions and wiring diagrams. Coordinate electrical connections with electrical trade.

3.8.2. Provide required day storage tank accessories. Install in accordance with manufacturer's instructions and wiring diagrams. Coordinate electrical connections with electrical trade.

3.8.3. Provide an overfill prevention valve for each tank. Install in accordance with manufacturer's instructions.

3.8.4. Provide a magnetostrictive probe for each tank. Install and connect to monitoring and leak detection system in accordance with manufacturer's instructions and wiring diagrams. Coordinate electrical connections with electrical trade.

3.8.5. Provide float-operated switches in each aboveground and/or day tank and install in accordance with manufacturer's instructions. Provide required control wiring as detailed on drawing. Coordinate electrical connections with electrical trade.

3.8.6. Provide an overfill alarm and acknowledgement switch. Install, connect to monitoring and leak detection system, and test, all in accordance with manufacturer's instructions and wiring diagrams. Coordinate electrical connections with electrical trade.

3.9. INSTALLATION OF SUMP/PAN LEAK SENSORS

3.9.1. Provide a sump/pan leak sensor where shown and/or required by Code, including, but not limited to, following locations:

a) Diesel room;

b) Oil retention pans; and

c) Transition sump.

3.9.2. Install and connect sump/pan leak sensor to monitoring and leak detection system in accordance with manufacturer's instructions and wiring diagram. Coordinate electrical connections with electrical trade.

3.9.3. Do not mount sensor to flexible product line.

3.10. INSTALLATION OF FILL CAP ENCLOSURE

3.10.1. Provide a tank fill pipe and cap enclosure mounted to an exterior wall. Confirm exact location prior to installation. Install in accordance with manufacturer's instructions.

3.10.2. Terminate concealed tank fill piping with a fill cap in enclosure.

3.10.3. Hand two identified enclosure keys to Metrolinx.

3.11. INSTALLATION OF TRANSITION SUMP

3.11.1. Provide required transition sumps and install in accordance with manufacturer's instructions and local code requirements. Confirm quantity of sumps required before ordering.

3.11.2. Provide one transition sump for each fuel supply line into building.

3.12. INSTALLATION OF FUEL OIL PUMP SET

3.12.1. Provide a duplex fuel oil pump set.

3.12.2. Secure pump set in place on a concrete housekeeping pad within a curbed, oil-tight enclosure.

3.12.3. Check pump head relief valve operation and adjust as required. Check pump-motor alignment and, if necessary, realign in accordance with pump manufacturer's instructions.

3.12.4. Provide flexible connection between pump discharge and system piping. Flexible connection shall conform to CSA B139.1. Install in accordance with manufacturer's instructions.

3.12.5. Surface wall mount control panel adjacent to pump set. Coordinate installation with electrical trade who shall perform line and load-side power wiring work, and control wiring work.

3.12.6. When installation is complete, arrange, and pay for pump set supplier to visit site to examine installation, certify it correct in writing, and supervise start-up and testing of control and operating functions. Fuel oil pump set supplier to submit a signed start-up and commissioning report to Consultant. Include copy of report in O&M manual.

3.13. INSTALLATION OF OIL RETENTION PANS

3.13.1. Provide oil retention pans under fuel oil day tanks and fuel oil pumps. Oil retention pans under pumps shall extend under pumps, valves, strainers, and fittings at pumps.

3.13.2. Locate pans on concrete housekeeping pad.

3.14. EQUIPMENT AND SYSTEM START-UP

3.14.1. Refer to Section entitled Basic Mechanical Materials and Methods for equipment/system start-up requirements.

3.15. SUPPLY OF FUEL OIL

3.15.1. When fuel oil storage and piping system is complete, fill system with fuel oil for testing, and, at Substantial Performance of the Work, refill tank.

END OF SECTION