

Shirleys Bay B3 Fuel Storage Tank System Upgrade Ottawa, Ontario

SPECIFICATIONS

RE-ISSUED FOR TENDER

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Prepared For:




Public Services and Procurement Canada
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 A circular blue seal for a Licensed Professional Engineer in the Province of Ontario. The seal contains the date 2021-01-22, the name C. S. LOBO, the license number 100502643, and a signature. The text "LICENSED PROFESSIONAL ENGINEER" is at the top and "PROVINCE OF ONTARIO" is at the bottom.	 A circular blue seal for a Licensed Professional Engineer in the Province of Ontario. The seal contains the date 2021-01-22, the name A.J. GRIGAITIS, the license number 100053832, and a signature. The text "LICENSED PROFESSIONAL ENGINEER" is at the top and "PROVINCE OF ONTARIO" is at the bottom.
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 A circular blue seal for a Licensed Professional Engineer in the Province of Ontario. The seal contains the date 2021-01-22, the name C.B.M. VONTEICHMAN, the license number 100183463, and a signature. The text "LICENSED PROFESSIONAL ENGINEER" is at the top and "PROVINCE OF ONTARIO" is at the bottom.	
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END OF SECTION

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END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 02 65 00 – Storage Tank Removal.
- .2 Section 33 56 13 – Aboveground Fuel Storage Tanks.

1.2 TAXES

- .1 Pay all taxes properly levied by law (including Federal, Provincial and Municipal).

1.3 FEES, PERMITS and CERTIFICATES

- .1 Pay all fees and obtain all permits. Provide authorities with plans and information for acceptance certificates. Provide inspection certificates as evidence that work conforms to requirements of Authority having jurisdiction.

1.4 CONSTRUCTION PROGRESS SCHEDULE

- .1 Schedule and execute work with least possible interference or disturbance to the normal use of premises.
- .2 On award of contract submit bar chart construction schedule for work, indicating anticipated progress stages within time of completion. When the Departmental Representative has reviewed schedule, take necessary measures to complete work within scheduled time. Do not change schedule without notifying Departmental Representative.
- .3 Carry out work during "regular hours", Monday to Friday from 07:00 to 18:00 hours and on Saturdays, Sundays and statutory holidays.
- .4 Carry out the following noise generating work during "off hours" Monday to Friday from 18:00 to 07:00 hours and on Saturdays, Sundays, and statutory holidays:
 - .1 Cutting, coring and/or drilling activities inside the building.
- .5 Give the Departmental Representative 48 hours notice for work to be carried out during "off hours".

1.5 SUBMITTAL PROCEDURES

- .1 Submit promptly to Departmental Representative submittals listed for review, in orderly sequence to not cause delay in work.
- .2 Do not proceed with work affected by submittals until review is complete.
- .3 Shop Drawings:
 - .1 Submit electronic copies of shop drawings in accordance with project schedule.
 - .1 Where indicated, shop drawings shall bear stamp and signature of qualified Professional Engineer licensed in Province of Ontario.
 - .2 The review is for the sole purpose of ascertaining conformance with the general design concept, and does not mean approval of the design details inherent in the shop drawings, responsibility for which shall remain with the Contractor. Such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of his responsibility for meeting all requirements of the Contract Documents.

- .4 Product Data:
 - .1 Submit electronic copies of product data: manufacturers catalogue sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products.
 - .2 Cross reference product data information to applicable portions on Contract Documents.
- .5 Submit photographs of surrounding properties, objects and structures liable to be damaged or be the subject of subsequent claims.

1.6 REGULATORY REQUIREMENTS

- .1 References and Codes:
 - .1 Materials shall be new and work shall conform to the minimum applicable standards of the "References" indicated in the specification sections, the National Building Code of Canada 2015 (NBC) and all applicable Provincial and Municipal codes. In the case of conflict or discrepancy the most stringent requirement shall apply.
- .2 Building Smoking Environment:
 - .1 Smoking is not permitted in the Building. Obey smoking restrictions on building property.
- .3 Hazardous Material Discovery:
 - .1 Stop work immediately when material resembling spray or trowel-applied asbestos, Polychlorinated Biphenyl (PCB), mould or other designated substance is encountered during demolition work.
 - .1 Take preventative measure and promptly notify Departmental Representative.
 - .2 Do not proceed until written instructions have been received from Departmental Representative.

1.7 FUEL STORAGE TANK SYSTEM DOCUMENTATION REQUIREMENTS

- .1 Contractor to provide the following documentation, supplementary to requirements noted in other Sections, including but not limited to Section 02 65 00 – Storage Tank Removal and Section 33 56 13 – Aboveground Fuel Storage Tanks:
 - .1 Letter with Contractor letterhead identifying the amount of diesel fuel removed and disposed off-site and was done so in an approved manner. Letter to include the total amount of fuel disposed, the date of disposal, identifying whether any fuel was spilled during the operation (and cleaned up as appropriate) and the disposal location including company name, and the facility name or address.
 - .2 Letter with Contractor letterhead stating that all new aboveground piping for new diesel fuel storage tank system has successfully completed a pressure test, including the test date, the start and end time, the approximate outside ambient temperature at start and end time, the duration of the test, the test pressure and the testing medium. Submit piping leak detection test results to Departmental Representative prior to filling the system with petroleum product.
 - .3 Provide wiring diagrams and conduit layouts to the Departmental Representative prior to final system commissioning.
 - .4 Red-line mark-up drawings to the Departmental Representative prior to the product transfer into the new diesel fuel storage tank system. The Contractor must provide the Departmental Representative with mark-up drawings for the production of as-built drawings.
 - .5 Letter with Contractor letterhead stating the diesel fuel storage tank system passed successful commissioning, including the verification that the monitoring

system is functioning as intended. Contractor must provide supporting successful commissioning forms with manufacturer letterhead as part of the letter. Letter shall be submitted to the Departmental Representative within two (2) weeks of successful system commissioning.

- .6 Letter with Contractor letterhead stating that the Departmental Representative, their personnel and system Operator's representatives have been satisfactorily trained on the operation of the fuel oil system upon completion of work. Contractor shall provide the letter within one (1) week of completion of demonstration and training. The letter shall include a list of all persons who attended the demonstration and training as well as the date and time of the training.
- .7 Provide all quality control material testing reports for all materials, including for Base material and Portland Cement Concrete.
- .2 Provide all such documentation in the Operation and Maintenance Manual.

1.8 FIRE SAFETY REQUIREMENTS

- .1 Comply with both the National Building Code of Canada 2015 and the National Fire Code of Canada 2015 for safety of persons in buildings in the event of a fire and the protection of buildings from the effects of fire, as follows;
 - .1 The National Building Code (NBC): for fire safety and fire protection features that are required to be incorporated in a building during construction.
 - .2 The National Fire Code (NFC):
 - .1 The on-going maintenance and use of the fire safety and fire protection features incorporated in buildings.
 - .2 The conduct of activities that might cause fire hazards in and around buildings.
 - .3 Limitations on hazardous contents in and around buildings.
 - .4 The establishment of fire safety plans.
 - .5 Fire safety at construction and demolition sites.
- .2 Welding and cutting:
 - .1 Before welding, soldering, grinding and/or cutting work, obtain a permit as directed by the Departmental Representative. Store flammable liquids in approved CSA containers.
 - .2 At least one week prior to commencing cutting, welding or soldering procedure, provide to Departmental Representative:
 - .1 Notice of intent, indicating devices affected, time and duration of isolation or bypass.
 - .2 Completed welding permit as defined in NFC.
 - .3 Return welding permit to Departmental Representative immediately upon completion of procedures for which permit was issued.
 - .3 "Fire Watchers" as described in NFC shall be assigned when welding or cutting operations are carried out in areas where combustible materials within 15m may be ignited by conduction or radiation.
- .3 Where work requires interruption or cause activation of fire alarms or fire suppression, extinguishing or protection systems:
 - .1 Provide "Watchman Service" as described in NFC; In general, watchman service is defined as an individual conversant with "Fire Emergency Procedures", performing fire picket duty within an unprotected and unoccupied (no workers) area once per hour.

- .2 Retain services of manufacturer for fire protection systems on daily basis or as approved by Departmental Representative, to isolate and protect all devices relating to:
 - .1 modification of fire alarms, fire suppression, extinguishing or protection systems; and/or
 - .2 cutting, welding, soldering or other construction activities that might activate fire protection systems.
- .3 Immediately upon completion of work, restore fire protection systems to normal operation and verify that all devices are fully operational.
- .4 Inform fire alarm system monitoring agency and local Fire Department immediately prior to isolation and immediately upon restoration of normal operation.

1.9 QUALITY CONTROL

- .1 Testing Laboratory Services:
 - .1 Departmental Representative will appoint and pay for costs of inspection and testing services, unless indicated otherwise.
 - .2 Provide safe working areas and assist with testing procedures, including provisions for materials or services and co-ordination, as required by testing agency and as authorized by Departmental Representative.
 - .3 Where tests indicate non-compliance with specifications, contractor to pay for initial test and all subsequent testing of work to verify acceptability of corrected work.

1.10 HAZARDOUS MATERIALS

- .1 Hazardous Materials: product, substance, or organism that may cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.
- .2 Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and the provision of Safety Data Sheets (SDS).
- .3 For work in occupied buildings, give the Departmental Representative one week notice for work involving designated substances (Ontario Bill 208), hazardous substances (Canada Labour Code Part II Section 10), and before painting, caulking, installing carpet or using adhesives and other materials, that cause off gassing.

1.11 TEMPORARY UTILITIES

- .1 There shall be a continuous supply of fuel provided to the emergency generator during construction in accordance with Section 33 56 13 – Aboveground Fuel Storage Tanks.
- .2 Existing services required for work, excluding power required for heating to permit concrete and/or asphalt work during winter, may be used by the Contractor without charge. Ensure capacity is adequate prior to imposing additional loads. Connect and disconnect at own expense and responsibility.
- .3 Connect to existing power supply in accordance with Canadian Electrical Code.
- .4 Notify the Departmental Representative and utility companies of intended interruption of services and obtain requisite permission.
- .5 Give the Departmental Representative one week notice related to each necessary interruption of any mechanical or electrical service throughout the course of the work. Keep duration of these interruptions to a minimum. Carry out all interruptions after normal working hours of the occupants, preferably on weekends.

1.12 CONSTRUCTION FACILITIES

- .1 Site Storage:
 - .1 The Departmental Representative will assign storage space that shall be equipped and maintained by the Contractor.
 - .2 Do not unreasonably encumber site with materials or equipment.
 - .3 Move stored products or equipment that interfere with operations of Departmental Representative or other contractors.
 - .4 Obtain and pay for use of additional storage or work areas needed for operations.
 - .5 Do not load or permit to load any part of work with weight or force that will endanger work.
- .2 Where security is reduced by work provide temporary means to maintain security.
- .3 Sanitary facilities: will be assigned for Contractor's personnel. Others shall not be used. Keep facilities clean.
- .4 Signage:
 - .1 Provide common-use signs related to traffic control, information, instruction, use of equipment, public safety devices, etcetera, in both official languages or by the use of commonly understood graphic symbols and to approval of the Departmental Representative.
 - .2 No advertising will be permitted on this project.

1.13 TEMPORARY BARRIERS AND ENCLOSURES

- .1 Maintain existing services to building and provide for personnel and vehicle access.
- .2 Hoarding:
 - .1 Design, erect and maintain temporary site enclosure as required by authority having jurisdiction.
- .3 Dust Control:
 - .1 Provide dust tight screens or partitions to localize dust-generating activities, and for protection of workers, finished areas of work and site personnel.
 - .2 Maintain and relocate protection until such work is complete.
 - .3 Protect all furnishings within work area with 0.102 mm thick polyethylene film during construction. Remove film during non-construction hours and leave premises in clean, unencumbered and safe manner for normal daytime function.
- .4 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.
- .5 Protection:
 - .1 Protect work against damage until handover.
 - .2 Protect adjacent work against the spread of dust and dirt beyond the work areas.
 - .3 Protect operatives and other users of site from all hazards.
- .6 Work zones:
 - .1 Work zone locations include: exterior and interior of Building 3, as identified on drawings.
 - .2 The contractor shall agree to install proper site separation and identification in order to maintain "Time and Space" at all times throughout the life of the project. When Building Operations staff requires access to equipment in order to operate

the building, proper coordination and communication must exist between all parties involved.

1.14 COMMON PRODUCT REQUIREMENTS

- .1 Quality of Work:
 - .1 Carry out work using qualified licenced workers or apprentices in accordance with Provincial Act respecting manpower vocational training and qualification.
 - .2 Permit employees registered in Provincial apprenticeship program to perform specific tasks only if under direct supervision of qualified licenced workers.
 - .3 Determine permitted activities and tasks by apprentices, based on level of training attended and demonstration of ability to perform specific duties.
- .2 Storage, Handling and Protection:
 - .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions.
 - .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove packaging or bundling until required in work.
- .3 Manufacturer's Instructions: unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

1.15 EXAMINATION and PREPARATION

- .1 Examine site and conditions likely to affect work and be familiar and conversant with existing conditions.
- .2 Before commencing work, establish location and extent of services lines in area of work and notify Departmental Representative of findings.

1.16 EXECUTION

- .1 Cut, Patch and Make Good:
 - .1 Cut existing surfaces as required to accommodate new work.
 - .2 Remove all items so shown or specified.
 - .3 Patch and make good surfaces cut, damaged or disturbed, to Departmental Representative's approval. Match existing material, colour, finish and texture.
- .2 Firestop and smoke seal systems: in accordance with CAN-ULC-S115-2018 – Standard Method of Fire Test of Firestop Systems. Install around pipe, ductwork, cables, and other objects penetrating fire separations to provide fire resistance not less than the fire resistance rating of surrounding floor, ceiling, and wall assembly.
- .3 Sleeves, Hangers and Inserts: co-ordinate setting and packing of sleeves and supply and installation of hangers and inserts. Obtain Departmental Representative's approval before cutting into structure.
- .4 Unless otherwise specified, materials for removal become the Contractor's property and shall be taken from site.

1.17 WASTE MANAGEMENT

- .1 Comply with Environmental Protection Act, Ontario Regulations: O. Reg. 102/94 – Waste Audits and Waste Reduction Work Plans; and O. Reg. 103/94 – Industrial, Commercial and Institutional Source Separation Programs; for waste management on construction and demolition projects.

- .2 Conduct "waste audit" to determine what waste will be generated during construction and demolition operations. Prepare written "waste reduction work plan" and implement the principles to reduce, reuse and recycle materials to the extent that is possible.
- .3 Provide a "source separation program" to disassemble and collect in an orderly fashion the following "materials designated for alternative disposal" from the "general waste" stream:
 - .1 brick and Portland cement concrete;
 - .2 cardboard (corrugated);
 - .3 gypsum board (unfinished);
 - .4 steel; and
 - .5 wood (not including painted, treated or laminated wood).
- .4 Submit complete records of all removals from site for both "materials designated for alternative disposal" and "general waste" including:
 - .1 time and date of removal;
 - .2 description of material and quantities; and
 - .3 proof that materials have been received at an approved Waste Processing Site or certified Waste Disposal Site as required.

1.18 CLOSEOUT SUBMITTALS

- .1 Operational and Maintenance Manuals:
 - .1 Two (2) weeks prior to any scheduled training, submit to Departmental Representative two (2) copies of approved Operations Data and Maintenance Manual in both official languages, compiled as follows:
 - .1 Bind data in vinyl hard cover 3 "D" ring type loose-leaf binders for 212 x 275 mm size paper. Binders must not exceed 75mm thick or be more than 2/3 full.
 - .2 Enclose title sheet labelled "Operation Data and Maintenance Manual," project name, date and list of contents. Project name must appear on binder face and spine.
 - .3 Organize contents into applicable sections of work to parallel project specifications breakdown. Mark each section by labelled tabs protected with celluloid covers fastened to hard paper dividing sheets.
 - .2 Include following information plus data specified:
 - .1 Maintenance instruction for finished surface and materials.
 - .2 Copy of hardware and paint schedules.
 - .3 Description: operation of the equipment and systems defining start-up, shut-down and emergency procedures, and any fixed or adjustable set points that affect the efficiency of the operation. Include nameplate information such as make, size, capacity and serial number.
 - .4 Maintenance: use clear drawings, diagrams or manufacturers' literature which specifically apply and detail the following:
 - .1 lubrication products and schedules;
 - .2 trouble shooting procedures;
 - .3 adjustment techniques; and
 - .4 operational checks.
 - .5 Suppliers' names, addresses and telephone numbers and components supplied by them must be included in this section. Components must be identified by a description and manufacturers part number.
 - .6 Guarantees showing:

- .1 name and address of projects;
- .2 guarantee commencement date (date of Interim Certificate of Completion);
- .3 duration of guarantee;
- .4 clear indication of what is being guaranteed and what remedial action will be taken under guarantee; and
- .5 signature and seal of Guarantor.
- .7 Additional material used in project listed under various Sections showing name of manufacturer and source of supply.
- .3 Spare parts: list all recommended spares to be maintained on site to ensure optimum efficiency. List all special tools appropriate to unique application. All parts/tools detailed must be identified as to manufacturer, manufacturer part number and supplier (including address).
- .4 Include one complete set of final shop drawings (bound separately) indicating corrections and changes made during fabrication and installation.
- .2 Records:
 - .1 As work progresses, maintain accurate records to show deviations from contract drawings. Just prior to Departmental Representative's inspection for issuance of final certificate of completion, supply to the Departmental Representative one (1) set of white prints with all deviations neatly inked in. The Departmental Representative will provide two sets of clean white prints for this purpose.
- .3 Guarantees and Warranties:
 - .1 Before completion of work collect all manufacturer's guarantees or warranties and deposit with Departmental Representative.

1.19 CLEANING

- .1 Clean up as work progresses. At the end of each work period, and more often if ordered by the Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.
- .2 Upon completion remove temporary protection and surplus materials. Make good defects noted at this stage.
- .3 Clean and polish glass, mirrors, ceramic tile, aluminum, chrome, stainless steel, baked or porcelain enamel, plastic laminate and other plastic surfaces, floors, hardware and washroom fixtures. Clean manufactured articles in accordance with manufacturer's written instructions.
- .4 Clean areas under contract to a condition equal to what previously existed and to approval of Departmental Representative.

1.20 SECURITY CHECK

- .1 All personnel employed on this project will be subject to security check. Obtain requisite clearance, as instructed, for each individual required to enter the premises.
- .2 Personnel will be checked daily at start of work shift and given a pass, which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.

1.21 SECURITY ESCORT

- .1 All personnel employed on this project shall be escorted when executing work in non-public areas during normal working hours. Personnel shall be escorted in all areas after normal working hours.
- .2 Submit an escort request to Departmental Representative at least 14 days before the service is needed. For requests submitted within the time mentioned above, the

Departmental Representative will pay for the costs of the security escort. The cost incurred by a late request will be charged to the Contractor.

- .3 Any escort request may be cancelled free of charge if notification of cancellation is given at least 4 hours before the scheduled time of the escort. The cost incurred by a late cancellation will be charged to the Contractor.
- .4 The calculation of costs will be based on the average hourly rate of a security officer for a minimum of 8 hours per day for a late service request and 4 hours for late cancellations.

1.22 COST BREAKDOWN

- .1 Before submitting first progress claim, submit breakdown of Contract Amount in detail as directed by Departmental Representative and aggregating the Contract Amount. After approval by Departmental Representative cost breakdown will be used as the basis of progress payments.

1.23 PRECEDENCE

- .1 For Federal Government projects, Division 01 Sections take precedence over technical specification sections in other Divisions of this Project Manual.
- .2 Stantec is not responsible for any technical errors or other problems that may arise as a result of the translation by any third-party translator. The translated documents may not be relied upon as their accuracy and completeness cannot be guaranteed. The original English version takes precedence. For further clarity please note that any differences or contradiction between the English version and a translated version will be considered a translation error and the content of the English version will take precedence.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 00 10 – General Instructions.

1.2 REFERENCE STANDARDS

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Province of Ontario
 - .1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. 1990, c.0.1, as amended and O. Reg. 213/91 as amended - Updated 2017.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 10 – General Instructions.
- .2 Submit site-specific Health and Safety Plan: Within 5 business days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site-specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3 Submit copies of reports or directions issued by Federal, Provincial, and Municipal health and safety inspectors.
- .4 Submit copies of incident and accident reports.
- .5 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 00 10 – General Instructions.
- .6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 10 business days.
- .7 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .8 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.
- .9 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.4 FILING OF NOTICE

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.
- .2 Contractor shall be responsible and assume the Principal Contractor role for each work zone location and not the entire complex. Contractor shall provide a written acknowledgement of this responsibility with 3 weeks of contract award.
- .3 Work zone locations include:
 - .1 Exterior and interior of Building 3, as identified on drawings.

- .4 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

1.5 SAFETY ASSESSMENT

- .1 Perform site specific safety hazard assessment related to project.

1.6 MEETINGS

- .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

1.7 REGULATORY REQUIREMENTS

- .1 Do Work in accordance with Section 01 00 10 – General Instructions.

1.8 PROJECT / SITE CONDITIONS

- .1 Work at site will involve contact with, but is not limited to:
 - .1 PSPC, DND, CRC and Commissionaire Site Personnel.

1.9 GENERAL REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.10 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Contractor will be responsible and assume the role Constructor as described in the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.
- .3 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.11 COMPLIANCE REQUIREMENTS

- .1 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990, c. 0.1 and Ontario Regulations for Construction Projects, O. Reg. 213/91.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.12 UNFORSEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of authorities having jurisdiction and advise Departmental Representative verbally and in writing.
- .2 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise Safety Officer / Health and Safety co-ordinator and follow

procedures in accordance with Acts and Regulations of authorities having jurisdiction and advise Departmental Representative verbally and in writing.

1.13 HEALTH AND SAFETY CO-ORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
 - .1 Have site-related working experience specific to activities associated with the work.
 - .2 Have working knowledge of occupational safety and health regulations.
 - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
 - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.

1.14 POSTING OF DOCUMENTS

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of authorities having jurisdiction, and in consultation with Departmental Representative.

1.15 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction and by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.16 BLASTING

- .1 Blasting or other use of explosives is not permitted without prior receipt of written instruction by Departmental Representative.

1.17 POWDER ACTUATED DEVICES

- .1 Use powder actuated devices only after receipt of written permission from Departmental Representative.

1.18 WORK STOPPAGE

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Project No.
R.065220.759

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 CONSTRUCTION FIRE SAFETY

- .1 Be responsible for provision of construction fire safety in accordance with National Fire Code of Canada.

1.2 FIRE DEPARTMENT BRIEFING

- .1 Departmental Representative will co-ordinate arrangements for a Pre-Commencement Meeting following contract award. Contractors will be briefed on Fire Safety by the Chief Fire Prevention Officer (CFPO) or his designated representative before work starts.
- .2 Departmental Representative will provide Contractor with a copy of all Fire Orders.

1.3 REPORTING FIRES

- .1 Inform Departmental Representative and CFPO of fire incidents at construction site, regardless of size.
- .2 Know location of nearest fire alarm pull station and telephone, including emergency phone number.
- .3 Report immediately fire incidents to Fire Department as follows:
 - .1 Activate nearest fire alarm pull station.
 - .2 Call 911
 - .3 Call Departmental Representative & Chief Fire Inspector.
- .4 Person activating fire alarm pull station will remain at main entrance of site to direct Fire Department to scene of fire.
- .5 When reporting fire by telephone, give location of fire, name or number of building and be prepared to verify location.

1.4 FIRE SAFETY PLAN

- .1 Prepare a fire safety plan for construction site prior to commencement of on site work.
- .2 Submit fire safety plan to Departmental Representative for review by local fire department. Implement changes or recommendations made by local fire department into fire safety plan. Any comments by Departmental Representative and CFPO shall be implemented by the Contractor.
- .3 Limit scope of fire safety plan to area of construction only. Existing fire safety plans covering other existing buildings are not responsibility of this construction contract.
- .4 Post fire safety plan at entrance to construction site or near construction site's health and safety board.
- .5 Prepare fire safety plan in conformance with National Fire Code of Canada. Include:
 - .1 Emergency procedures in case of fire, including:
 - .1 Sounding fire alarm.
 - .2 Notifying fire department.
 - .3 Instructing occupants on procedures followed when fire alarm sounds.
 - .4 Evacuating occupants, including special provisions for persons requiring assistance.

- .5 Confining, controlling and extinguishing fires.
- .2 Appointment and organization of designated supervisory staff to carry out fire safety duties.
- .3 Training of supervisory staff and other occupants in their responsibilities for fire safety.
- .4 Documents including diagrams, showing type, location and operation of building fire emergency systems.
- .5 Holding of fire drills (where applicable).
- .6 Control of fire hazards in the building.
- .7 Inspection and maintenance of building facilities provided for the safety of occupants.

1.5 FIRE WARNING SYSTEM

- .1 Provide a fire warning system for entire construction site, capable of notifying construction personnel of a fire emergency in construction area.
- .2 Provide system with sufficient coverage so that alarms are capable of being heard throughout building and anywhere on site.

1.6 FIRE PROTECTION SYSTEM IMPAIRMENT

- .1 Maintain existing systems in an operational state at all times during construction.
- .2 Use of fire hydrants, standpipes or hose systems for purposes other than fire fighting unless authorized by CFPO, is prohibited.
- .3 Existing fire protection and alarm systems will not be obstructed, shut off, disabled or left inactive at end of each working day or shift without written authorization from CFPO.
- .4 Submit written notification to Departmental Representative and CFPO 48 hours in advance of planned interruption of services. Submit written notification for operation including shutting down active fire protection system, including water supply, fire suppression, fire detection and life safety systems.
- .5 Where a fire protection system that provides fire alarm monitoring is impaired in an existing building, provide a fire watch as directed by CFPO.
- .6 Conduct work on fire protection system where systems are affected or impaired in accordance with National Fire Code of Canada conforming to Base Fire Orders.

1.7 FIRE EXTINGUISHERS

- .1 Supply fire extinguishers, as scaled by CFPO, necessary to protect work in progress and contractor's physical plant on site.
- .2 Provide supplemental fire extinguishers to these areas and otherwise as directed by CFPO:
 - .1 Adjacent to hot works.
 - .2 Areas where combustibles materials are stored.
 - .3 Adjacent to areas where flammable liquids or gases are stored or handled.
 - .4 Near or on internal combustion engines.
 - .5 Adjacent to temporary oil fired or gas fired equipment.
 - .6 Adjacent to bitumen heating equipment.

- .3 Provide extinguishers rated as follows: 4A:40BC. Minimum 20 pounds unless otherwise directed by CFPO.
- .4 Provide dry chemical type extinguishers unless otherwise required by hazard being protected.
- .5 Provide sufficient numbers of extinguishers based on a maximum travel distance between extinguishers of 23.0 meters (75 feet).

1.8 ACCESS FOR FIRE FIGHTING

- .1 Provide and maintain access for firefighting in accordance with National Fire Code of Canada.
- .2 Provide written notification to CFPO a minimum of 5 working days in advance of operation that would impede fire apparatus response including:
 - .1 Violation of minimum horizontal and overhead clearances.
 - .2 Other operations as directed by CFPO.
 - .3 Erecting of barricades and digging of trenches.
- .3 Maintain a minimum clear horizontal width on access routes of 5.0 meters or otherwise as defined by CFPO.
- .4 Maintain a minimum vertical clearance of 6.0 meters or otherwise as defined by CFPO.

1.9 SMOKING PRECAUTIONS

- .1 Smoking is prohibited in buildings including buildings under construction.
- .2 Obey posted signs and confine smoking only to designated smoking areas. Observe posted smoking restrictions near existing buildings.
- .3 Observe posted smoking restrictions near existing buildings. Smoking areas will be in accordance with CFPO Fire Orders and will not be within 10 meters of any building entrance.

1.10 RUBBISH AND WASTE MATERIALS

- .1 Keep rubbish and waste materials to a minimum.
- .2 Burning of rubbish is prohibited.
- .3 Remove rubbish from work site at end of each work day or shift or more frequently as directed by CFPO.
- .4 Storage:
 - .1 Store oily waste in approved receptacles to ensure maximum cleanliness and safety.
 - .2 Deposit greasy or oily rags and materials subject to spontaneous combustion in approved receptacles and remove at end of each work day.

1.11 FLAMMABLE AND COMBUSTIBLE LIQUIDS

- .1 Handle, store and use flammable and combustible liquids in accordance with National Fire Code of Canada and as otherwise directed by the CFPO.
- .2 Store flammable and combustible liquids such as gasoline, kerosene and naphtha in quantities not exceeding 45 litres. Store in approved safety cans bearing Underwriters' Laboratory of Canada or Factory Mutual seal of approval. Obtain written authorization

from CFPO for storage of quantities of flammable and combustible liquids exceeding 45 litres.

- .3 Transfer of flammable or combustible liquids within buildings or on jetties is prohibited.
- .4 Transfer of flammable or combustible liquids in vicinity of open flames or any type of heat-producing devices is prohibited.
- .5 Use of flammable liquids having flash point below 38 degrees C such as naphtha or gasoline as solvents or cleaning agents is prohibited.
- .6 Storing flammable and combustible waste liquids on site is prohibited. Remove daily or more frequently as directed by CFPO.

1.12 HAZARDOUS SUBSTANCES

- .1 Work entailing use of toxic or hazardous materials, chemicals and/or explosives, or otherwise creating hazard to life, safety or health, shall be in accordance with National Fire Code of Canada.
- .2 Provide ventilation where flammable liquids, such as lacquers or urethanes are used. Eliminate all sources of ignition. Inform the CFPO prior to and at completion of such work.

1.13 HOT WORKS

- .1 Implement a hot works program in accordance with National Fire Code of Canada and NFPA 51B Standard for Fire Prevention. Apply hot works program to processes involving welding, cutting, roofing and other hot works as defined by CFPO.
- .2 Obtain a "Hot Works" permit from CFPO for hot works in construction area. Frequency of renewal for hot works permits is at discretion of the CFPO.
- .3 When work is carried out in dangerous or hazardous areas involving use of heat, provide fire watchers equipped with sufficient fire extinguishers. Determination of dangerous or hazardous areas along with level of protection necessary for Fire Watch is at discretion of the CFPO.
- .4 Provide fire watch service for work as directed by CFPO and as defined in Fire Department Briefing. Provide fire watchers trained in use of fire extinguishing equipment. The person(s) performing fire watch are not permitted to perform any other duties.
- .5 Carry out hot works processes in areas free of combustible and flammable content.
- .6 Where hot works must be carried out in areas where combustibles are present:
 - .1 Protect flammable and combustible materials within 15.0 meters of hot works in accordance with National Fire Code of Canada.
 - .2 Provide a fire watch during hot work and for a minimum of 60 minutes after work is complete unless otherwise directed by CFPO.
 - .3 Conduct a final inspection of area not less than 4 hours after completion of hot works unless otherwise directed by CFPO.
- .7 Where there is a possibility of sparks leaking onto combustible materials in areas adjacent to areas where the hot work is carried out:
 - .1 Cover or close openings in walls, floors or ceilings to prevent passage of sparks to such adjacent areas.
 - .2 Provide a fire watch during hot works and for a minimum of 60 minutes after work is complete.

- .3 Conduct a final inspection not less than 4 hours after completion of hot works unless otherwise directed by CFPO.
- .8 Protection of flammable or combustible materials:
 - .1 Remove flammable and combustible materials including combustible or flammable dust or residue from area where hot works is carried out.
 - .2 When removal is not possible, protect materials with a non combustible covering.
- .9 Provide a fire extinguisher within 3.0 meters of hot works. Provide a minimum size of 20 lbs Type ABC extinguisher unless otherwise directed by CFPO.

1.14 HAZARDOUS SUBSTANCES

- .1 Perform work involving the use of toxic or hazardous materials, chemicals or explosives, or otherwise creating hazard to life, safety or health, in accordance National Fire Code of Canada (NFC).
- .2 Provide ventilation where flammable liquids, such as lacquers or urethanes are used. Eliminate sources of ignition. Provide written notification to the CFPO a minimum of 5 days prior to starting work and immediately at completion of work.

1.15 PARTIAL OCCUPANCY

- .1 Implement partial occupancy procedures as defined in General Conditions of the Contract. Partial occupancy is defined as when construction occurs adjacent to work areas occupied by Departmental or Canadian Forces personnel. This includes:
 - .1 Phased new construction.
 - .2 Early or partial occupancy of new construction.
 - .3 New construction being added onto an existing building.
 - .4 Renovation or recapitalization of an existing building.
 - .5 Phased renovation or recapitalization of an existing building.
- .2 Where partial occupancy occurs, implement requirements as indicated in drawings and specifications. This may include construction of a rated fire separation between occupied and construction areas as required by National Fire Code.
- .3 If work is carried out in an occupied building, provide regular inspections every hour, throughout entire period of demolition.
- .4 If work is carried out in an occupied building and where building does not have a Fire Alarm system or similar automatic monitoring or protection equipment, provide regular inspections every hour for entire period of construction.

1.16 QUESTIONS OR CLARIFICATION

- .1 Direct questions or clarification on Fire Safety to Departmental Representative.
- .2 Departmental Representative will obtain clarifications from CFPO. Do not contact directly with CFPO for notification, authorization or any requests unless situation constitutes an immediate emergency.

1.17 FIRE INSPECTION

- .1 Co-ordinate site inspections by CFPO through Departmental Representative.
- .2 Allow CFPO unrestricted access to work site.
- .3 Co-operate with CFPO during routine fire safety inspection of work site.

- .4 Immediately remedy unsafe fire situations observed by CFPO.

Part 2 Products

2.1 NOT USED

- .1 NOT USED

Part 3 Execution

3.1 NOT USED

- .1 NOT USED

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 00 10 – General Instructions.

1.2 REFERENCE STANDARDS

- .1 Not Used.

1.3 DEFINITIONS

- .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
- .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 10 – General Instructions.
- .2 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative.
- .3 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.
- .4 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .5 Include in Environmental Protection Plan:
 - .1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.
 - .2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
 - .3 Names and qualifications of persons responsible for training site personnel.
 - .4 Descriptions of environmental protection personnel training program.
 - .5 Drawings indicating locations of proposed temporary excavations or embankments for material storage areas, structures, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.
 - .6 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.
 - .1 Plan to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.
 - .7 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
 - .8 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
 - .9 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into

air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

- .10 Waste Water Management Plan identifying methods and procedures for management discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

1.5 FIRES

- .1 Fires and burning of rubbish on site are not permitted.

1.6 DRAINAGE

- .1 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan.
- .2 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .3 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.
- .4 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.7 SITE CLEARING AND PLANT PROTECTION

- .1 Protect trees and plants on site and adjacent properties as indicated.
- .2 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes.
- .3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.
 - .1 Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.

1.8 POLLUTION CONTROL

- .1 Maintain temporary erosion and pollution control features installed under this Contract.
- .2 Control emissions from equipment and plant in accordance with local authorities' emission requirements.
- .3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.

1.9 NOTIFICATION

- .1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
 - .1 Take action only after receipt of written approval by Departmental Representative.

- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 CLEANING

- .1 Clean in accordance with Section 01 00 10 – General Instructions.
 - .1 Leave Work area clean at end of each day.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 35 29.06 – Health and Safety Requirements
- .2 Section 21 05 00 – Common Work Results for Mechanical.
- .3 Section 23 11 13 - Facility Fuel-Oil Piping.
- .4 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

1.2 UNIT PRICES

- .1 Provide unit price for excavation, remediation and disposal of contaminated soils in the event that they are encountered during removal of underground fuel tank soil testing.
- .2 Unit prices will apply where more than 75 m³ of soil is required removed from boundary area around tank; base contract shall account for this initial removal amount.

1.3 REFERENCE STANDARDS

- .1 American Petroleum Institute (API)
 - .1 API 1604-96, Closure of Underground Petroleum Storage Tanks.
- .2 American Society for Materials and Testing (ASTM)
 - .1 ASTM E1739-95(2015), Guide to Risk Based Corrective Action Applied at Petroleum Release Sites
 - .2 ASTM E1912-98(2004), Guide for Accelerated Site Characterization for Confirmed or Suspected Petroleum Releases
 - .3 ASTM E1943-98(2015), Guide for Remediation of Ground water by Natural Attenuation at Petroleum Release Sites
- .3 Canadian Federal Legislation and Guidelines
 - .1 Canadian Environmental Protection Act (CEPA), 1999
 - .1 Regulation SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.
 - .2 Canadian Environmental Assessment Act (CEAA), 1995
 - .3 Canada Labour Code (R.S. 1985, c. L-2).
 - .1 Part II (September 2000) - Occupational Health and Safety.
 - .4 Transportation of Dangerous Goods Act (TDGA), 1992
 - .5 Motor Vehicle Safety Act (MVSA), 1995
 - .6 Canadian Council of Ministers of the Environment (CCME)
 - .1 CCME PN1326, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.
 - .2 CCME PN 1299-2006, Canadian Environmental Quality Guidelines.
 - .1 Chapter 7-2006, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health.
- .4 CSA International
 - .1 CSA B139-19, Installation Code for Oil Burning Equipment, latest version.

- .5 National Research Council of Canada, Canadian Commission on Building and Fire Codes
 - .1 National Fire Code of Canada (2015).
- .6 National Fire Protection Agency (NFPA)
 - .1 NFPA 30: Flammable and Combustible Liquids Code.
 - .2 NFPA 326: Standard for Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair.
 - .3 NFPA 329: Recommended Practice for Handling Releases of Flammable and Combustible Liquids and Gases (the most up-to-date)
- .7 Public Services and Procurement Canada (PSPC)
 - .1 PSPC Storage Tank System Withdrawal and Removal Form (**Appendix B**).
- .8 Technical Standards and Safety Authority (TSSA)
 - .1 Ontario Technical Standards and Safety Act (2000)
 - .1 FS-219-16, Fuel Oil Code Adoption Document (Fuel Oil CAD).
 - .2 Ontario Regulation O.Reg 213/01- Fuel Oil.
 - .3 Ontario Regulation O.Reg 215/01- Fuel Industry Certificates.
 - .4 Ontario Regulation O.Reg 216/01- Certification of Petroleum Equipment Mechanics.
 - .5 Ontario Regulation O.Reg 223/01- Codes and Standards Adopted by Reference.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide required information in accordance with Section 21 05 00 – Common Work Results for Mechanical.
- .2 Refer to PART 3.2 - STORAGE TANK REMOVAL PROCEDURES of this Section for tank removal documentation requirements pertaining to the Federal Regulations.
- .3 Provide electronic copies of the Contractor employees' valid licenses that certifies they are authorized to conduct fuel oil related work by the Technical Standards and Safety Authority (TSSA), as required for this work on Federal sites in Ontario. Refer to 1.5 – QUALITY ASSURANCE of this Section for additional requirements.
- .4 Submit a written report describing in detail procedures used to remove liquid from storage tanks, cleaning and removing of storage tanks, and disposal of liquid residues; provide verification that materials were disposed of in an environmentally responsible waste disposal facility; provide photographic documentation of work, including lab and field results, and receipts from disposal sites for tank and liquid residue.
- .5 Submit a written contingency plan for actions to be taken in the event of a release or emergency including:
 - .1 Emergency contact numbers;
 - .2 Classification of land use;
 - .3 Plans for covering/containing contaminated soil;
 - .4 Plans for site assessment/remediation work; and,
 - .5 Reducing risk to human health.

1.5 QUALITY ASSURANCE

- .1 Underground and aboveground fuel tank removal and disposal shall comply with requirements of authorities having jurisdiction.
- .2 Contractor must be licensed/certified by the TSSA for removal of underground and aboveground storage tanks. Provide electronic copies of the Contractor's TSSA-licensed employee's certificates, confirming they are authorized to conduct petroleum-related removal work. This shall be submitted within fifteen (15) days of contract award, and prior to the commencement of any demolition work on-site.
 - .1 This shall include personnel names, licenses/certificates, titles and numbers.
 - .2 For the underground system, personnel removing the tank and appurtenances from service shall have a valid PM.2 certificate in good standing with TSSA.
 - .3 For the aboveground system, personnel removing the tank and appurtenances from service shall have a valid OBT-1 certificate in good standing with TSSA.
 - .4 Regulatory Requirements: ensure Work is performed in compliance with CEPA, TSSA, CEAA, TDGA and other applicable Provincial regulations.

Part 2 Products

2.1 MATERIALS

- .1 Provide necessary materials, equipment and tarps to prevent further contamination of site, and for safe handling and containment of fuel, fuel storage and removed contaminated soils.

Part 3 Execution

3.1 PREPARATION

- .1 Provide all necessary personal protective equipment, purging and inert gases, and electrical protection equipment, and verify that equipment is working properly before starting work of this Section.
- .2 Conform to or exceed Federal and Provincial codes, local municipal by-laws, by-laws, and codes and regulations of utility authorities having jurisdiction.
- .3 Do construction occupational health and safety in accordance with Section 01 35 29.06 – Health and Safety Requirements.

3.2 STORAGE TANK REMOVAL PROCEDURES

- .1 Only the Contractor's appropriately TSSA-licensed employees may conduct the fuel oil piping and storage tank removal activities. Provide proof of adequate licensure of employees as stipulated under this specification Section.
- .2 Liquid Removal:
 - .1 Provide samples of liquids from fuel storage tanks to a certified hazardous waste testing facility for laboratory analysis and approval for liquid disposal and disposal location.
 - .2 Remove liquid from tanks, piping and all associated petroleum-containing equipment for disposal prior to removing tanks.
 - .3 Obtain disposal facility receipts noting proper liquid disposal.

- .3 Storage Tank Cleaning:
 - .1 Remove tank from ground, place it on ground adjacent to removal location, and secure it prior to cleaning.
 - .2 Measure levels of combustible vapours and oxygen, and ventilate tank if required to bring vapour or oxygen levels to safe limits:
 - .1 Ventilate tank using a small gas exhauster until vapour concentration is reduced to 10% or less of lower explosive limit.
 - .2 Oxygen content shall range from 19.5 to 23.5%.
 - .3 Cut access ports for cleaning into tank after vapour and oxygen concentrations are at a safe level.
 - .3 Clean tank by mopping, scraping, sweeping or steam cleaning interior of tank.
 - .4 Collect, contain and place residuals removed from tank in a 200 litre capacity drum for transporting and disposal acceptable to authorities having jurisdiction.
 - .5 Obtain disposal facility receipts noting proper effluent disposal.
- .4 Storage Tank Disposal:
 - .1 Verify that final vapour and oxygen concentrations are within requirements noted above before proceeding to cut and dismantle tank for its disposal.
 - .2 Remove dismantled tank to a disposal facility acceptable to authorities having jurisdiction.
 - .3 Remove all piping, devices and associated tank accessories in accordance with this section and Section 23 11 13 – Facility Fuel-Oil Piping.
 - .4 Obtain disposal facility receipts noting proper tank disposal.
- .5 Underground fuel storage tank: the underground tank and related system shall be drained, disposed of, and destroyed in accordance with the CEPA SOR/2008-197 Regulations, Sections 44 and 45.
 - .1 Conduct excavation around storage tank and backfilling in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.
 - .1 Do not undermine existing buildings or structures as part of the excavation activities.
 - .2 Ensure all liquids and sludge are removed and disposed of from the storage tank.
 - .3 Cleaning and removing of storage tank, and disposal of liquid residues. Ensure the tank is purged of all vapours to less than 10% of the lower flammability limit and the presence of vapours is checked with a combustible gas meter. The Contractor shall retain photographic evidence of such readings as proof for recordkeeping purposes.
 - .4 Affix a label the storage tank system's fill pipe stating that the system has been permanently removed from service.
 - .5 Provide photographic documentation of work, including lab and field results, and receipts from disposal sites for tank and liquid residue.
 - .6 Ensure the withdrawal of all systems are completed in such a way that there is no immediate or long-term harmful effects on the environment and it will not constitute a danger to human life or health. Provide verification that materials were disposed of in an environmentally-responsible manner at a licensed waste disposal facility by providing receipts as proof of proper fuel and storage tank disposal.

- .6 Notify the Departmental Representative within ten (10) business days of the fuel storage tank system removals, and provide the Departmental Representative with letter on the Contractor's letterhead (in searchable PDF format) stating the following at minimum:
 - .1 The extent of the fuel oil systems that were removed, including quantity and estimated volume of the fuel-oil tanks. Provide Environment and Climate Change Canada (ECCC) registration number.
 - .2 Identify the removal activities were conducted by the Contractor's appropriately TSSA-licensed employee. The letter shall be signed by the Contractor's appropriately TSSA-licensed employee, including their full contact information and TSSA license number.
 - .3 Identify the estimated volume of fuel removed due to the demolition of the fuel storage tank system, and acknowledge the oil was disposed off-site to a hazardous waste facility appropriately licensed to handle such material.
 - .4 Identify the date of the fuel oil and system removal.
 - .5 Provide the address of the hazardous waste facility where the material was disposed. Append a copy of disposal records (waybill) of the oil and tanks at the licensed facility.
 - .6 Acknowledge that the removal was conducted in such a manner that will have no immediate or long-term harmful effects on the environment, and the removal does not constitute a danger to human life or health.
 - .7 Append photographic evidence that the storage tank was purged to 10% of the lower flammability limit or lower prior to tank removal.
 - .8 State that the fuel storage tank system and its fuel was removed and disposed of in accordance with the CEPA SOR/2008-197 Regulations, Sections 44 and 45.
- .7 Contractor to provide signed, system-specific copies of PSPC Storage Tank System Withdrawal and Removal Form (**Appendix B**) within ten (10) working days of permanent withdrawal from service and removal.
 - .1 Electronic copies are acceptable. The Departmental Representative can provide a Microsoft Word version of the Form upon request.
 - .2 Contractor shall revise & resubmit Form within five (5) working days to address Departmental Representative's review comments.

3.3 REMOVED TANK AREA ASSESSMENT

- .1 Permit and facilitate the Departmental Representative's collection of six (6) soil samples from removed underground storage tank area as follows:
 - .1 One sample from each of sidewalls.
 - .2 Two samples from base.

3.4 SITE RESTORATION AND REMEDIATION

- .1 To CCME PN 1299.
- .2 Repair/replace finish grade to match surrounding asphalt area to avoid ponding around new tank concrete pad or low points in asphalt. The sloping shall be so as to maintain existing site drainage objectives.
- .3 Conduct backfilling, compaction and site restoration in accordance with requirements as stipulated under Divisions 31, 32, and 33.
- .4 In event of required site remediation, direction will be provided by the Departmental Representative.

3.5 CONTAMINATED SOIL REMEDIATION

- .1 Boundary of tank shall not to exceed 75 m³ of soil removed; work beyond this boundary will be considered as an extra to the Contract and shall be based on unit pricing.
- .2 Do not proceed with remediation actions until a written approval has been received by the Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 20 00 – Concrete Reinforcing
- .2 Section 03 30 00 – Cast-in-place Concrete
- .3 Section 03 35 00 – Concrete Finishing

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete, Includes Update No. 1 (2015).
 - .2 CAN/CSA O86-14, Engineering Design in Wood;
 - .3 CSA O121-17, Douglas Fir Plywood.
 - .4 CSA O153-13, Poplar Plywood.
 - .5 CSA O437 Series-93 (R2011), Standards for OSB and Waferboard.
 - .6 CAN/CSA-S269.3-M92 (R2013), Concrete Formwork.
- .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.3 SUBMITTALS

- .1 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CAN/CSA-S269.3 for formwork drawings.
- .2 Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Store and manage hazardous materials.
- .2 Waste Management and Disposal:
 - .1 Place materials defined as hazardous or toxic in designated containers.
 - .2 Divert wood materials from landfill to a recycling facility as approved by Departmental Representative.
 - .3 Divert plastic materials from landfill to a recycling facility as approved by Departmental Representative.
 - .4 Divert unused form release material from landfill to an official hazardous material collections site as approved by the Departmental Representative.

1.5 FORMWORK DESIGN

- .1 The specialized Contractor is entirely responsible for engineering, locating and building the formworks.
- .2 Every aspect of construction shall at all times comply with various government standards (municipal, provincial and federal standards) that govern the specialized Contractor's duties regarding worker safety on construction worksites.

1.6 FASTENERS

- .1 In all cases where fasteners not indicated on the drawings are required in concrete components to provide vertical or lateral support for architectural elements, pre-fabricated concrete components, parts for mechanical, electrical or other equipment, the structural design and engineering of these fasteners are the full and sole responsibility of the manufacturer who shall provide them, and shall in no way confer liability on the Departmental Representative.
- .2 The fasteners to which Paragraph 1.6.1 refers above include plates, angle irons and other hardware in direct contact with the concrete of components identified on the drawings, including rods, bolts, dowels and various anchoring devices wholly or partially embedded in this concrete.
- .3 The specialized Contractor shall nevertheless provide the Departmental Representative with a reproducible copy and a copy of the shop drawings, for information purposes, clearly indicating the location of all fasteners required as well as the intensity and direction of the stresses that each of the fasteners exert on the concrete components. These drawings stamped by an engineer member of P.E.O shall have been approved for construction beforehand by the Departmental Representative.

1.7 FORMWORK MATERIALS

- .1 Formwork materials:
 - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121, CAN/CSA-O86, CSA O437 Series and CSA-O153.
 - .2 For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.
 - .3 Rigid insulation board: to CAN/ULC-S701.
- .2 Form ties:
 - .1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
 - .2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.

- .3 Form release agent: non-toxic, biodegradable and low VOC.
- .4 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity 24 mm²/s at 40°C, flashpoint minimum 150°C, open cup.
- .5 Form release oil with chemical properties, containing compounds that react with the free lime in the concrete to form insoluble soaps in the water and prevent the concrete from adhering to the form.
- .6 Sleeves, fasteners, anchors and other parts embedded in concrete meet the requirements of the drawings and specifications, and comply with Sections 6.2 and 6.7 of the CAN/CSA-A23.1/A23.2 standard. Sleeves embedded in concrete shall be equipped with a steel water barrier able to withstand a minimum of 60 kPa of hydrostatic pressure or the pressure in the line if it is greater.

1.8 CONCRETE ACCESSORIES

- .1 Auxiliary backer rod for joints: closed cell polyethylene foam, diameters required based on the dimensions shown on the drawings.
- .2 Joint sealer: two-component, polyurethane-based product with a chemical cure, in compliance with the CAN/CGSB-19.24 standard.
- .3 Primer for use with joint sealer: Xylene based primer.
- .4 Reinforcement steel: according to Section 03 20 00 – Concrete Reinforcing.
- .5 Embedded steel components: in compliance with the requirements of the CSA-G40.21 standard, 300 MPa grade.
- .6 Sealant for cracks to be pressure injected: two-component (2) epoxy paste, 100% solids, moisture tolerant.
- .7 Epoxy for cracks to be pressure injected: two-component (2) structural epoxy paste, 100% solids, moisture tolerant, low viscosity.
- .8 Mechanical rebar coupler: Mechanical couplers must develop 120% of the steel rebar's tension.
- .9 Ribbed waterproofing joint polyvinyl chloride (PVC) extruded with the following properties:
 - .1 Minimum Tensile strength: 11.4 MPa (ASTM D412-80 Standard Method "C");
 - .2 Elongation: 275% (ASTM D418-80 Standard Method "C");
 - .3 Tear strength: 50 kN / m (ASTM D624-73 Standard Method "B").
- .10 Sealer for concrete surfaces: acrylic carnauba wax.

- .11 Repair grout: Non-shrink cementitious grout.
- .12 Sealing mortar: After the injection is completed, fill the cracks with an epoxy mortar.
- .13 Epoxy repair grout: Three-component (3) epoxy.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 FABRICATION AND ERECTION

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Refer to architectural drawings for concrete members requiring architectural exposed finishes.
- .5 Do not place shores and mud sills on frozen ground.
- .6 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .7 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .8 Align form joints and make watertight.
 - .1 Keep form joints to minimum.
- .9 Use 20 mm chamfer strips on external corners and/or 20 mm fillets at interior corners, joints, unless specified otherwise.
- .10 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .11 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
 - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

- .12 Line forms for following surfaces:
 - .1 Outer face of outside slabs on grade.
 - .2 Secure lining taut to formwork to prevent folds.
 - .3 Pull down lining over edges of formwork panels.
 - .4 Ensure lining is new and not reused material.
 - .5 Ensure lining is dry and free of oil when concrete is poured.
 - .6 Application of form release agents on formwork surface is prohibited where drainage lining is used.
 - .7 If concrete surfaces require cleaning after form removal, use only pressurized water stream so as not to alter concrete's smooth finish.
 - .8 Cost of textile lining is included in price of concrete for corresponding portion of Work.
- .13 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

3.2 ANCHORS, SLEEVES AND EMBEDDED PARTS

- .1 In all cases, the specialized Contractor must take into account the use of special cement types and supplementary cementing materials in concrete for the required length of time prior to removal of the formwork.
- .2 Provide and install in the forms, the sleeves, fasteners, anchor plates and other embedded components required in the drawings and/or specifications, in compliance with Section 6.7 of the CAN/CSA-A23.1/A23.2 standard.
- .3 Provide and install in the forms, the anchor bolts for fasteners and machinery as shown and detailed in the drawings, in compliance with Section 6.7 of the CAN/CSA-A23.1/A23.2 standard.
- .4 Install in the forms, the sleeves, conduits and ducts provided by others at the levels and locations shown on the mechanical, electrical, procedural and architectural drawings.
- .5 In all cases, comply with the installation tolerances specified in Article 13.3 of the CAN/CSA A23.1/A23.2 standard.
- .6 In slabs, place conduits between the upper and lower rows of reinforcement.
- .7 Install sleeves, conduits and ducts in compliance with the following requirements:
 - .1 The exterior diameter of the sleeves, conduits or ducts shall not exceed one third of the thickness of the beams, slabs or walls in which they are embedded;
 - .2 The centreline between adjacent components must be greater than or equal to three diameters;
 - .3 These parts shall not be positioned in a manner that reduces the strength of the structure;
 - .4 These parts shall not be embedded in ground slabs exposed to the weather;
- .8 If the requirements of Paragraph 3.2.6 cannot be met, notify the Departmental Representative and await his instructions on how to proceed.
- .9 Make sure aluminum sleeves, conduits or ducts embedded in concrete are covered or adequately coated to protect them against aluminum corrosion.

- .10 Submit a sleeve location plan for approval by the Departmental Representative.
- .11 Coordinate with subcontractors responsible for their supply the delivery (to the construction site) and the installation in the formwork of accessory parts.
- .12 It is forbidden to place in the formwork any accessory parts which are not indicated in the drawings, or required in the specifications or the drawings referred to in Paragraph 3.2.2 above, unless the Departmental Representative so authorizes.

3.3 REMOVAL OF THE FORMS

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 Seven (7) days for beam soffits, slabs, decks and other structural members.
- .2 Remove the formwork when the concrete has reached 70% of its design strength or after the minimum curing period previously specified, whichever of these cases and immediately put back in place the appropriate shoring.
- .3 In all cases, the specialized Contractor must take into account the use of special cement types and supplementary cementing materials in concrete for the required length of time prior to removal of the formwork.
- .4 Remove the formwork and dismantle the falsework in compliance with Article 6.5.3.5 of the CAN/CSA-A23.1/A23.2 standard, unless otherwise indicated.
- .5 Do not disturb or remove the formwork or falsework as long as the concrete has not become strong enough to support its own weight and the load it supports.
- .6 Unless otherwise indicated, leave the formwork in place after the concrete has been poured for the following lengths of time:
 - .1 Slabs and beam soffits: 3 days if all the supports removed to enable the removal of each of the form panels are immediately reinstalled within 30 minutes or less, and remain in place until expiry of the aforementioned 28-day period;
- .7 The periods of time specified above represent a cumulative number of hours, days or fractions of days, not necessarily consecutive, during which the ambient temperature is maintained above 10°C.
- .8 Do not remove the forms unless the Departmental Representative authorizes their removal because he is satisfied with the measures taken to ensure the concrete cures properly and the concrete is protected against cold or heat and the weather.
- .9 However, the Departmental Representative may approve the removal of the formworks if the non-destructive trials on the concrete placed in beam and slab forms indicate that the concrete has achieved 80% of the compression strength specified in Section 03 30 00 – Cast-in-place Concrete of these specifications. The non-destructive trials mentioned above shall have a recognized value and be approved by the Departmental Representative; he will determine beforehand the locations where they are to be performed. The costs of all these trials shall be borne by the specialized Contractor.
- .10 Even when the Departmental Representative has authorized him to remove the forms, the specialized Contractor remains solely responsible for all damage caused to concrete components if action is taken prematurely.

- .11 Depending on weather conditions, the placement of the concrete and curing conditions, the Departmental Representative may specify a minimum period of time that must elapse before the forms are removed from the various pours.
- .12 Re-use formwork subject to requirements of CSA-A23.1/A23.2.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 00 10 – General Instructions.
- .2 Section 03 10 00 – Concrete Forming and Accessories
- .3 Section 03 30 00 – Cast-in-place Concrete
- .4 Section 03 35 00 – Concrete Finishing

1.2 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 ACI 315-99, Details and Detailing of Concrete Reinforcement.
- .2 CSA International
 - .1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CSA-A23.3-14, Design of Concrete Structures.
 - .3 CSA-G30.18-09 (R2014), Carbon Steel Bars for Concrete Reinforcement, Includes Update No. 1 (2012).
 - .4 CSA W186-M1990 (R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .3 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 10 – General Instructions.
- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and ACI 315.
- .3 Shop Drawings:
 - .1 Submit drawings to Departmental Representative.
 - .1 Indicate placing of reinforcement and:
 - .1 Bar bending details.
 - .2 Lists.
 - .3 Quantities of reinforcement.
 - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.

1.4 QUALITY ASSURANCE

- .1 Mill Test Report: provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.

- .2 Submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

1.6 SAMPLING, TRIALS AND INSPECTION

- .1 Provide the Departmental Representative with free access to the plant and the construction site at all times to enable him to verify, examine and supervise the quality of materials and their manufacture, and if required, take samples for testing, trial and analytical purposes.
- .2 Pouring of the concrete is not authorized before the Departmental Representative has inspected and approved the reinforcement in place.
- .3 At his request, send the Departmental Representative one (1) copy of the certificates issued by the steel mill attesting to the chemical composition and physical properties of the steel used to manufacture the reinforcement.
- .4 Upon request, inform the Departmental Representative regarding the proposed source of supply for the materials to be provided.

1.7 SHOP DRAWINGS

- .1 Submit for review and comments, all shop drawings for all steel reinforcement for the work in compliance with the following requirements.
- .2 The format of the reinforcement drawings shall be the same as that of the drawings upon which they are based.
- .3 The drawings submitted shall include three (3) copies of each reinforcement drawing. The drawings shall be accompanied by three (3) photocopies of each purchase order. One (1) corrected copy of the shop drawings shall be returned to the Contractor. The Contractor shall be responsible for making any additional copies he requires.
- .4 The reinforcement drawing shall clearly indicate:
 - .1 The number, nominal diameter, length, position, spacing and bending details of each type of bar shown on the drawings.
 - .2 The bar-supports, separators, additional bars and other accessories required to support and fasten the reinforcements while the concrete is being poured.
- .5 When not specified in the plans:

- .1 Reinforcement overlap and sealing lengths shall comply with the requirements of Articles 7 and 12 of the CSA-A23.3 standard. Unless otherwise indicated on the drawings, all overlaps shall be Class B (1.3 Lc), in compliance with Table 17b: overlapping requirements for upper reinforcement in the Reinforcing Steel Institute of Canada's manual of standard practice.
- .2 Overall dimensions of hangers, ties and coils shall comply with the minimum concrete cover thicknesses stipulated in Article 6.6.6 of the CAN/CSA A23.1/A23.2 standard.
- .6 Unless otherwise indicated in the drawings, the hooks required at the end of certain bars, including hangers, ties and spirals are all "standard hooks", which shall comply with the description provided in Articles 6.6.2 of the CAN/CSA A23.1/A23.2 standard.
- .7 The reinforcement shall be marked so that it is easy to find on the purchase orders.
- .8 The Contractor shall provide shop drawings so the Departmental Representative has at least ten (10) working days to examine and comment on the shop drawings, which are submitted at each phase of the concrete work.
- .9 The reviewed shop drawings, which may or may not be annotated by the Departmental Representative, shall be returned to the specialized Contractor, who shall revise these drawings and resubmit them to the Departmental Representative for review and comment, if required. However, if the Departmental Representative finds that too many revisions are required, he shall return the drawings without annotating them; in addition, if the drawings need to be submitted more than twice, the Departmental Representative shall withhold funds from the specialized Contractor to pay for the cost of the Departmental Representative's additional reviews.
- .10 The specialized Contractor is solely responsible for the accuracy of his drawings; he cannot claim any supplement for delays caused by the discovery, on site, of errors or omissions on his own drawings, even if they have been reviewed by the Departmental Representative.
- .11 Unless otherwise indicated, use steel reinforcement details that comply with the most recent edition of the Reinforcing Steel Manual of Standard Practice published by the Reinforcing Steel Institute of Canada.
- .12 Wait for final approval of the shop drawings before cutting and bending the rebar.
- .13 Submit the steel schedules that match the various shop drawings at the same time as the shop drawings.

Part 2 Products

2.1 MATERIALS

Description	Standards
• Weldable high adherence steel reinforcement bars made of low alloy weldable steel, weldable category (W).	CAN/CSA G30.18 Grade 400
• Chairs, bar chairs, bar supports, spacers (rustproof)	CSA A23.1/A23.2

2.2 SUBSTITUTES

- .1 Obtain the Departmental Representative's written approval to substitute specified bars with bars of different dimensions, and to change spacing, overlapping or bending specified on the drawings.

2.3 FABRICATION

- .1 Form the bars at the factory, in compliance with requirements of the CAN/CSA-A23.1/A23.2 standard.
- .2 Unless otherwise indicated, forming tolerances are those indicated in Chapter 6 of the Reinforcing Steel Manual of Standard Practice published by the Reinforcing Steel Institute of Canada. Bars that do not comply with these tolerances shall be rejected.
- .3 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .4 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.

2.4 IDENTIFICATION

- .1 Clearly identify bar and wire fabric lots to conform to the shop drawings and steel schedules before shipping them to the construction site.
- .2 Use factory-labelled reinforcement bars. The label identifies the size, quality and manufacturer of the bar. All unlabelled bars shall be rejected.

2.5 SOURCE QUALITY CONTROL

- .1 Provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.
- .2 Inform Departmental Representative of proposed source of material to be supplied.

Part 3 Execution

3.1 FIELD BENDING

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.
- .2 When field bending is authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars, which develop cracks or splits.

3.2 PLACING REINFORCEMENT

- .1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.
- .2 Use plain round bars as slip dowels in concrete.

- .3 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .4 Ensure cover to reinforcement is maintained during concrete pour.

3.3 MANUFACTURE OF REINFORCEMENT

- .1 The manufacture of the reinforcement shall not start until the Departmental Representative has reviewed the drawings of this reinforcement.
- .2 Cut and bend the bar in strict compliance with the details shown on the drawings and in accordance with the requirements of the CSA-A23.1/A23.2 standard.
- .3 No substitution of the bars shown on the reinforcement drawing shall be allowed without the Departmental Representative's authorization.
- .4 Take every precaution to avoid deforming or dirtying the reinforcement during transportation, handling and storage.

3.4 REINFORCEMENT INSTALLATION

- .1 Assemble and install the rebar with care and tie it with black annealed drawn steel wire. Use a pattern and number of supports that comply with Section 6.6.7 of the CAN/CSA-A23.1/A23.2 standard.
- .2 Install the rebar and keep it in place during the pouring of the concrete in compliance with the tolerances stipulated in Section 6.6.8 of the CAN/CSA-A23.1/A23.2 standard.
- .3 Unless otherwise indicated on the drawings or in Section 3.7 of these specifications, the minimum concrete cover thickness around reinforcement bars is that stipulated for each of the various structural components in Article 6.6.6 of the CAN/CSA A23.1/A23.2 standard.
- .4 If required, before placing the rebar in the formwork, remove all excess rust, scale, mud, oil and any other dirt likely to reduce the concrete's adherence.
- .5 Use an adequate number of support bars of the height and rigidity required to ensure all concrete coverage of the rebar complies with the thicknesses stipulated on the drawings and in the standards.
- .6 Have the Departmental Representative approve the rebar and its installation, before pouring the concrete. The Departmental Representative shall have 48 hours to approve the steel reinforcement before the concrete is poured.

3.5 OVERLAPS

- .1 Overlap the reinforcement as indicated on the drawings and typical details.
- .2 Overlap lengths and extension lengths of bars beyond critical points shall comply with the CSA-A23.3 standard. Unless otherwise indicated on the drawings, all overlaps shall be Class B (1.3 Lc), in compliance with Table 17b: overlapping requirements for upper reinforcement in the Reinforcing Steel Institute of Canada's manual of standard practice.
- .3 Obtain the Departmental Representative's approval for the locations of reinforcement overlaps other than those shown on the drawings.

3.6 WELDING

- .1 Do not weld steel rebar without the Departmental Representative's written authorization.
- .2 Where permitted by the Departmental Representative, perform the welding work in compliance with Section 6.6.10 of the CAN/CSA-A23.1/A23.2 standard and the requirements of the CSA W186 standard. When welding is performed, the use of category W weldable bars is mandatory.
- .3 All welding work shall be assigned to a company accredited by the Canadian Welding Bureau and shall be performed in compliance with the requirements of the most recent version of the CSA W186 standard. Prior to starting any welding work, submit to the Departmental Representative for verification, all details regarding the welds to be performed. In this case, the steel reinforcement to be welded shall comply with the requirements of the most recent version of the CSA G30.16 standard. Pre-heat all steel reinforcement as required by these standards.

3.7 REINFORCEMENT COVERAGE

- .1 Unless otherwise indicated on the drawings, the reinforcement bars shall be installed at the following specific distances from the surface of the concrete:

Concrete Coverage			
Exposure condition	Non Exposed	Exposed	Exposed to Chloride
Permanent concrete poured directly on ground	-	75 mm	75 mm
1. Beams, columns and piles	30 mm	40 mm	60mm
2. Slabs, walls and concrete floor joist.	20 mm	40 mm	60 mm
Ratio between the coverage and the nominal diameter of the bars	1	1.5	2
Ratio between the coverage and the maximum measurement of the aggregate.	1	1.5	2

- .2 For conditions of the preceding table, the ratio between coverage and the maximum size of the aggregate as well as the ratio between the coverage and the nominal diameter of the bars shall be at least 1.5 for concrete exposed to the ground and weather, and 1.0 for concrete not exposed to the ground and weather.

3.8 STORAGE AND DELIVERY

- .1 Deliver the reinforcement and wire fabric to the construction site in clearly identified lots.
- .2 Handle the reinforcement and wire fabric with care to avoid deforming them.
- .3 As soon as they are delivered on site, properly stack the steel reinforcement and wire fabric on wood skids to protect them against rust and keep them off the ground.
- .4 When there is snow; cover all stored steel with a woven tarp to protect it from the weather.
- .5 During transportation and handling, use a covering to protect the parts of the bars coated with epoxy and paint.

3.9 REINFORCEMENT DOWELLING

- .1 The installation of reinforcement dowels in concrete that has already been poured shall be performed using a chemical anchoring system.
- .2 The sealing length of the dowels is that indicated in the sealing lengths table provided on the drawings.

3.10 ON-SITE TOUCH-UPS

- .1 Using a compatible finishing product, touch up damaged or cut ends of galvanized or epoxy-coated reinforcement to provide a continuous coat.

3.11 CLEANING

- .1 In order for the pouring of the concrete to take place, the condition of the reinforcement bars shall comply with Section 6.1.5 of the CAN/CSA A23.1/A23.2 standards.
- .2 If required, clean the reinforcement immediately before the concrete is poured.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 00 10 – General Instructions.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 10 00 – Concrete Forming and Accessories
- .2 Section 03 20 00 – Concrete Reinforcing
- .3 Section 03 35 00 – Concrete Finishing

1.2 REFERENCES

- .1 Abbreviations and Acronyms:
 - .1 Cement: hydraulic cement or blended hydraulic cement (XXb – where b denotes blended).
 - .1 Type GU or GUb – General use cement.
 - .2 Type MS or MSb – Moderate sulphate-resistant cement.
 - .3 Type MH or MHb – Moderate heat of hydration cement.
 - .4 Type HE or Heb – High early-strength cement.
 - .5 Type LH or LHb – Low heat of hydration cement.
 - .6 Type HS or HSb – High sulphate-resistant cement.
 - .2 Fly ash:
 - .1 Type F – with CaO content less than 8%.
 - .2 Type CI – with CaO content ranging from 8 to 20%.
 - .3 Type CH – with CaO greater than 20%.
 - .3 GGBFS – Ground, granulated blast-furnace slag.
- .2 Reference Standards:
 - .1 ASTM International:
 - .1 ASTM C260/C260M-10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C494/C494M-2016, Standard Specification for Chemical Admixtures for Concrete.
 - .3 ASTM C1017/C1017M-13e1, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - .2 CSA International:
 - .1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A283-06(R2016), Qualification Code for Concrete Testing Laboratories, Includes Update No. 1 (2007), Update No. 2 (2013).
 - .3 CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005), Includes Update No. 1 (2014), Update No. 2 (2014), Update No. 3 (2014), Update No. 4 (2016).

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: convene pre-installation meeting one week prior to beginning concrete works.

- .1 Ensure site supervisor, Departmental Representative and testing laboratories attend.
 - .1 Verify project requirements.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide testing results and reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .2 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 – ON-SITE QUALITY CONTROL.
- .3 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.
- .4 Provide two copies of WHMIS MSDS in accordance with Section 01 35 29.06 – Health and Safety Requirements.
- .5 At least 4 weeks prior to starting concrete work, provide the Departmental Representative with copies of the manufacturer's trial reports, as well as a certificate issued by a qualified independent testing and inspection laboratory attesting that the materials listed hereinafter will comply with the specified requirements.
 - .1 Portland cement.
 - .2 Blended hydraulic cement.
 - .3 Supplementary cementing materials.
 - .4 Grout.
 - .5 Admixtures.
 - .6 Aggregates.
 - .7 Water.
 - .8 Waterstops.
 - .9 Waterstop joints.
 - .10 Joint filler.

1.5 QUALITY ASSURANCE

- .1 Provide Departmental Representative, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
 - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.
- .2 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:
 - .1 Hot weather concrete.
 - .2 Cold weather concrete.
 - .3 Curing.
 - .4 Finishes.
 - .5 Formwork removal.
 - .6 Joints.
- .3 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 – PRODUCTS.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements:
 - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
 - .1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
 - .2 Deviations to be submitted for review by Departmental Representative.
 - .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.
- .2 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 00 10 – General Instructions.

Part 2 Products

2.1 DESIGN CRITERIA

- .1 Alternative 1 – Performance: to CSA A23.1/A23.2, and as described in MIXES of PART 2 – PRODUCTS.

2.2 PERFORMANCE CRITERIA

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Departmental Representative and provide verification of compliance as described in PART 1 – QUALITY ASSURANCE.
- .2 The concrete producer assumes responsibility for concrete mix proportioning and performance of the concrete as delivered, and the Contractor assumes responsibility for the concrete in place.

2.3 MATERIALS

- .1 Cement: Type MS, MSB or LH (unless otherwise specified) Portland cement that complies with the CSA-A3000 standard. Only use one recognized brand of cement per type of concrete for the entire contract.
- .2 Fine aggregate: of normal density, complying with Articles 4.2.3 of the CAN/CSA-A23.1/A23.2 standard. The aggregate may be natural sand or manufactured sand containing at least 20% natural sand.
- .3 Coarse aggregate: of normal density, complying with Articles 4.2.3 of the CAN/CSA-A23.1/A23.2 standard. The particles shall be clean, durable and free from dust and harmful material and shall contain less than 20% flat or elongated particles. Loss shall be less than 12% after 5 cycles of the magnesium sulphate soundness test. The Los Angeles abrasion test loss shall be less than 50%. The aggregates shall not contain fine-grained limestone and crystalline limestone. The maximum aggregate size shall be 20 mm, unless otherwise indicated. Subject to the Departmental Representative's approval, a 13 mm maximum aggregate size may be used in certain areas where concrete flow is restricted.
- .4 Mixing water: complies with Section 4.2.2 of the CAN/CSA-A23.1/A23.2 standard.
- .5 Air-entraining admixture: complies with the ASTM C260 standard.
- .6 Chemical and pozzolanic mineral admixtures: comply respectively with the requirements of the ASTM C494/C494M and ASTM C1017/C1017M standards. The use of calcium chloride or admixtures that contain CaCl₂ is not allowed. The Departmental Representative must approve accelerators or retarders during hot and cold weather concrete work.
- .7 Non-shrink mortar for concrete repairs: pre-mixed Portland cement-based product containing a non-metal aggregate and a plasticizer, capable of achieving at least 35 MPa of compression strength at seven (7) days.
- .8 Superplasticizer: complies with requirements of the ASTM C494/C494M standard.
- .9 Supplementary Cementing Materials: comply with the CSA-A3000 standard.

- .10 Set retarders: comply with the ASTM C494 water-based, low VOC content, solvent-free standard. The set retarder film shall never be exposed to humidity.
- .11 Concrete Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2.
 - .1 Compressive strength: 30 MPa at 28 days.
- .12 Non premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 30 MPa at 28 days.
- .13 Anchor Bolts for housekeeping pads: to CSA-G40.20/G40.21, Grade 350W;

2.4 MIXES

- .1 Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.
 - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
 - .2 Provide quality management plan to ensure verification of concrete quality to specified performance.
 - .3 Concrete supplier's certification: both batch plant and materials meet CSA A23.1 requirements.
- .2 Assume responsibility for the mix of each type of concrete required, while taking into account the requirements described in Section 2.1 of these specifications and the following criteria in compliance with possibility No. 1 presented in Table 5 of the CAN/CSA-A23.1/A23.2 standard.
 - .1 Types of concrete: normal density concrete
 - a) Concrete for slab on grade and curb
 - .1 Tested compression strength: 35 MPa at 28 days, unless otherwise indicated on the drawings.
 - .2 Cement type: GU.
 - .3 Exposure category (Table No. 1, CSA-A23.1/A23.2): C1
 - .4 Chemical admixtures: that complies with the ASTM C494/C494M standard.
 - .5 Normal density concrete.
- .3 Obtain the Departmental Representative's approval for all admixtures used in concrete mixes (superplasticizers and required air-entrainers or other admixtures needed for any specific purpose, designated by the specialized Contractor). The use of calcium chloride is prohibited.
- .4 Provide a sample of the admixture(s) used, at the Departmental Representative's request.
- .5 Follow the manufacturer's instructions when using admixtures.
- .6 The specialized Contractor is responsible for ensuring the admixtures are compatible with one another and with the materials included in the mix.
- .7 Enter the type and quantity of the admixture(s) used on the concrete shipping slip.

- .8 The use of an admixture shall never reduce the soundness of the concrete or its ability to withstand freezing and thawing.

2.5 CONCRETE CONTROL

- .1 Concrete quality control performed in compliance with the CAN/CSA-A23.1/A23.2 standard by a designated laboratory at the General Contractor's expense.
- .2 Submit to the laboratory for approval, proposed formulas for batching the mixes for each class of concrete; specify the type and brand of all admixtures used.
- .3 Provide the laboratory with samples of the fine and coarse aggregates that will be incorporated into the concrete blends and identify the quarry they come from. Unless otherwise directed in writing by the Departmental Representative.
- .4 Notify the laboratory at least 24 hours before each concrete pour, whatever the volume involved.
- .5 Cooperate with sampling and facilitate testing. Provide free access to the structures. Provide the required concrete at no cost. If applicable, protect and provide a storage area for the samples taken.
- .6 The concrete's compression strength shall be checked during construction by taking 3 core samples per 75 m³ poured or at least 3 core samples per pour. The Departmental Representative may ask the laboratory to produce a fourth core sample and let it cure on the construction site as a control sample. A sample shall be crushed on the 7th day; the two other samples shall be crushed on the 28th day.
- .7 The cylinders shall be numbered consecutively and the laboratory report shall indicate the exact location of the concrete they represent in the framework, as well as the number of the truck that delivered the concrete.
- .8 The laboratory shall measure the concrete slump and air content every time it samples the concrete for strength tests and as often as necessary depending on the type of structure to be built.
- .9 Provide a sheltered location on site where the concrete core samples can be stored at an ambient temperature ranging from a minimum of 10°C to a maximum of 25°C before they are shipped to the trial laboratory.
- .10 If the core sample test results do not comply with Article 4.4.6.7 of the CAN/CSA A23.1/A23.2 standard, the Departmental Representative may require that Section 4.4.6.8 of the standard be applied.
- .11 The specialized Contractor is solely responsible for the all concrete work required to complete the structures as indicated on the drawings or stipulated in the Specifications. All work that does not meet the requirements of the Specifications, for any reason whatsoever (quality of materials, batching, placement, strength, impermeability, etc.), shall be modified in compliance with the Departmental Representative's requirements, or it shall be completely demolished and rebuilt in compliance with the provisions of the Specifications and drawings, at the specialized Contractor's expense.

Part 3 Execution

3.1 PREPARATION

- .1 Obtain Departmental Representative's written approval before placing concrete.
 - .1 Provide 24 hours minimum notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 – Concrete Reinforcing.
- .3 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
 - .3 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .4 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .5 Protect previous Work from staining.
- .6 Clean and remove stains prior to application for concrete finishes.
- .7 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .8 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.
 - .1 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.
- .9 Do not place load upon new concrete until authorized by Departmental Representative.

3.2 MANUFACTURE AND DELIVERY OF THE CONCRETE

- .1 Provide ready-to-use concrete manufactured in a concrete plant, transported and discharged at the site in compliance with Section 5.2 of the CSA-A23.1/A23.2 standard, or provide concrete manufactured on site in compliance with all Section 18 requirements. If the second alternative is chosen, submit the entire procedure to the Departmental Representative for approval.
- .2 The manufacturer of the ready-to-use concrete is solely responsible for batching the concrete, and he shall personally, at his expense, take all necessary measures to ensure the quality and uniformity of his product.
- .3 Require that the concrete supplier provide a delivery slip for each load of concrete and provide the Departmental Representative with a copy of these slips. The slips shall contain the following information: name and address of the supplier's company, truck number, specialized Contractor's name, project name and location, class of concrete, cumulative quantity, start of discharge, end of discharge, maximum size of aggregate, slump and air-entrainment required, types of admixtures used, quantity and type of cement and quantity of water.

- .4 The addition of water to the mix after the initial batching shall only be carried out in strict adherence with Article 5.2.4.3.2 of the CAN-A23.1/A23.2 standard, but the maximum quantity used shall be 6 l/m³. Submit all anticipated additions to the Departmental Representative for approval and control. Indicate on the delivery slip the quantity of all water added at discharge.
- .5 Plan the manufacture of the concrete and schedule the deliveries to the site so that each pour can be performed without any interruptions. Each batch of concrete shall be completely discharged into the forms within two (2) hours of beginning of batching.
- .6 Never remix concrete or mortar that has started to set.
- .7 The temperature of the concrete at discharge shall be within the range presented in Table 14 of the CSA A23.1/A23.2 standard and shall be controlled according to Article 5.2.4.4 of the same standard. Use all protective measures required for this purpose.
- .8 No aluminum component shall be used to batch, transport or place the concrete.

3.3 INSTALLATION / APPLICATION

- .1 Do cast-in-place concrete work to CSA A23.1/A23.2.
- .2 Sleeves and inserts:
 - .1 Do not permit penetrations, sleeves, ducts, pipes, or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by Departmental Representative.
 - .2 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.
 - .3 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by Departmental Representative.
 - .4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Departmental Representative before placing of concrete.
 - .5 Confirm locations and sizes of sleeves and openings shown on drawings.
- .3 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete
- .4 Carry out the consolidation of the concrete using models and sizes of mechanical vibrators approved by the Departmental Representative.
- .5 Select an appropriate type and number of vibrators and use them in accordance with Section 7.2.5 of the CSA-A23.1/A23.2 standard.
- .6 Bind the fresh concrete with rock or hardened concrete in accordance with Section 7.2.2 of the CSA-A23.1/A23.2 standard.
- .7 Saturate hardened concrete surfaces with water immediately before pouring concrete on these surfaces.
- .8 Lay the concrete without interruption or in layers thick enough that each new layer will bind with the underlying layers before they have hardened enough to form cold joints.

- .9 If difficulties arise during pouring, change the concrete formula following the laboratory's directives and use the admixture(s) prescribed by the laboratory, and assume all expenses for this procedure.
- .10 Anchor bolts:
 - .1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.
 - .2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from Departmental Representative.
 - .1 Drilled holes: 2 mm minimum diameter larger than bolts used.
 - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
 - .4 Set bolts and fill holes with epoxy grout.
 - .5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
- .11 Grout under base plates and machinery using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.

3.4 CONCRETE CURING

- .1 The concrete shall be cured according to the requirements of Chapter 7.4 of the CSA-A23.1/A23.2 standard. Walls and slabs 500 mm thick or thicker are considered mass concrete.
- .2 The concrete shall be cured using two layers of jute kept moist at all times.
- .3 Slabs and other unformed surfaces shall be kept moist for a period of at least 7 days.
- .4 When the outside temperature exceeds 20°C for mass concrete or otherwise 27°C, keep the forms moist before pouring the concrete and throughout the entire time they remain in place.
- .5 In cold weather, water curing ends 12 hours before the end of protection.
- .6 Throughout the entire cure, the concrete shall never be under any load and shall be adequately protected against violent shocks, excessive vibration, weather and other disturbances.

3.5 CONCRETE PROTECTION

- .1 In hot weather, the concrete shall be protected according to Article 7.4.2.4 of the CAN/CSA-A23.1/A23.2 standard.
- .2 Concrete components containing silica fume shall be protected from drying according to Article 7.4.2 of CAN/CSA-A23.1/A23.2 standard.
- .3 Other concrete components shall be protected from dry out based on Appendix D – Geotechnical Report of the CAN/CSA A23.1/A23.2 standard.
- .4 In cold weather, the concrete shall be protected according to Article 7.4.2.5 of the CAN/CSA-A23.1/A23.2 standard.

3.6 FINISHING OF FORMED SURFACES

- .1 Clean and finish the formed surfaces in compliance with Section 7.7.3 of the CAN/CSA-A23.1/A23.2 standard. All surfaces require to be semi-rough formed surfaces in accordance with Article 7.7.3.6 of the CSA-A23.1/A23.2 standard.
- .2 Fill the holes left by the form ties in compliance with Section 03 10 00 – Concrete Forming and Accessories of these specifications.

3.7 CONCRETE REPARATION

- .1 Remove and replace all damaged or defective concrete with concrete that meets the specifications and requirements of the drawings.
- .2 After the forms have been removed, the Departmental Representative shall examine all voids, honeycombs and other defects. If applicable, submit the methods for repairing the voids, honeycombs and other defects to the Departmental Representative for approval. Do not repair any of the surfaces before having received the Departmental Representative's authorization.
- .3 Wherever possible, repair formed surfaces as soon as possible after the forms have been removed.
- .4 Cover the concrete surfaces with epoxy-based glue before performing concrete or mortar repairs.
- .5 The product used shall comply with Paragraph 2.3.7 of this section.

3.8 CUTS, DRILL HOLES AND CUT-OUTS IN HARDENED CONCRETE

- .1 Components that have already been poured shall never be cut, drilled or cut-out for any reason whatsoever, unless the Departmental Representative has authorized these procedures.
- .2 Any cut, drill hole or cut-out in hardened concrete authorized by the Departmental Representative shall be performed at the specific location, using the exact dimensions he has approved. Use rotary tools that prevent the concrete from shattering.

3.9 TOLERANCES

- .1 If the tolerances specified in Article 6.4 of the CSA-A23.1/23.2 standard have not been met during the construction of any component of a structure shown on the drawings, the Departmental Representative may require that this component be demolished and rebuilt according to the tolerances of said article, at no additional expense to the Departmental Representative.

3.10 CONSTRUCTION JOINTS

- .1 Follow the indications of Section 7.3 of the CSA-A23.1/A23.2 standard for construction joints.
- .2 The Departmental Representative shall approve the location of the construction joints that demarcate each concrete pour. If the Departmental Representative deems it appropriate, he may require that these joints be brought closer together or relocated.

- .3 None of the construction joints already indicated on the drawings shall be moved or eliminated without prior authorization from the Departmental Representative.
- .4 Immediately before resuming pouring against a construction joint or above it, clean and score the surface of the hardened concrete to eliminate all loose fragments and any trace of bleeding, moisten the surface and allow to dry to obtain saturated, dry surface conditions.
- .5 Allow a section to cure for a minimum of 7 days before pouring a new section next to it.

3.11 ON-SITE QUALITY CONTROL

- .1 A testing laboratory designated by the General Contractor shall inspect and test the concrete and its constituents in accordance with the CSA-A23.1/A23.2 and CSA-A283 standards.
- .2 The Laboratory shall take additional core samples during cold weather concrete work. These core samples shall be cured on site, under the same conditions as the concrete pours they represent.
- .3 Non-destructive concrete trials shall be performed according to the methods described in the CSA-A23.1/A23.2 standard.
- .4 The inspection and trials performed by the Laboratory shall not replace or finalize the quality control performed by the Contractor, nor shall they release the Contractor from his contractual obligations in this respect.

3.12 CLEANING

- .1 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 00 10 – General Instructions.
 - .1 Divert unused concrete materials from landfill to local quarry or facility after receipt of written approval from Departmental Representative.
 - .2 Provide appropriate area on job site where concrete trucks can be safely washed.
 - .3 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by Departmental Representative.
 - .4 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
 - .5 Prevent admixtures and additive materials from entering drinking water supplies or streams.
 - .6 Using appropriate safety precautions collect liquid or solidify liquid with inert, non-combustible material and remove for disposal.
 - .7 Dispose of waste in accordance with applicable local, Provincial and National regulations.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 10 00 – Concrete Forming and Accessories
- .2 Section 03 20 00 – Concrete Reinforcing
- .3 Section 03 30 00 – Cast-in-place Concrete

1.2 REFERENCES

- .1 CSA International
 - .1 CAN/CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction//Test Methods and Standard Practices for Concrete, Includes Update No. 1 (2015).
- .2 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-A2005(June 2006), Adhesives and Sealants Applications.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 00 10 – General Instructions.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.
 - .1 Provide two copies of WHMIS MSDS in accordance with Section 01 35 29.06 – Health and Safety Requirements. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content in g/L.
 - .2 Include application instructions for concrete floor treatment.

1.4 ENVIRONMENTAL REQUIREMENTS

- .1 Temporary lighting:
 - .1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.
- .2 Electrical power:
 - .1 Provide sufficient electrical power to operate equipment normally used during construction.
- .3 Work area:
 - .1 Make work area water tight protected against rain and detrimental weather conditions.

- .4 Temperature:
 - .1 Maintain ambient temperature of not less than 10°C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
- .5 Moisture:
 - .1 Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.
- .6 Safety:
 - .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .7 Ventilation:
 - .1 Provide continuous ventilation during and after coating application.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 00 10 – General Instructions.

Part 2 Products

2.1 PERFORMANCE REQUIREMENTS

- .1 Product quality and quality of work in accordance with Section 01 00 10 – General Instructions.
- .2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

2.2 SEALING COMPOUNDS

- .1 Surface sealer: to CAN/CGSB-25.20, Type 2 – water based.
- .2 Sealants: maximum VOC limit 250 g/L to SCAQMD Rule 1168.
- .3 Surface sealer: acrylic carnauba wax.
- .4 Joint sealers two-component, polysulphide-based product with a chemical cure, in compliance with the CAN/CGSB 19.24 Type 2, Class A standard

2.3 MIXES

- .1 Mixing ratios in accordance with manufacturer's written instructions.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that slab surfaces are ready to receive work and elevations are as recommended by manufacturer's written instructions.

3.2 PREPARATION OF EXISTING SLAB AND HOUSEKEEPING SLABS

- .1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.
- .2 Saw cut control joints to CAN/CSA-A23.1, 24 hours maximum after placing of concrete.
- .3 Use mechanical stripping to remove chlorinated rubber or existing surface coatings.
- .4 Use protective clothing, eye protection and respiratory equipment during stripping of chlorinated rubber or existing surface coatings.

3.3 CONTROL JOINT SAWING

- .1 Unless otherwise specified, a maximum of 4 to 12 hours after concreting, use a chain saw suitable for joint control needed on the slab on grade. The maximum distance between control joints in each direction is 4.5 m. Check with the Departmental Representative regarding all joints that are not on the drawings.
- .2 Use polysulfide caulking to seal control joints sawn.
- .3 Unless otherwise specified, saw control joints as indicated on the plan.
 - .1 The saw cut should be 6mm wide.
 - .2 The saw cut must have a 40mm depth where there is no reinforcement. When there are reinforcing bars, the depth of the saw cut must be adjusted to avoid damaging the reinforcing bars.

3.4 CAULKING OF JOINT

- .1 Remove dust, loose mortar and other foreign matters and dry the joint surface.
- .2 Prepare the surface according to caulking manufacturer's instructions.
- .3 Clean the joint to the required depth to install a backer rod. Then apply a coat of sealant as recommended by the manufacturer to the width of the joint.
- .4 Apply primer to the mating surfaces and then apply the sealant as recommended by the manufacturer. Clean adjacent surfaces immediately after application.

3.5 FINISHES

- .1 Unless otherwise specified, exterior concrete surfaces shall be trowel finished with a 1% slope to the open side of pad.

3.6 CLEANING

- .1 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 00 10 – General Instructions.

3.7 PROTECTION

- .1 Protect finished installation in accordance with manufacturer's instructions.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 21 05 00 – Common Work Results for Mechanical.

1.2 REFERENCE STANDARDS

- .1 Canadian Forces Fire Marshal Directive
 - .1 FMD 4003: Fire Protection and Life Safety Engineering Design, December 2014.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2015 (NBC).
- .4 Underwriter's Laboratories of Canada (ULC)
 - .1 ULC-S115-18, Fire Tests of Fire Stop Systems.
 - .2 CAN-ULC-S101-14, Standard Methods of Fire Endurance Tests of Building Construction and Materials.
 - .3 CAN-ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.3 DEFINITIONS

- .1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.
- .2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.
- .3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.
- .4 Tightly Fitted; (ref: NBC Part 3.1.9.1(1) and 9.10.9.6(1)): penetrating items that are cast in place in buildings of non-combustible construction or have "0" annular space in buildings of combustible construction.
 - .1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 21 05 00 – Common Work Results for Mechanical.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

- .2 Submit electronic copies of WHMIS MSDS - Material Safety Data Sheets.
- .3 Shop Drawings:
 - .1 Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation.
 - .2 Construction details should accurately reflect actual job conditions.
- .4 Samples:
 - .1 Submit duplicate 300 x 300 mm samples showing actual fire stop material proposed for project.
- .5 Quality assurance submittals: submit following in accordance with Section 21 05 00 – Common Work Results for Mechanical.
 - .1 Test reports: in accordance with CAN-ULC-S101-14 for fire endurance and CAN-ULC-S102 for surface burning characteristics.
 - .1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures and all other relevant installation and application information.
 - .4 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.5 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: Person and company must specialize in fire stopping installations and must be approved by manufacturer with documented 5 years of experience.
- .2 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section, with Departmental Representative, contractor's representative. to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
- .2 Deliver, store and handle materials in accordance with Section 21 05 00 – Common Work Results for Mechanical.
 - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .2 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, and ULC markings.

- .3 Storage and Protection:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .4 Waste Management and Disposal:
 - .1 Separate waste materials for recycling and / or reuse in accordance with Section 21 05 00 – Common Work Results for Mechanical.

Part 2 Products

2.1 MATERIALS

- .1 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115 and FMD 4003 (**Appendix A**).
 - .1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended and conforming to specified special requirements described in PART 3.
 - .2 Fire stop system rating: 2 hour as per base building firewall ratings and as per drawings.
- .2 Service penetration assemblies: systems tested to CAN-ULC-S115.
- .3 Service penetration fire stop components: certified by test laboratory to CAN-ULC-S115.
- .4 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.
- .5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.
- .6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.
- .7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .8 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .9 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
- .10 Sealants for vertical joints: non-sagging.

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 datasheets.

3.2 PREPARATION

- .1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
 - .1 Ensure that substrates and surfaces are clean, dry and frost free.
- .2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.
- .3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.
- .4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.3 INSTALLATION

- .1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing and FMD 4003 (**Appendix A**).
- .2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.
- .3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .4 Tool or trowel exposed surfaces to neat finish.
- .5 Remove excess compound promptly as work progresses and upon completion.

3.4 SEQUENCES OF OPERATION

- .1 Proceed with installation only when submittals have been reviewed by Departmental Representative.
- .2 Install floor fire stopping before interior partition erections.
- .3 Metal deck bonding: fire stopping to precede spray applied fireproofing to ensure required bonding.
- .4 Mechanical pipe insulation: certified fire stop system component.
 - .1 Ensure pipe insulation installation precedes fire stopping.

3.5 FIELD QUALITY CONTROL

- .1 Inspections: notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

3.6 CLEANING

- .1 Proceed in accordance with Section 21 05 00 – Common Work Results for Mechanical.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

- .3 Remove temporary dams after initial set of fire stopping and smoke seal materials.

3.7 SCHEDULE

- .1 Fire stop and smoke seal at:
 - .1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
 - .2 Edge of floor slabs at curtain wall and precast concrete panels.
 - .3 Top of fire-resistance rated masonry and gypsum board partitions.
 - .4 Intersection of fire-resistance rated masonry and gypsum board partitions.
 - .5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
 - .6 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
 - .7 Openings and sleeves installed for future use through fire separations.
 - .8 Around mechanical and electrical assemblies penetrating fire separations.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 00 10 – General Instructions.
- .2 Section 23 11 13 – Facility Fuel Oil Piping.

1.2 REFERENCE STANDARDS

- .1 Not used.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 10 – General Instructions.
- .2 Submittals shall be provided for all new products and materials provided for this project. If a submittal type is not identified in the product section, request direction from Departmental Representative.
- .3 All Submittals to include:
 - .1 All performance characteristics noted on drawing schedules and in specifications.
 - .2 Detailed drawings of bases, supports, and anchor bolts.
 - .3 Acoustical sound power data, where applicable.
 - .4 Points of operation on performance curves.
 - .5 Manufacturer to certify current model production.
 - .6 Certification of compliance to applicable codes.
 - .7 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
 - .8 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .9 WHMIS SDS - Safety Data Sheets, where applicable.
 - .10 Operating and maintenance clearances.
 - .11 Electrical data and controls sequence.
 - .12 Listed options.
- .4 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for products and include product characteristics, performance criteria, physical size, finish and limitations.
- .5 Shop Drawings:
 - .1 Detailed drawings showing equipment construction, dimensions, and configuration.
 - .2 Mounting arrangements.
- .6 Samples:
 - .1 Example products that provide sufficient information to illustrate final intended materials for installation.

- .7 In addition to transmittal letter referred to in Section 01 00 10 – General Instructions: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
- .8 Submittals will be reviewed by Departmental Representative and returned within 5 days of receipt.
 - .1 If returned submittal is marked for resubmission, the contractor shall revise submission as noted and resubmit within 5 days of receipt of reviewed document.
 - .2 If returned submittal is marked reviewed as noted, the contractor shall address any noted comments in their procurement of products and execution of work.
 - .3 Material procurement shall not proceed until receipt of reviewed submittals not marked for resubmission from Departmental Representative.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 00 10 – General Instructions.
- .2 Operation and Maintenance Data: submit operation and maintenance data for all specified equipment.
 - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .2 Operation data to include:
 - .1 Description of systems and their controls.
 - .2 Operation instruction for systems and component.
 - .3 Description of actions to be taken in event of equipment failure.
 - .4 Valves schedule and flow diagram.
 - .5 Colour coding chart.
 - .3 Maintenance data to include:
 - .1 Equipment model, manufacturer, serial number, and year of manufacture.
 - .2 Recommended spare parts lists.
 - .3 Servicing, maintenance, operation and trouble-shooting instructions, including any manufacturer recommended log sheets, for each item of equipment.
 - .4 Data to include schedules of tasks, frequency, tools required and task time.
 - .5 Provide a list of individual manufacturers' recommended spare parts for equipment, addresses of suppliers, and list of specialized tools necessary for adjusting, repairing or replacing equipment.
 - .4 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
 - .4 Pressure testing reports as specified in Section 23 11 13 – Facility Fuel Oil Piping.
 - .5 Approvals:
 - .1 Submit electronic copy of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.

- .2 Make changes as required and re-submit as directed by Departmental Representative.
- .6 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .7 Site records:
 - .1 Departmental Representative will provide one (1) set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 Transfer information to reproducibles, revising reproducibles to show work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection.
- .8 As-Built drawings:
 - .1 Prior to start of testing and commissioning, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
 - .3 Submit to Departmental Representative for approval and make corrections as directed.
 - .4 Perform testing and commissioning using as-built drawings.
 - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .9 Submit copies of as-built drawings for inclusion in final close-out report.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 10 – General Instructions.
- .2 Furnish spare parts as follows:
 - .1 Valves:
 - .1 Valve seats: one for every 10 valves each size, minimum 1.
 - .2 Discs: one for every 10 valves, each size. Minimum 1.
 - .3 Stem packing: one for every 10 valves, each size. Minimum 1.
 - .4 Valve handles: 2 of each size.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: work to be performed in compliance with TDGA, CEAA, CEPA and applicable Provincial and Federal regulations.
- .2 Installers for work of the following sections shall have the below minimum qualifications:
 - .1 Section 23 11 13 – Facility Fuel Oil Piping: Installer is authorized by Authority Having Jurisdiction.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions and manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors, in dry location, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect all new and existing equipment from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Not Used.

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 datasheets.

3.2 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for new work.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.3 PAINTING REPAIRS AND RESTORATION

- .1 Prime and touch up marred finished paintwork to match original.
- .2 Restore to new condition, finishes which have been damaged.

3.4 SYSTEM CLEANING

- .1 Clean interior and exterior of all systems including strainers.

3.5 FIELD QUALITY CONTROL

- .1 Site Tests: conduct tests in accordance with Section 01 00 10 – General Instructions and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .2 Manufacturer's Field Services:

- .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.6 DEMONSTRATION

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, troubleshooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .3 Use operation and maintenance manual, as-built drawings, and audiovisual aids as part of instruction materials.
- .4 Instruction duration time requirements as specified in appropriate sections.
- .5 Departmental Representative will record these demonstrations on video tape for future reference.

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 10 – General Instructions.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 10 – General Instructions.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 00 10 – General Instructions.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.8 PROTECTION

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.
- .2 Protect installed products and components from damage during construction.
- .3 Repair damage to adjacent materials caused by new work installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 07 84 00 – Fire Stopping.
- .2 Section 21 05 00 – Common Work Results for Mechanical.
- .3 Section 23 11 13 – Facility Fuel Oil Piping.

1.2 REFERENCE STANDARDS

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .2 CSA International
 - .1 CSA-B139-19, Installation Code for Oil Burning Equipment.
- .3 National Research Council Canada (NRC)
 - .1 National Fire Code of Canada, 2015 (NFC).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 21 05 00 - Common Work Results for Mechanical.

Part 2 Products

2.1 MATERIAL

- .1 Paint: zinc-rich to CAN/CGSB-1.181.
- .2 Fire Stopping: in accordance with Section 07 84 00- Fire Stopping.

Part 3 Execution

3.1 PERFORMANCE OF WORK

- .1 Perform work in accordance with Section 21 05 00 – Common Work Results for Mechanical, supplemented as noted herein.

3.2 CONNECTIONS TO EQUIPMENT

- .1 In accordance with manufacturer's instructions unless otherwise indicated.
- .2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

3.3 CLEARANCES

- .1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer and National Fire Code of Canada and CAN/CSA B139.

- .2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer without interrupting operation of other system, equipment, components.

3.4 PIPEWORK INSTALLATION

- .1 Install fuel oil pipework to CAN/CSA B139.
- .2 Refer to Section 23 11 13 - Facility Fuel Oil Piping for additional requirements.
- .3 Screwed fittings, where indicated as acceptable in Section 23 11 13 - Facility Fuel Oil Piping, shall be jointed with Teflon tape.
- .4 Protect openings against entry of foreign material.
- .5 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.
- .6 Assemble piping using fittings manufactured to ANSI standards.
- .7 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.
- .8 Piping shall be accessible for inspection of potential leakage at all joints.
- .9 Slope piping, except where indicated, in direction of flow for positive drainage and venting.
- .10 Group piping wherever possible and as indicated.
- .11 Ream pipes, remove scale and other foreign material before assembly.
- .12 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.
- .13 Provide for thermal expansion as indicated.
- .14 Valves:
 - .1 Install in accessible locations.
 - .2 Valves shall be accessible for maintenance without removing adjacent piping.
- .15 Check Valves:
 - .1 Install silent check valves in vertical pipes with downward flow and as indicated.
 - .2 Install swing check valves in horizontal lines and as indicated.

3.5 SLEEVES

- .1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and as indicated.
- .2 Material: schedule 40 black steel pipe.
- .3 Construction: use annular fins continuously welded at mid-point at foundation walls and where sleeves extend above finished floors.
- .4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.
- .5 Installation:
 - .1 Concrete, masonry walls, concrete floors on grade: terminate flush with finished surface.
 - .2 Other floors: terminate 25 mm above finished floor.

- .3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.
- .6 Sealing:
 - .1 Provide space for fire stopping.
 - .2 Maintain the fire-resistance rating integrity of the fire separation.
 - .3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.
 - .4 Ensure no contact between pipe and sleeve.

3.6 PREPARATION FOR FIRE STOPPING

- .1 Coordinate the installation of fire stopping around pipes, insulation and adjacent fire separation in accordance with Section 07 84 00- Fire Stopping.
- .2 Pipes subject to movement: conform to fire stop system design listing to ensure pipe movement without damaging fire stopping material or installation.
- .3 Insulated pipes: ensure integrity of insulation and vapour barriers.

3.7 EXISTING SYSTEMS

- .1 Connect into existing piping systems at times approved by Departmental Representative only.
- .2 Request written approval by Departmental Representative, 10 days minimum, prior to commencement of work.
- .3 Be responsible for damage to existing systems, and costs to rectify damage, when undertaking this work.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 07 84 00 – Fire Stopping
- .2 Section 21 05 00 – Common Work Results for Mechanical.
- .3 Section 23 05 15 – Common Installation Requirements for Pipework.
- .4 Section 33 56 13 – Aboveground Fuel Storage Tanks.

1.2 REFERENCE STANDARDS

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME-B16.3-2016, Malleable-Iron Threaded Fittings: Classes 150 and 300.
 - .2 ASME-B16.9-2018, Factory-Made Wrought Steel Butt welding Fittings.
 - .3 ASME-B31.3-2018, Process Piping.
- .2 ASTM International (ASTM)
 - .1 ASTM A47/A47M-19, Standard Specification for Ferritic Malleable Iron Castings.
 - .2 ASTM A53/A53M-18, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
- .3 CSA International
 - .1 CSA-B139-19, Installation Code for Oil Burning Equipment.
- .4 Manufacturers Standardization Society of the Valve and Fitting Industry (MSS)
 - .1 MSS-SP-80-2019, Bronze Gate, Globe, Angle and Check Valves.
- .5 Technical Standards and Safety Authority (TSSA)
 - .1 Technical Standards and Safety Act, 2000.
 - .2 Ontario Regulation 213/01 – Fuel Oil, dated June 27, 2001.
 - .3 Ontario Regulation 215/01 – Fuel Industry Certificates, dated July 1, 2019.
- .6 Underwriter's Laboratories of Canada (ULC)
 - .1 ULC S661-10(R2016), Standard for Overfill Protection Devices for Flammable and Combustible Liquid Storage Tanks.
 - .2 ULC S663-11(R2016), Standard for Spill Containment Devices for Flammable and Combustible Liquid Aboveground Storage Tanks.
 - .3 ULC C842-84, Guide for the Investigation of Valves for Flammable and Combustible Liquids.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit the following for work of this section in accordance with Section 21 05 00 – Common Work Results for Mechanical:
 - .1 Product data.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit the following for work of this section in accordance with Section 21 05 00 – Common Work Results for Mechanical:

- .1 Operation data.
- .2 Maintenance data.

1.5 QUALITY ASSURANCE

- .1 Ensure piping is installed by individual authorized by TSSA.

1.6 CORE DRILLING FOR NEW PIPING INSTALLATION

- .1 Core drilling will be required for the installation of the new fuel oil supply and return piping.
 - .1 Contractor is responsible for scans prior to core drilling.

Part 2 Products

2.1 GENERAL

- .1 All components of fuel system shall melt at temperatures greater than 538°C unless:
 - .1 The device is directly protected by a fusible link valve rated to less than 177°C with casing rated to greater than 538°C, and the fusible link valve is located between the tank and the device.
- .2 All fuel piping and components shall be rated to minimum 70 kPa if not otherwise stated.

2.2 FILL VENT AND CARRIER PIPE

- .1 Materials as per CSA-B139 and ASME B31.3.
- .2 Piping: carbon steel to ASTM A53/A53M, Schedule 40.
- .3 All joints, except for connections to valves and accessories, shall be welded. Welding shall be performed by a welder certified through the Technical Standards and Safety Authority (TSSA) using a qualified welding procedure.
- .4 All piping shall be primed and painted.

2.3 STEEL PIPE COATING

- .1 Apply one coat epoxy primer and two coats epoxy paint.
- .2 Primers, Paints, Coating: in accordance with manufacturer's recommendations for surface conditions.

2.4 JOINTING MATERIAL

- .1 Welded fittings: Socket weld as per Federal and Provincial regulations.
- .2 Threaded and welded pipe connections and valves shall have a minimum rating of 1034 kPa (150 psi) and shall meet the applicable approved standard.
- .3 Outer casing: shall be exposed wherever possible such that it can be visually inspected regularly for leaks.

2.5 FITTINGS

- .1 Steel:
 - .1 Malleable iron: screwed, banded, Class 150 to ASME-B16.3.
 - .2 Welding: butt-welding to ASME-B16.3.

- .1 Welding shall be performed by a certified welder through TSSA using a qualified welding procedure.
- .3 Unions: malleable iron, brass to iron, ground seat, screwed, to ASTM A47/A47M.
- .4 Nipples: Schedule 40, to ASTM A53/A53M.
- .5 Vent Cap: for vent piping terminations, die cast aluminum, updraft type, cross-sectional free area not less than vent pipe cross-section, with internal drain channels and weep holes, and 40 mesh SS screens.

2.6 BALL VALVES

- .1 ULC listed for petroleum use in conformance with ULC/ORD-C842, unless otherwise in conformance with CSA B139.
- .2 50mm (NPS 2) diameter or less:
 - .1 Class: 600.
 - .2 Full port type.
 - .3 Quarter turn lever operation, bi-directional.
 - .4 Blowout-proof stem.
 - .5 Materials: Forged brass body, hard chrome-plated ball, Teflon seal.
 - .6 Provide handle lockable with padlock where indicated.

2.7 CHECK VALVES

- .1 ULC-listed for fuel oil applications, line-sized to match to adjacent piping and selected to suit application flowrates.

2.8 PRESSURE RELIEF VALVE

- .1 New pressure relief valve shall be provided for thermal expansion relief, rated for the project application.
 - .1 Pressure-relief valves shall be installed outdoors on the supply piping, piped back to the tank. Valve shall be set above the normal operating conditions but below the high-pressure switch trigger point.

2.9 FLEXIBLE FUEL HOSES

- .1 Shall be acceptable by TSSA for the proposed outdoor application.
- .2 Flexible hoses to be sized to suit existing 350 kW emergency generator, as indicated on drawings.
 - .1 Maximum length: 600mm.
 - .2 Minimum length: twice manufacturer's minimum recommended length for vibration control.
 - .3 Flexible hose shall have a maximum of 1 bend, and any bends shall be minimum 1.5 times manufacturer's minimum bend radius.
 - .4 Conforms to ULC-C536.

2.10 ANTI-SIPHON VALVE

- .1 Shall be ULC listed for fuel service and in conformance with ULC-C842.
- .2 Materials:
 - .1 Body: Clear anodized aluminum.

- .2 Bonnet: Powder-coated aluminum.
- .3 Cap: Powder-coated aluminum.
- .4 Spring: Stainless steel.
- .5 Poppet: Hard-coated aluminum.
- .6 Poppet Seal: Nitrile.
- .3 Head Pressure Settings: To suit installation location. Contractor to verify pressure settings on-site based on proposed piping arrangement and submit piping arrangement with anti-siphon valve submittal for review.
- .4 Shall be self-relieving and demonstrable to TSSA.
- .5 Temperature rating: -29°C to 49°C.
- .6 Minimum size: 25mm (1").

2.11 FUSIBLE LINK VALVE

- .1 Fusible link shut-off (fire) valve shall be ULC listed for petroleum use.
- .2 Valve to have screwed ends, spring to close. Valve to be sized based on piping size and location. Valve must be acceptable by TSSA and be ULC approved.
- .3 Operating Temperature range: -28°C to 51°C.
- .4 Operating pressure rating: 433.7 kPa (50 psi).
- .5 Materials:
 - .1 Body and trim: stainless steel.
 - .2 O-ring and disc: Viton.
- .6 Fusible Link temperature: 73°C.
- .7 Size: 25mm (1").

2.12 LABELING

- .1 Piping to be labeled with product, flow direction and pipe purpose at intervals not less than 3 m. Lettering to be black, minimum 13 mm in height, on yellow background. Examples of pipe labels include: "DIESEL VENT PIPE", "DIESEL FILL PIPE", "DIESEL SUPPLY", "DIESEL RETURN".
- .2 Tank contents and capacity must be labelled on front of outdoor spill container and a minimum of 2 sides. Lettering to be black on white background. Lettering size to be a minimum of 25mm on outdoor spill container and a minimum of 75mm on fuel storage tanks.
 - .1 "DIESEL FUEL".
 - .2 "2,359 L TOTAL CAPACITY".
- .3 All labeling shall be weatherproof and securely fastened to prevent unwanted removal.
- .4 All labeling, with the exception of fuel piping labels, shall be black lettering on white background.
- .5 Handwritten labeling will not be accepted under any circumstances.

2.13 SIGNAGE

- .1 As indicated on drawings.

- .2 All signage: aluminum or UV-proof plastic backing, fastened using expansion-type anchors, screws, bolts or rivets to prevent easy removal by vandals.

Part 3 Execution

3.1 PERFORMANCE OF WORK

- .1 Perform work in accordance with Section 21 05 00 – Common Work Results for Mechanical, supplemented as noted herein.

3.2 TSSA LICENSING

- .1 All work involving installing, removing, altering, repairing, testing and servicing the aboveground storage tank system installation, including the equipment and accessories essential to its operation, must be performed by a person that is approved to do so by TSSA. The Contractor shall provide evidence of the person's valid OBT-1 and PM.3 designation prior to any work being performed that involves the removal, altering or installation of fuel storage tanks within this scope of work.

3.3 FEES, PERMITS AND CERTIFICATES

- .1 Pay all fees and obtain all permits. Provide authorities with plans and information for acceptance certificates. Provide inspection certificates as evidence that work conforms to requirements of Authority Having Jurisdiction.

3.4 PIPING

- .1 Install fuel oil piping system in accordance with CSA-B139, ASME B31.3 and Section 23 05 15 – Common Installation Requirements for Pipework.
- .2 Paint all non-galvanized piping.
- .3 Ensure all joints and connections are fuel-oil tight.
- .4 Slope piping minimum 2% down in direction of storage tank unless otherwise indicated.
- .5 Above ground piping to be protected from physical damage due to impact. Refer to drawings for details.
- .6 All threaded piping shall extend a minimum of 25mm beyond wall penetration before first fitting, on both sides.
- .7 Fill, vent, and overflow piping:
 - .1 Tank vent termination: equipped with ULC-certified weatherproof cap and bird/bug screen as specified.
- .8 Piping at tanks:
 - .1 Suction: terminate 150 mm from bottom of tank.
 - .2 Return: terminate 50 mm from bottom of tank. Drill 10mm hole at top of return line inside tank for anti-siphon protection.
 - .3 Comply with CSA-B139 and TSSA requirements for vent piping at tanks.
 - .4 Fill pipes: install to comply with CSA-B139.
 - .1 Refer to Section 33 56 13 – Aboveground Fuel Storage Tanks for additional requirements.
- .9 Clearly label piping runs in legible form indicating:
 - .1 Piping product content.

- .2 Direction of flow.
- .3 Identify transfer points in piping systems to CFA Colour-Symbol System to Mark Equipment and Vehicles for Product Identification

.10 Hangers and Supports:

- .1 To requirements of CSA B139, ASME B31.3, and as below. Adhere to the most stringent requirement.

Pipe size, mm	Maximum Spacing of Supports, m
Horizontal Piping	
≤12.5	1.8
19-25	2.4
32-64	3.0
75-100	4.6
Vertical Piping	
≥25	Every Floor Level

- .2 All outdoor piping supports shall be galvanized (hot-dip) or 316 stainless steel only.
 - .1 Contractor shall provide evidence of material used for supports.
- .11 Building Wall and Floor Penetrations
- .1 All pipe penetrations through building walls and floors must be sleeved, with insulation installed in the sleeve-pipe cavity and sealed weather-tight with fire stopping sealant. Refer to drawings for details.
 - .2 Sleeves shall protect piping from damage and galvanic action.

3.5 VALVES

- .1 Install valves with stems upright or horizontal unless approved otherwise by Departmental Representative.
- .2 Install ball valves at branch take-offs, to isolate pieces of equipment and as indicated.
- .3 Install check valves as indicated.
- .4 No valves are permitted to be installed on any pressure-relief, generator return or tank vent pipes.

3.6 OIL FILTERS

- .1 At time of acceptance, replace existing fuel oil filter cartridges with new.

3.7 OVERFILL AND SPILL PROTECTION

- .1 Refer to Section 33 56 13 – Aboveground Storage Tanks for positive shut-off overfill protection device (CAN/ULC-S661), spill container (CAN/ULC-S663), overfill alarm (CAN/ULC-S661) and tamperproof tight-fill camlock fitting on fill pipe.

3.8 LEAK DETECTION

- .1 Refer to Section 33 56 13 – Aboveground Storage Tanks.

3.9 PIPE PENETRATIONS THROUGH BUILDING WALLS/FLOORING

- .1 All new fuel pipe penetrations through building walls must be sealed with a material having a minimum 2-hour fire-resistance rating, as per Section 07 84 00 – Fire Stopping.
- .2 All penetrations shall be installed as per CSA B139.

3.10 FIELD QUALITY CONTROL

- .1 Site Tests/Inspection:
 - .1 Test system to CSA-B139 and TSSA requirements.
 - .1 Activate generator and verify all new and existing components for the generator and fuel system are operating as designed.
 - .2 Isolate tanks prior to performing piping pressure tests.
 - .1 Prior to conducting pipe pressure/leak detection test, remove foreign matter and flush piping and equipment using same petroleum product as the one being transported.
 - .2 Contractor is to provide temporary, flexible fuel-rated hoses to bypass permanent equipment such as pumps, prior to performing flushing.
 - .3 Following complete installation of piping, hydrostatically test all fuel oil piping at 1-1/2 times the working pressure but at not less than 863 kPa (125 psi) for a period of not less than four (4) hours with a gauge that is capable of measuring up to 1035 kPa (150 psi) using compressed air or nitrogen.
 - .1 No pressure drop shall be allowed. Test to be witnessed by Departmental Representative using a certified pressure gauge. Caulking of joints shall not be permitted.
 - .2 Should there be a loss of pressure, soap test all welds and threaded connections, or use a tracer gas with compressed gas as directed by Departmental Representative.
 - .4 Pressure test shall be witnessed by Departmental Representative.
 - .5 Contractor shall provide signed pressure test report to Departmental Representative within three (3) business days of pressure test.
 - .6 Flush lines with diesel following pressure test.
 - .7 Dispose of flushing liquids to approval of the Environment and Climate Change Canada (ECCC), the Ministry of the Environment, Conservation and Parks (MECP) and TSSA.
 - .3 When installation is complete, perform start-up & testing of all controls and operating functions, and certify it is complete with a full and detailed start-up & commissioning report.
- .2 Performance Verification:
 - .1 Refer to Section 21 05 00 - Common Work Results for Mechanical.
 - .2 All work must have an OBT-1 10-year Comprehensive inspection at end of project. Cost of inspection to be paid by Contractor.

3.11 CLEANING

- .1 Clean in accordance with manufacturer's instructions, Section 21 05 00 - Common Work Results for Mechanical, supplemented as follows:
 - .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 Ensure vents are terminated in approved location and are protected against blockage and damage.
- .4 Ensure entire installation is approved by Authority Having Jurisdiction.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group
 - .1 CSA C22.1-12 , Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
 - .1 CSA Z462-15, Workplace Electrical Safety Standard.
 - .2 CAN3-C235-83(R2010) , Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Institute of Electrical and Electronics Engineers (IEEE)/National Electrical Safety Code Product Line (NESC)
 - .1 IEEE SP1122-2000 , The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.
- .3 Ontario Electrical Safety Code 2018 (OSEC)

1.2 DEFINITIONS

- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 10 General Instructions.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for high level alarm panel and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop drawings:
 - .1 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
 - .2 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
 - .3 Indicate on drawings clearances for operation, maintenance, and replacement of operating equipment devices.
 - .4 Submit electronic copy of drawings and product data to Departmental Representative and Engineer.
 - .5 If changes are required, notify Departmental Representative and Engineer of these changes before they are made.
- .4 Certificates:
 - .1 Provide CSA certified material and equipment .
 - .2 Submit test results of installed electrical systems and instrumentation.
 - .3 Permits and fees: in accordance with General Conditions of contract.
 - .4 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

- .5 Manufacturer's Field Reports: submit to Departmental Representative and Engineer manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 00 10 General Instructions.
- .2 Operation and Maintenance Data: submit operation and maintenance data for for incorporation into manual.
 - .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
 - .2 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment failure.
 - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
 - .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
 - .4 Post instructions where directed.
 - .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
 - .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location, indoors, off ground and in accordance with manufacturer's recommendations in clean, well-ventilated area.
 - .2 Store and protect equipment from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 DESIGN REQUIREMENTS

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

- .3 Language operating requirements: provide identification nameplates for control items in French and English.
- .4 Use one nameplate for both languages.

2.2 MATERIALS AND EQUIPMENT

- .1 Provide material and equipment in accordance with Section 01 00 10 General Instructions .
- .2 Factory assemble control panels and component assemblies.

2.3 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of Departmental Representative.
- .2 Porcelain enamel signs, minimum size 175 x 250 mm.

2.4 WIRING TERMINATIONS

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.5 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates as follows:
 - .1 Normal power lamacoids shall be black lettering with white face.
 - .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .2 Wording on nameplates to be approved by Departmental Representative prior to manufacture.
- .3 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .4 Terminal cabinets and pull boxes: indicate system and voltage.

2.6 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.

2.7 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

Type	Prime	Auxiliary
up to 250 V	Yellow	
Other Communication Systems	Green	Blue
Other Security Systems	Red	Yellow

2.8 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

3.3 NAMEPLATES AND LABELS

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.4 CONDUIT AND CABLE INSTALLATION

- .1 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .2 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.5 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

3.6 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.7 FIELD QUALITY CONTROL

- .1 Conduct following tests in accordance with Section 01 00 10 General Instructions.
 - .1 Circuits originating from branch distribution panels.
 - .2 Insulation resistance testing:
 - .1 Check resistance to ground before energizing.
- .2 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .3 Manufacturer's Field Services:

- .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.8 SYSTEM STARTUP

- .1 Instruct Departmental Representative in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

3.9 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 10 General Instructions.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 10 General Instructions.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section includes requirements for selective demolition and removal of electrical components including removal of conduit, junction boxes, wiring and related incidentals as indicated.

1.2 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Common Work Results for Electrical.

1.3 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA S350 M1980 (R2003), Code of Practice for Safety in Demolition of Structures

1.4 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes , cabling and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .3 Remove and Salvage: Detach items from existing construction and deliver them to Departmental Representative ready for reuse.
- .4 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.
- .5 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCBs, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.
- .2 Scheduling: Account for Departmental Representative's continued occupancy requirements during selective demolition and schedule staged occupancy and worksite activities.

1.6 SITE CONDITIONS

- .1 Existing Conditions: Condition of materials identified as being demolished are based on their observed condition.

Part 2 Products

2.1 MATERIALS

- .1 General Patching and Repair Materials: Patching and repairs to be made to the satisfaction of Departmental Representative. Patching and repair shall match existing finishes as required.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Existing Conditions: Visit site, thoroughly examine and become familiar with conditions that may affect the work of this Section before tendering the Bid; Departmental Representative will not consider claims for extras for work or materials necessary for proper execution and completion of the contract that could have been determined by a site visit.

3.2 PREPARATION

- .1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:
 - .1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.
 - .2 Prevent debris from blocking drainage inlets.
 - .3 Protect mechanical systems that will remain in operation.
- .2 Protection of Building Occupants: Sequence demolition work so that interference with the use of the building by the Departmental Representative and users is minimized and as follows:
 - .1 Prevent debris from endangering safe access to and egress from occupied buildings.
 - .2 Notify Departmental Representative and cease operations where safety of occupants appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

3.3 EXECUTION

- .1 Demolition: Coordinate requirements of this Section as follows:
 - .1 Disconnect electrical circuits and panel feeders; maintain electrical service and main distribution panel as is, ready for subsequent Work.
 - .2 Perform demolition work in a neat and workmanlike manner:
 - .1 Remove tools or equipment after completion of work, and leave site clean and ready for subsequent renovation work.
 - .2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.
 - .3 Disconnect panel feeders back to main distribution panel and re label respective circuit breaker as "SPARE".
 - .4 Place weatherproof blank cover plates on exterior outlet boxes remaining after demolition and removal activities.
 - .5 Remove existing conduits, boxes, cabling and wiring associated with removed luminaires, electrical devices and equipment.

- .6 Grind off conduits and make flush with surface of concrete where conduits are cast into concrete; seal open ends of conduit with approved non shrink grout and leave in place.
- .7 Seal open ends of conduit with approved non shrink grout and leave in place where they are inaccessible or cannot be removed without damaging adjacent construction.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Common Work Results for Electrical.
- .2 Section 26 05 21 – Wires and cables - (0-1000 V).
- .3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.2 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CAN/CSA-C22.2 No.18-98(R2003), Outlet Boxes, Conduit Boxes and Fittings.
 - .2 CAN/CSA-C22.2 No.65-03(R2008), Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 00 10 General Instructions.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, in dry location, indoors, and in accordance with manufacturer's recommendations in clean, well-ventilated area.
 - .2 Store and protect wire and box connectors from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Clamps or connectors for TECK cable and flexible conduit as required to: CAN/CSA-C22.2 No.18.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.

3.2 INSTALLATION

- .1 Remove insulation carefully from ends of conductors cables and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.
 - .3 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.
 - .4 Install bushing stud connectors in accordance with NEMA.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 10 General Instructions .
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 10 General Instructions.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Common Work Results for Electrical.
- .2 Section 26 05 20 - Wire and Box Connectors - (0-1000 V).
- .3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.2 PRODUCT DATA

- .1 Provide product data in accordance with Section 01 00 10 General Instructions.

Part 2 Products

2.1 BUILDING WIRES

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with 600V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPEJacketted.

2.2 TECK 90 CABLE

- .1 Cable: in accordance with Section 26 05 00- Common Work Results for Electrical.
- .2 Conductors:
 - .1 Grounding conductor: copper.
 - .2 Circuit conductors: copper size as indicated.
- .3 Insulation:
 - .1 Cross-linked polyethylene XLPE.
 - .2 Rating: 600V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: interlocking.
- .6 Overall covering: thermoplastic polyvinyl chloride
- .7 Fastenings:
 - .1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
 - .2 Threaded rods: 6 mm diameter to support suspended channels.
- .8 Connectors:
 - .1 Watertight, approved for TECK cable.

2.3 CONTROL CABLES

- .1 Type: LVT: soft annealed copper conductors, sized as indicated:
 - .1 Insulation: thermoplastic.
 - .2 Shielding: tape coated with diamagnetic material braid over each pair.
 - .3 Overall covering: polyethylene jackets or PVC jackets.

Part 3 Execution

3.1 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

- .1 Terminate cables in accordance with Section 26 05 20- Wire and Box Connectors - (0-1000 V).
- .2 Cable Colour Coding: to Section 26 05 00- Common Work Results for Electrical.
- .3 Conductor length for parallel feeders to be identical.
- .4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.
- .6 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34- Conduits, Conduit Fastenings and Conduit Fitting .

3.4 INSTALLATION OF TECK90 CABLE (0 -1000 V)

- .1 Group cables wherever possible on channels.
- .2 Install cable exposed, securely supported by straps.

3.5 INSTALLATION OF CONTROL CABLES

- .1 Install control cables in conduit.
- .2 Ground control cable shield.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 – Common Work Results for Electrical

1.2 REFERENCE STANDARDS

- .1 Ontario Electrical Safety Code 2018 (OSEC)

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, in dry location, and in accordance with manufacturer's recommendations in clean, well-ventilated area.
 - .2 Store and protect grounding equipment from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 EQUIPMENT

- .1 Clamps for grounding of conductor: size as required to existing grounding system.
- .2 Grounding conductors: bare stranded copper, tinned, size as indicated.
- .3 Insulated grounding conductors: green, copper conductors, size as indicated.
- .4 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings.
 - .2 Protective type clamps.
 - .3 Bolted type conductor connectors.
 - .4 Bonding jumpers, straps.
 - .5 Pressure wire connectors.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.

3.2 INSTALLATION GENERAL

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT or rigid PVC is used, run ground wire in conduit.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections, and connections to conductive water main, electrodes, using permanent mechanical connectors.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .6 Soldered joints not permitted.
- .7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00- Common Work Results for Electrical.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 10 General Instructions.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 10 General Instructions.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 – Common Work Results for Electrical

1.2 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .3 CSA C22.2 No. 83-M1985(R2003), Electrical Metallic Tubing.
 - .4 CSA C22.2 No. 211.2-M1984(R2003), Rigid PVC Conduit.
 - .5 CSA 22.2 No. 45.1-07(R2017), Electrical Rigid Metal Conduit.

Part 2 Products

2.1 CONDUITS

- .1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .2 Rigid pvc conduit: to CSA C22.2 No. 211.2.
- .3 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal
- .4 Rigid metal conduit to CSA 22.2 No. 45.

2.2 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 50 mm and smaller.
 - .1 Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Threaded rods, 6 mm diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
 - .1 Set-screws are not acceptable.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.

- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

- .1 Polypropylene.

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 datasheets.

3.2 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Surface mount conduits.
- .3 Use liquid tight flexible metal conduit for connection to equipment in damp, wet or corrosive locations.
- .4 Minimum conduit size for lighting and power circuits: 19 mm.
- .5 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .6 Mechanically bend steel conduit over 19 mm diameter.
- .7 Install fish cord in empty conduits.
- .8 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .9 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on surface channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CLEANING

- .1 Proceed in accordance with Section 01 00 10 General Instructions.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, and equipment.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 02 65 00 – Storage Tank Removal.
- .2 Section 03 10 00 – Concrete Forming and Accessories
- .3 Section 03 20 00 – Concrete Reinforcing
- .4 Section 03 30 00 – Cast-in-place Concrete
- .5 Section 03 35 00 – Concrete Finishing

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .2 ASTM D422-63(2007)e2, Standard Test Method for Particle-Size Analysis of Soils.
 - .3 ASTM D1557-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
 - .4 ASTM D4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 - .5 ASTM D4595-17, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
 - .1 No.2-M85, Methods of Testing Geosynthetics – Mass per Unit Area.
 - .2 No.3-M85, Methods of Testing Geosynthetics – Thickness of Geotextiles.
 - .3 No.10-94, Methods of Testing Geosynthetics – Geotextiles – Filtration Opening Size.
 - .2 CAN/CGSB-8.2-M89, Sieves, Testing, Woven Wire, Metric.
- .3 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 1010-April 2004, Material Specification for Aggregates.
 - .2 OPSS 1860-March 1998, Material Specification for Geotextiles.

1.3 DEFINITIONS

- .1 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 Topsoil:

- .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .7 Unsuitable materials:
 - .1 Weak, chemically unstable, and compressible materials.
 - .2 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.2.
 - .2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 – 100
0.02 mm	10-80
0.005 mm	0-45
 - .3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.
- .8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.4 SUBMITTALS

- .1 Make submittals in accordance with Section 01 00 10 – General Instructions.
- .2 Quality Control:
 - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
 - .2 Submit for review by Departmental Representative proposed dewatering and heave prevention methods as described in PART 3 of this Section.
 - .3 Submit to Departmental Representative written notice when bottom of excavation is reached.
 - .4 Submit to Departmental Representative testing results and report as described in PART 3 of this Section.
- .3 Preconstruction Submittals:
 - .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.

- .4 Samples:
 - .1 Submit samples in accordance with Section 01 00 10 – General Instructions.

1.5 QUALITY ASSURANCE

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Where Departmental Representative is employee of Contractor, submit proof that Work by Departmental Representative is included in Contractor's insurance coverage.
- .3 Submit design and supporting data at least 2 weeks prior to beginning Work.
- .4 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in the Province of Ontario, Canada.
- .5 Keep design and supporting data on site.
- .6 Engage services of qualified professional Engineer who is registered or licensed in the Province of Ontario, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.
- .7 Do not use soil material until written report of soil test results are reviewed and approved by Departmental Representative.
- .8 Health and Safety Requirements:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 – Health and Safety Requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Divert excess aggregate materials from landfill to local facility for reuse as directed by Departmental Representative.

1.7 EXISTING CONDITIONS

- .1 Buried services:
 - .1 Before commencing work verify location of buried services on and adjacent to site.
 - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
 - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
 - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .5 Prior to beginning excavation Work, notify applicable authorities having jurisdiction to establish location and state of use of buried utilities and structures. Notify authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
 - .6 Confirm locations of buried utilities by careful test soil hydro-vac methods.
 - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered as indicated.
 - .8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing.

- .9 Record location of maintained, re-routed and abandoned underground lines.
- .10 Confirm locations of recent excavations adjacent to area of excavation.
- .2 Existing buildings and surface features:
 - .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
 - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.
 - .3 Where required for excavation, cut roots or branches as directed by Departmental Representative.

1.8 CHOICE OF EXCAVATION METHODS

- .1 The Contractor is solely responsible for choosing the excavation methods to be applied. Submit these methods beforehand to the Departmental Representative for review and comments.

1.9 PROTECTION OF EXISTING STRUCTURES

- .1 Protect the excavation bottoms against any softening. If softening occurs, remove the softened soil and replace it with type 2 compacted fill.
- .2 Protect excavation bottoms against frost.
- .3 Take the necessary measures to eliminate the dust generated.
- .4 Adequately protect existing facilities, buildings and services, and existing equipment located on site to ensure they are not damaged during the work.
- .5 Never stack waste material in an area where it could hinder the work or property drainage.
- .6 Underground structures and utility systems
 - .1 Details indicated on the drawings regarding the dimensions, location and depth at which underground structures and utilities are buried are only provided for general information purposes and are not necessarily accurate or complete.
 - .2 Before starting to dig trenches, notify the Departmental Representative and/or the authorities of the public utility companies involved and determine the location and condition of the underground structures and systems. Clearly identify the locations to prevent any service interruptions while the work is being performed.
 - .3 Confirm the location of the underground systems by carefully performing trial excavations.
 - .4 Maintain in operation and protect against any damage all water, sewage, gas, electricity and telephone lines as well as other systems or structures that might be in the areas to be excavated. Before moving or disturbing a structure or a public utility system in any way, obtain appropriate directives from the Departmental Representative.
 - .5 If required, provide the Departmental Representative and the public company with recommendations regarding the removal or detour of existing systems at the excavation site. Assume the costs for this work.

- .6 Take note of the location of the underground lines that have been retained, diverted or abandoned.
- .7 Confirm the location of excavations recently performed near the work area.
- .7 Existing buildings and structures on the property
 - .1 In the presence of the Departmental Representative, check the condition of the buildings, trees and other plants, lawns, fences, service poles, cables, railroad tracks, road surfaces, survey markers and elevation indicators that need to stay in place and which may be damaged during the work.
 - .2 Protect existing buildings and structures on the property likely to sustain damage, against all such damage while the work is being performed. In the event of damage, immediately restore the affected components to their original state, to the Departmental Representative's satisfaction.
 - .3 If roots or branches need to be cut to complete the excavation work, only perform this work after obtaining the Departmental Representative's approval.
- .8 Adequately protect elevation indicators, alignment markers, survey markers and survey monuments located on the construction site.
- .9 Take all necessary measures to prevent any property damage and bodily injury.
- .10 Install protective barriers around all excavation sites.

PART 2 Products

2.1 MATERIALS

- .1 Type 1 fill: OPSS Granular A
 - .1 Clean, hard, durable crushed stone or gravel free of shale, clay and friable, organic or deleterious material; the sizing of the material shall remain within the range indicated below, in accordance with the OPSS 1010 Standard, and the sizing curve plotted on a semi-logarithmic graph shall be continuous and progressive. The fill shall not contain pyrite.
- .2 Type 2 fill: OPSS Granular B Type 1
 - .1 Compactable soils, essentially comprising granular, hard, durable, non-plastic material, such as sand, gravel or crushed stone. These soils shall be free of shale, clay, and friable, organic or deleterious material, and contaminated material. These soils shall not be frost prone. These soils shall conform to the requirements of the OPSS 1010 Standard.
- .3 Geotextiles: must meet following requirements (OPSS1860)
 - .1 Thickness: to CAN/CGSB-148.1, No.3
 - .2 Mass per unit area: to CAN/CGSB-148.1, No.2
 - .3 Tensile strength: minimum 330 N, wet condition, ASTM D4595
 - .4 Elongation at break: 50%, ASTM D4595
 - .5 Permittivity: to 0.05 s⁻¹, CAN/CGSB-148.1 No.10
- .4 Before using, have the Departmental Representative approve all fill materials. After receiving approval, always purchase the same materials from the same sources.

- .5 Instead of using borrowed material, the Contractor may use excavated material if it meets the requirements of this section of the specifications and is approved by the Departmental Representative. In-situ soils shall not be used as type 2 fill. They may be considered as type 3 fill if they meet the requirements for this type of fill.
- .6 Provide supplementary fill material suitable for the work, from an outside supplier.

PART 3 Execution

3.1 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

3.2 PREPARATION/PROTECTION

- .1 Keep excavations clean, free of standing water, and loose soil.
- .2 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.
- .3 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .4 Protect buried services that are required to remain undisturbed.

3.3 STOCKPILING

- .1 Stockpile fill materials in areas designated by Departmental Representative.
 - .1 Stockpile granular materials in manner to prevent segregation.
 - .2 Stockpile removed soil on-site beside excavation using hydrophobic containment liners that are impermeable to hydrocarbons. If contamination is suspected or confirmed, follow directions of Departmental Representative.
- .2 Protect fill and backfill materials from contamination. Refer to Section 02 65 00 – Storage Tank Removal.
- .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.4 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for Departmental Representative approval details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
 - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.

- .5 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

3.5 EXCAVATION

- .1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.
- .2 Provide equipment and assist the Departmental Representative to collect soil samples from the bottom and sides of the excavation.
- .3 Excavate to lines, grades, elevations and dimensions as directed by Departmental Representative.
- .4 Excavation must not interfere with bearing capacity of adjacent foundations.
- .5 Do not disturb soil within branch spread of trees or shrubs that are to remain.
 - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .6 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
- .7 Restrict vehicle operations directly adjacent to open trenches.
- .8 Dispose of surplus and unsuitable excavated material off site.
- .9 Do not obstruct flow of surface drainage or natural watercourses.
- .10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .11 Notify Departmental Representative when bottom of excavation is reached.
- .12 Obtain Departmental Representative approval of completed excavation.
- .13 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .14 Correct unauthorized over-excavation as follows:
 - .1 Fill with Type 1 fill compacted to not less than 95% of corrected Standard Proctor maximum dry density.
- .15 Hand trim, make firm and remove loose material and debris from excavations.
 - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
 - .2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.
- .16 Install geotextiles in accordance with OPSS1860.

3.6 FILL TYPES AND COMPACTION

- .1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D1557.
 - .1 Under concrete slabs and around concrete foundation walls: provide layers of 200 mm compacted 100% standard proctor test (SPMDD)

3.7 BACKFILLING

- .1 Vibratory compaction equipment: 4.4 kW Diesel vibratory plate.
- .2 Do not proceed with backfilling operations until completion of following:
 - .1 Departmental Representative has inspected and approved installations.
 - .2 Departmental Representative has reviewed laboratory results which have confirmed that petroleum hydrocarbon concentrations are within acceptable limits.
 - .3 Departmental Representative has inspected and approved of construction below finish grade.
 - .4 Inspection, testing, approval, and recording location of underground utilities.
 - .5 Removal of concrete formwork.
 - .6 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .4 Do not use backfill material which is frozen or contains ice, snow or debris.
- .5 Do not use backfill material which is suspected to be or confirmed as being contaminated. Refer to Section 02 65 00 – Storage Tank Removal.
- .6 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .7 Backfilling around installations:
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Do not backfill/compact around or over cast-in-place concrete within 48 hours after placing of concrete.
 - .3 Place layers simultaneously on both sides of installed Work to equalize loading.
- .8 Consolidate and level unshrinkable fill with internal vibrators.

3.8 INSPECTION AND LABORATORY TRIALS

- .1 The materials and compacting analyses shall be performed by a testing laboratory designated and paid by the Contractor.

3.9 FROST PROTECTION

- .1 When backfilling is performing under freezing conditions, defrost and heat the material before placing and compacting it. Protect the ground against frost until the backfilling operation is completed.

3.10 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Replace topsoil as directed by Departmental Representative.
- .3 Reinstate lawns to elevation which existed before excavation.
- .4 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstate areas affected by Work as directed by Departmental Representative.
- .6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.
- .7 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 02 65 00 – Storage Tank Removal.
- .2 Section 21 05 00 – Common Work Results for Mechanical.
- .3 Section 23 11 13 – Facility Fuel Oil Piping.
- .4 Section 26 05 28 – Grounding – Secondary.

1.2 REFERENCE STANDARDS

- .1 Canadian Federal Legislation and Guidelines
 - .1 Canadian Environmental Protection Act (CEPA), 1999
 - .1 Regulation SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.
- .2 CSA International
 - .1 CSA-B139-19, Installation Code for Oil Burning Equipment.
- .3 Government of Ontario Regulations
 - .1 Environmental Protection Act, R.S.O. 1990, c. E.19, dated March 22, 2017.
 - .2 Technical Standards and Safety Act, 2000: Ontario Regulation 213/01 – Fuel Oil, dated June 27, 2001.
 - .3 Technical Standards and Safety Act, 2000: Ontario Regulation 215/01 – Fuel Industry Certificates, dated May 15, 2015.
 - .4 Technical Standards and Safety Act, 2000: Ontario Regulation 216/01 – Certification of Petroleum Mechanics, dated August 1, 2008.
- .4 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2015 (NBC).
- .5 Public Services and Procurement Canada (PSPC)
 - .1 PSPC Storage Tank System Identification and Registration Form (**Appendix C**).
- .6 Underwriters' Laboratories of Canada (ULC).
 - .1 CAN/ULC-S601-14-REV1, Shop Fabricated Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids.
 - .2 CAN/ULC S661-10(R2016), Standard for Overfill Protection Devices for Flammable and Combustible Liquid Storage Tanks.
 - .3 CAN/ULC S663-11(R2016), Standard for Spill Containment Devices for Flammable and Combustible Liquid Aboveground Storage Tanks.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit shop drawings in accordance with Section 21 05 00 - Common Work Results for Mechanical.
- .2 Indicate details of construction, appurtenances, installation and leakage detection system.

- .3 Shop drawings to detail and indicate following as applicable to project requirements. Submit manufacturers product data to supplement shop drawings.
 - .1 Size, materials and locations of lifting lugs.
 - .2 Tanks capacity.
 - .3 Size and location of fittings.
 - .4 Environmental compliance package accessories.
 - .5 Decals, type size and location.
 - .6 Accessories: provide details and manufacturers product data.
 - .7 Size, material and location of manholes.
 - .8 Size, materials and locations of steps/stairs and tank supports.
 - .9 Finishes.
 - .10 Electronic accessories: provide details and manufacturers product data.
 - .11 Piping, valves and fittings: type, materials, sizes, piping connection details, valve shut-off type and location.
 - .12 Spill containment: provide description of methods and show sizes, materials and locations for collecting spills at connection point between storage tank system and delivery truck, rail car, or vessel.
 - .13 Anchors: description, material, size and locations.
 - .14 Level gauging: type and locations, include:
 - .1 Reporting systems, types of reports and report frequency.
 - .2 Maximum number of tanks to be monitored.
 - .3 Number of probes required and sizes.
 - .4 Provide details and manufacturer's product data.
 - .15 Ancillary devices: provide details and manufacturer's product data.
 - .16 Leak detection system, type and locations, and alarm system.
 - .17 Grounding and bonding: provide details of design, type, materials and locations.
 - .18 Corrosion protection: provide details of design, type, materials and locations.
- .4 Provide maintenance data for tank appurtenances and leakage detection system for incorporation into manual specified in Section 21 05 00 - Common Work Results for Mechanical.
- .5 Contractor shall be advised that although the system is not Federally Regulated under CEPA SOR/2008-197, the installation shall meet the intent of the Federal Regulations.
- .6 Contractor to provide signed, system-specific copy of PSPC Storage Tank System Identification and Registration Form (**Appendix C**) prior to final system commissioning.
 - .1 Electronic copy is acceptable. The Departmental Representative can provide a Microsoft Word version of the Form upon request.
 - .2 Contractor shall revise & resubmit Form within five (5) working days to address Departmental Representative's review comments.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling or reuse in accordance with Section 21 05 00 - Common Work Results for Mechanical.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

- .4 Ensure emptied containers are sealed and stored safely.
- .5 Dispose of unused paint or coating material at an official hazardous material collections site as approved by Departmental Representative.
- .6 Do not dispose unused paint material must into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .7 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 TANKS: CONVENTIONAL STEEL

- .1 One (1) new double wall steel vacuum-monitored aboveground diesel storage tank of 2,359 L capacity.
 - .1 Constructed in conformance with latest standard of CAN/ULC-S601.
 - .2 Tank to be factory pressure tested to 70 kPa with test report provided to Departmental Representative prior to installation.
 - .3 Vacuum gauge shall be visible at final installation.
 - .4 The outer dimensions of the tank shall not exceed the following:
 - .1 Outer diameter: 1,286 mm.
 - .2 Length excluding factory installed step: 1,863 mm.
 - .3 Height to top of factory installed spill container: 1,691 mm.
 - .5 Tank to come with two grounding lugs thermowelded on the tank by the manufacturer.
 - .6 Provide factory installed galvanized steel step to requirements of National Building Code of Canada to permit access to fill pipe within spill container.
 - .7 Support legs shall be less than 300mm high.
 - .8 Tank shall be double walled and monitored continuously for fuel leaks using a combination vacuum (leak) gauge and switch assembly.
- .2 Corrosion protection: external coat of oxide primer and top coat white paint as per manufacturer's instructions.
 - .1 Tank to arrive on-site primed and painted white by the tank manufacturer. Contractor responsible for repainting damaged/scratched areas as a result of the tank installation. Contractor to use touch up paint provided by the tank manufacturer only.
- .3 All unused tank openings shall be sealed liquid- and vapour-tight.
- .4 Connections: Eight (8) top connections, minimum.
 - .1 Sizes: 50 mm diameter, minimum. The normal and emergency vent shall be sized in accordance with CSA-B139 and CAN/ULC-S601.
 - .2 Emergency vent shall extend at minimum 150mm (6") above the fill height.
 - .3 Normal vent shall extend at minimum 150mm (6") above the fill height and 2m above grade.

2.2 ANCHORAGE

- .1 Storage tank to be anchored to new concrete pad with expansion-type bolts approved by fuel storage tank manufacturer.

2.3 CONCRETE PAD

- .1 The aboveground fuel tank shall be installed on a concrete pad in accordance with Section 03 30 00 – Cast-in-Place Concrete.
- .2 The concrete pad shall be sized to suit the footprint of the fuel tank with the pad extending on all sides of the tank in accordance with Division 03 requirements. The Contractor shall coordinate the size of the fuel tank and concrete pad with all trades prior to installation of the new concrete pad.

2.4 INSTRUMENTATION AND CONTROL WIRING/CABLING

- .1 Provide all control wiring/cabling for the instrumentation required under the Work which includes but may not be limited to remote electronic overfill alarm, tank-mounted level switches and sensors, and related equipment. Install instrumentation and control wiring as per the manufacturer's installation instructions.

2.5 PIPING, VALVES AND FITTINGS

- .1 Provide fuel piping system for new diesel fuel tank in accordance with Section 23 11 13 – Facility Fuel Oil Piping.

2.6 LEVEL GAUGING

- .1 Tank shall be equipped with a new ULC-approved continuous electronic probe level transmitter that is monitored by the new overfill alarm panel.
 - .1 Output: 4-20 mA from bottom to top.
 - .2 Housing: NEMA 4X, Aluminum, Explosion Proof, Class I, Div. 1, Groups C & D.
 - .3 Measuring range/length shall be verified by Contractor prior to procurement. Calibrate on-site to suit height of new tank.
 - .4 Operating temperature: -28 °C to 121 °C.
 - .5 The level transmitter shall be supplied and installed by Division 33 and wired to overfill alarm panel by Division 26.
- .2 Tank shall be equipped with a new ULC-approved visual level gauge, installed above the normal liquid level of the tank.
 - .1 Measuring range/length shall be verified by Contractor prior to procurement. Calibrate on-site to suit height of new tank.

2.7 LEAKAGE DETECTION SYSTEM

- .1 Interstice of new tank shall be equipped with a new vacuum gauge installed by tank manufacturer.

2.8 GROUNDING AND BONDING

- .1 Aboveground fuel storage tank to be grounded according to Section 26 05 28 – Grounding – Secondary.

2.9 OVERFILL PROTECTION AND SPILL CONTAINMENT

- .1 Provide spill container in conformance with CAN/ULC-S663 at top of new tank.
 - .1 Spill container shall be securely welded to top of new tank by manufacturer to ensure that it is liquid-tight.
 - .2 Spill container shall be equipped with lockable drain valve, lockable lid, and contain a minimum volume of 28 L of liquid.

- .2 Provide ULC-approved, pressure-fill positive shut-off overfill protection device in tank fill pipe drop tube, built and certified to CAN/ULC-S661. Overfill device to be installed such that tank cannot be filled past 95% of its maximum storage capacity.
- .3 Provide liquid and vapour-tight aluminum camlock connection with fill cap on fill pipe inside the new spill container.
 - .1 Fill pipe size: 50mm minimum.
- .4 Vent whistle:
 - .1 Provide vent whistle that is ULC-listed for fuel oil applications such that it does not restrict venting. Vent whistle shall be sized to suit tank opening and vent pipe.
- .5 Overfill Alarm Panel: Provide ULC-listed weatherproof audible and visual overfill alarm panel complete with high level float switch set to trigger an audible and visual alarm at 90% of tank capacity, built and certified to CAN/ULC-S661.
 - .1 Panel shall be rated for continuous outdoor use and cUL/CSA Listed.
 - .2 Overfill alarm panel shall be supplied by Division 33 and installed and wired by Division 26.
 - .3 Panel shall include the following:
 - .1 Stainless Steel Inner Panel with Heater;
 - .2 Alarm Horn;
 - .3 Test-Silence Selector Switch;
 - .4 90% High Level/Tank Fill Alarm with Audible and Visual Alarm;
 - .5 Continuous Tank Level LED Display with 4-20 mA Output; and
 - .6 NEMA/CSA 4X Fiberglass Deadfront Grey Enclosure with Padlockable Snap Latch.
 - .4 Provide 1-position stainless steel float switch, by same equipment manufacturer as overfill alarm panel, inside new tank.
 - .1 The float switch shall trigger an audible and visual alarm at 90% of the tank capacity.
 - .2 Housing: NEMA 4X, Aluminum, Explosion Proof, Class I, Div. 1, Groups C & D.
 - .3 Setpoint shall be verified by Contractor prior to procurement. Calibrate on-site to suit height of new tank.
 - .4 Operating temperature: -28 °C to 121 °C.
 - .5 The float switch shall be supplied and installed by Division 33 and wired by Division 26.
 - .5 Electrical specifications: 120VAC, 60 Hz, emergency power only.
 - .6 Pilot lights:
 - .1 "Power" (white in colour).
 - .2 "Diesel Tank High Level/Stop Fill" (red in colour). Red light to remain illuminated until alarm condition is corrected.
 - .7 Toggle switch:
 - .1 "Mute" or "Acknowledgement". Mute toggle-switch shall be a momentary switch that mutes horn for alarm input when pushed down.
 - .2 "Test". Test toggle-switch shall be a momentary switch that turns on the red light and the horn when pushed up.
 - .8 Horn: 95 dB at 3 m distance.

- .9 Mounted to the existing exterior wall adjacent to the new tank, at the location indicated in the drawings.

2.10 PRODUCT TRANSFER

- .1 ASTs with normal vent and separate emergency vent.
 - .1 Liquid- and vapour-tight connection on fill pipes for flammable products.
- .2 Three-sided concrete containment berm shall be provided, as indicated on Drawing M01, to meet the intent of Section 15 of CEPA SOR/2008-197.

2.11 TANK BOTTOM WATER

- .1 Disposed of in accordance with applicable Federal and Provincial regulations, guidelines and policies.

2.12 SPILLS AND SPILL KIT

- .1 Contained, treated and disposed of in accordance with applicable Federal and Provincial regulations, guidelines and policies.
- .2 Contractor to relocate existing spill kit next to new tank. Contractor shall ensure that spill kit is equipped with the following materials for petroleum product-type spills up to 500 L that includes, but is not limited to, the following materials:
 - .1 Absorbent pads.
 - .2 Absorbent booms.
 - .3 Absorbent socks.
 - .4 Rubber drain covers (two minimum).
 - .5 Waste disposable bags.
 - .6 Safety goggles.
 - .7 Nitrile gloves.

2.13 SIGNAGE, LABELS, DECALS AND TAGS

- .1 Provide signage, labels, decals and tags as indicated on drawings.
- .2 All signage, labels, decals and tags shall be bilingual.
- .3 Tank labels as per CAN/ULC-S601:
 - .1 Min. on 3 exposed side of tank.
 - .2 To read: "DIESEL FUEL 2,359 L"
 - .3 Black lettering, 100mm in height, on white background.
 - .4 Weather-proof, UV-resistant.
- .4 Fill connection tag:
 - .1 As indicated on drawings, chained to fill pipe inside spill container.

Part 3 Execution

3.1 TEMPORARY FUEL STORAGE DURING CONSTRUCTION

- .1 The Contractor is to ensure that a minimum of 12 hours of fuel is available during the construction period at all times. The Contractor must take all necessary precautions to ensure that the existing 350 kW generator has a continuous supply of fuel throughout the

duration of the construction period. Fuel from the existing system can be used for emergency usage.

3.2 EXISTING DIESEL FUEL AND STORAGE TANK REMOVAL

- .1 The storage tanks are to be drained of fuel by the Contractor prior to the commencement of the fuel storage tank upgrade work. Drained fuel may be used for the temporary fuel system; however, it must be disposed off-site once the work is complete. Under no circumstances will the fuel drained from the existing tanks be placed into the new fuel storage tanks. Provide documented proof to Departmental Representative of fuel disposal.
 - .1 Remove the existing storage tank steel support structure, piping and electrical components off-site for disposal/recycling.
- .2 Refer to Section 02 65 00 – Storage Tank Removal for additional requirements.

3.3 INSTALLATION

- .1 Install tanks in accordance with CAN/CSA-B139 including TSSA CAD revisions, National Fire Code of Canada, regulations set forth by TSSA and manufacturer's recommendations.
- .2 Double-wall steel vacuum monitored storage tank shall be placed outdoors and anchored onto new concrete pad, not less than 3 m from existing building and 900 mm from new traffic protection bollards, as indicated.
- .3 Install tanks such that certification labels and vacuum gauge are readily visible and unobstructed.
- .4 Install all equipment in accordance with the manufacturer's instructions.
- .5 Position tanks using lifting lugs and hooks, and where necessary use spreader bars. Do not use chains in contact with tank walls.
- .6 Contractor to provide ten (10) working days' notice to Departmental Representative for tank removal and tank installation activities.
- .7 Provide redline drawings of installation during construction to the Departmental Representative for the production of as-built drawings by others.
- .8 Tanks shall only be installed by persons certified by TSSA as having valid OBT-1 as per Ontario Regulation 215/01. The Contractor shall provide evidence of the person's valid OBT-1 designation prior to any work being performed that involves the removal, altering or installation of fuel storage tanks and associated components within this scope of work.
- .9 Provide certification of installation to Departmental Representative.
- .10 No fuel shall be added to the storage tank system until the Departmental Representative has provided approval for the first product transfer.
- .11 The storage tank system shall not put into operation until:
 - .1 The OBT-1 10-year Comprehensive inspection has been completed.

3.4 FIELD QUALITY CONTROL

- .1 Test tanks for leaks to requirements of CSA B139 and in presence of Departmental Representative.
 - .1 Complete tests in accordance with CSA B139.1.0, Part 13.6.3.

- .2 Complete tests and observations of generator and fuel system as laid out in CSA B139, Part 13.2.1 and provide report to Departmental Representative upon completion of tests.
- .3 During testing, do not exceed recommended operating pressure as directed by manufacturer.
- .4 Confirm storage tank is not leaking prior to entering the tank into service.
 - .1 The vacuum gauge reading on the new storage tank interstice to be a maximum of -20" Hg, otherwise Contractor is required to pull new vacuum at own expense.
- .5 Contractor is responsible for repairing and/or replacing faulty tanks and components at their own expense.

3.5 TOUCH-UP

- .1 Where coating is damaged, touch-up with original coating material in accordance with manufacturer's guidelines.

3.6 LEVEL GAUGE SYSTEM

- .1 Provide leak and vapour proof caulking at connections.
- .2 Shield capillary and tubing connections in heavy duty 50 mm polyethylene pipe.
- .3 Contractor shall calibrate system to satisfaction of Departmental Representative and provide signed report certifying accuracy of level gauging system.

3.7 LEAK DETECTION SYSTEM

- .1 Install in accordance with manufacturer's recommendations.

3.8 STORAGE TANK REFUELING

- .1 Contractor is responsible for procuring #2 diesel fuel oil and filling the new diesel fuel storage tank to 90% of its maximum storage capacity.

3.9 FUEL STORAGE TANK SYSTEM COMMISSIONING

- .1 Remote overfill alarm panel, level transmitters and leak detection devices:
 - .1 Retain manufacturer's representative to commission the overfill alarm panel and associated components.
 - .2 Test and confirm that all alarm conditions and components are functional.
 - .3 Retained manufacturer's technician to provide a certified commissioning test report to stipulate all specified alarms were tested, verified, and are fully functional.
- .2 Test and confirm the mechanical overfill protection device by verifying the device engages during the first transfer of product into the new storage tank.
 - .1 Prior to system commissioning, Contractor shall use test mechanism by same equipment manufacturer to verify that overfill prevention device engages for positive shut-off as designed.

3.10 CERTIFICATION

- .1 The fuel storage system shall be installed by an appropriately licensed Contractor as certified by TSSA.
- .2 The Contractor's Oil Burner Technician 1 (OBT-1) shall complete a 10-year comprehensive inspection upon complete system installation. Contractor's OBT-1 shall

install a tag on the installed fuel storage tank system at the completion of construction per O.Reg. 213/01. Systems installed without a proper installer's tag, including name, date and signature by the licensed OBT-1, will not be accepted and the system will not be turned over to the Departmental Representative until so.

END OF SECTION

APPENDIX A



CANADIAN FORCES FIRE MARSHAL

DIRECTIVE

FMD 4003

Authority Having Jurisdiction: CFFM

Subject:

**Fire Protection and Life Safety
Engineering Design**

Section:

Fire Prevention

OPI:

CFFM 4

Date of

Original publication: June 2008

Latest revision: December 2014

Reference:

See References

PURPOSE

To provide criteria for building design for construction projects, renovation projects and minor works.



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RECORD OF AMENDMENTS

Amendment No.	Additions/Revisions	New Version No.	Date
1	Title change from FMOG to FMD	1	1 Sep 09
2	Amendments and updates	2	14 Mar 11
3	General updates and revisions	3	15 Dec 14

Change Indication

Where a technical change or addition has been made relative to the 2nd version, a vertical line [|] has been added in the margin next to the affected provision. No change indication has been provided in cases where provisions have been renumbered or deleted.

General

1. This document provides criteria for the design and production of drawings and specifications for the Department of National Defence and Canadian Armed Forces (DND/CAF) infrastructure.

Definitions

2. Authority Having Jurisdiction (AHJ): The authority having jurisdiction for infrastructure in the Department of National Defence (DND) and the Canadian Armed Forces (CAF) is the Canadian Forces Fire Marshal.
3. Responsible authority: For DND/CAF construction projects, the responsible authority is the office responsible for project review as detailed in the Department of National Defence's Realty Asset Management Manual (RAMM), Chapter 10, publication C-08-005-120/AG-000. For locally managed projects, the responsible authority shall be the Fire Chief, the Chief Fire Inspector or the Senior Fire Fighter as applicable. For projects exceeding local spending authority, the responsible authority shall be the CFFM.
4. Consultant: means a private professional engineer or architect and / or the individual responsible for the design of the project.
5. Temporary infrastructure: Any building or structure for the occupancy of persons or material that will remain in place for less than 6 months.
6. Fire pump: A fire pump for fire protection service providing required design flow and pressure for water supply infrastructure or fixed systems supplying DND/CAF infrastructure.
7. Fire booster pump: A fire pump for fire protection service providing required design pressure for fixed water-based fire protection systems. This pump is often in the building it supplies.

Application

8. This document applies to all new construction and renovation projects for DND/CAF infrastructure in Canada.

9. This document is not intended to be applied to existing infrastructure.
10. Foreign deployed operations infrastructure shall comply with FMD 2000 Fire Protection Services Standard on Deployed Operations.
11. Temporary infrastructure deployed in exercises within Canada, such as tents and deployed mobile feeding platforms (MFP), shall conform to FMD 2000. All other infrastructure in Canada shall comply with the criteria in this document.
12. Tension fabric shelters (ex. Sprung) and trailers shall comply with FMD 4009 Trailers and Tension Fabric Shelters.
13. For leased facilities, this document should form part of the design criteria for design / fit up of the space for DND/CAF use. Consult the responsible authority for guidance on spaces intended to be leased for occupancy by DND/CAF personnel.
14. This document applies to renovation projects where the project scope includes extension of building area by 50% or more, major recapitalisation of building electrical, mechanical and architectural features or projects involving a change of major occupancy as defined in the National Building Code of Canada. For clarification see the responsible authority.

Intent

15. This document is intended for building designers. Statements of work for design of DND/CAF infrastructure by architectural and engineering firms shall include this document to ensure building designers are aware of design requirements for DND/CAF occupied buildings and leased spaces.
16. The Consultant is expected to incorporate the requirements of this document in the drawings and specifications to ensure the contractor has a sufficient understanding of the expectations for installation and acceptance of passive and active fire protection and life safety systems, including shop drawing requirements, installation quality, acceptance testing requirements, and close-out documentation submittals.

17. While all the requirements of this document are applicable in all cases as previously detailed, judgement should be used in the application of the requirements relative to the scope of the project. See the responsible authority for clarification.

Applicable Codes and Standards

18. The minimum standard for design and construction of buildings for the DND/CAF shall be:
 - 18.1 Department of National Defence's Realty Asset Management Manual (RAMM), Chapter 10, publication C-08-005-120/AG-000;
 - 18.2 The National Building Code of Canada (NBCC) and all documents referenced therein;
 - 18.3 The National Fire Code of Canada (NFCC) and all documents referenced therein;
 - 18.4 Provincial building and fire codes;
 - 18.5 Local regulations; and
 - 18.6 National Fire Protection Association (NFPA) 409: *Standard on Aircraft Hangars*.
19. In addition to the codes and standards referenced above, the following DND Construction Engineering Technical Orders (CETO) contain relevant fire and life safety design requirements. These requirements shall be included in the design of all DND/CAF facilities.
 - 19.1 C-98-001-003-MS-003 Handbook - Siting;
 - 19.2 C-98-007-000-AF-Z01 Universal design and barrier free access directives and standards for DND / CAF facilities;
 - 19.3 C-98-15F-001/DD-001 Design Criteria Fuel Facilities;
 - 19.4 G1-029 RCMP Guide – Secure Rooms;
 - 19.5 C-98-010-001 DD-003 Design and construction requirements for battery charging and storage rooms; and

19.6 C-09-153-001/TS-000 Ammunition and Explosives Safety Manual
Volume 1: Storage and Transportation.

- 20. Regardless of the edition of the documents referenced in the NBCC or NFCC, the Consultant shall reference the latest edition at time of tender for all codes and standards referenced in this and other referenced publications.
- 21. In the case of conflict or discrepancy, the most recent and/or stringent requirement shall apply.
- 22. Alternative solutions: Alternative solution proposals submitted to the responsible authority shall be prepared in accordance with NBCC Division C, Section 2.3.

- 23. All alternative solutions shall be submitted to CFFM for review and approval.

Design and Code Analysis

- 24. A design and code analysis for each design shall be submitted to the responsible authority for review.
- 25. The design and code analysis shall be included in every concept review and design development report submission and shall be updated and modified as the design progresses.
- 26. The design and code analysis shall detail each relevant code requirement and then clearly describe **how** the design meets or exceeds the requirements of relevant codes and standards. Where applicable, discuss the following fire and life-safety provisions:
 - 26.1 Building Code analysis (standard Building Code compliance chart);
 - 26.2 Classification of occupancy;
 - 26.3 Expected occupant load; where the Statement of Requirement (SOR) design is based on the personnel requirements for the infrastructure, the Consultant shall employ the occupant load calculation that is the greater of the SOR or the NBCC calculation.

- 26.4 Requirements for fire-rated walls, fire-rated doors, fire dampers, smoke barriers, fire stop systems, fire blocks;
- 26.5 Interior finish ratings;
- 26.6 Standpipe systems and fire extinguishers;
- | 26.7 Analysis of automatic water-based fire suppression systems and protected areas; methods, densities, and any parameters applicable to sprinkler storage applications (height, configuration and commodity classification as defined in NFPA 13);
- | 26.8 Description of special fire suppression systems other than water-based, and the rationale for their use;
- | 26.9 Water supply for fire protection and evaluation of available supply with potential demand;
- 26.10 Smoke control systems;
- 26.11 Fire alarm system (the type of alarm system and a description of fire alarm zones);
- | 26.12 Connection to and description of the fire alarm monitoring system;
- | 26.13 Emergency and exit lighting;
- | 26.14 Emergency power;
- 26.15 Coordination with physical security, access control and force protection requirements;
- 26.16 Fire department access;
- 26.17 Spatial separation, including detailed calculations of new buildings and any surrounding infrastructure;
- | 26.18 Description of hazardous materials storage including Petroleum, Oil and Lubricants (POL), dangerous goods and ammunition;

- 26.19 Description of any hazardous activities occurring in the building, including restricted egress, processes involving HAZMAT or dangerous goods, or any activity causing increased risk to life and property;
 - 26.20 Description of any applicable requirements of the National Fire Code of Canada, including Part 2 Building and Occupant Fire Safety, Part 3 Indoor and Outdoor Storage, Part 4 Flammable and Combustible Liquids and Part 5 Hazardous Processes and Operations, and
 - 26.21 Specific compliance with the additional requirements of this FMD.
27. **NOTE:** Projects with limited fire protection considerations might not require a detailed fire protection design analysis. Consult the responsible authority for clarification.

Partial Occupancy

- 28. Where construction occurs adjacent to areas occupied by DND/CAF personnel, partial occupancy measures shall be implemented in accordance with the NFCC and FMD 4005 *Partial Occupancy*.
- 29. The responsible authority shall determine the application of partial occupancy measures; this may include a temporary 1hour fire separation, temporary fire alarm or fire watch service, and modification to the building's existing fire safety plan.

Shop Drawing Submissions

- 30. Fire protection and life-safety shop drawings shall be submitted to the responsible authority as a complete package, by trade, after review and comment by the design consultant.
- 31. After shop drawing review by the responsible authority, comments from both consultant and responsible authority shall be acted upon prior to material order and installation.

32. Design specifications shall detail all shop drawings to be reviewed by the responsible authority prior to installation, including all types of systems addressed in this document. Consult the responsible authority for a specific list of shop drawings to be submitted for review.

Fire Separations

33. Fire separations shall be provided where required by the NBCC and the NFCC.
34. Fire resistance ratings of fire separations shall conform to CAN/ULC-S101: *Fire Endurance Tests of Building Construction and Materials*.
35. The fire resistance ratings of fire separations shall be based on a ULC or cUL listed design. Where a ULC listed design does not exist, reference to Appendix D of the NBCC is permitted.
36. The responsible authority will evaluate UL or other recognized designs only where no ULC or cUL design exists.
37. Assemblies conforming to NBCC tables A-9.10.3.1.A and A-9.10.3.1.B are only permitted to be used for buildings conforming to Part 9 of the NBCC.
38. All listed assembly design numbers (or reference to Appendix D of the NBCC) shall be shown on working drawings for the assembly shown.

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39. An examination of the fire separation assembly by the responsible authority shall determine if the assembly is installed as per its ULC or cUL listing or as specified in Appendix D of the NBCC.
40. The examination shall take place prior to close up to confirm assembly components and installation configuration.
41. Any and all deviations from design shall be considered grounds for rejection and replacement.

Closures in Fire Separations

42. Closures in fire separations shall be provided in accordance with the NBCC.
43. Closures in fire separations, including fire dampers, shall be installed in accordance with NFPA 80: *Standard for Fire Doors and Other Opening Protectives*.
44. Fire-rated double door installations shall be provided with door closers on both the active and the inactive leaf.
45. Where a roll down fire door (shutter) is provided with a fire alarm release device, the device shall incorporate battery back-up to prevent the release device from activating on AC power failure. Where practical, release devices shall receive their power from an auxiliary fire alarm power output.

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46. Closures in fire separations shall be inspected and tested as per NFPA 80.
47. Each fire damper shall be tagged following testing, and the tag shall identify the date of testing.
48. Each roll down fire door shall be functionally tested from each release point by cutting an 'S' hook on the fusible link line and also by activating the fire alarm release device where applicable.

Access Control

49. Installation of access control devices for all doors in a means of egress shall comply with the NBCC and FMD 4010 Security and Safe Egress.
50. Installation of magnetic locking devices shall comply with FMD 4000 Electro Magnetic Door Locks.
51. Where security / access control requirements and safe egress requirements conflict, the requirements of the NBCC shall have priority.

Exit Discharge

52. Every exit to the exterior shall discharge to a level hard-surface landing of minimum 300mm larger dimensions than the door opening.
53. A hard-surface path shall lead from each exterior exit landing to a public thoroughfare.
54. Exterior pathways provided for building emergency egress and leading to a public thoroughfare shall be a minimum of 1100mm wide and shall be a minimum of 3 metres from any unprotected openings in the building exterior.
55. Where an exit discharges to a fenced-in or enclosed space, the path leading to a public thoroughfare shall be provided with a gate or other unobstructed means to permit occupants to proceed to the public thoroughfare.

Spray-Applied Fireproofing

56. Spray-applied fireproofing is permitted to provide fire resistance ratings of supporting structural members where required by the NBCC.
57. Fire resistance ratings of spray-applied fireproofing materials shall conform to CAN/ULC-S101: *Fire Endurance Tests of Building Construction and Materials*.
58. Spray-applied fireproofing shall be specified by either a ULC or cUL listed design. The responsible authority will evaluate UL or other recognized designs only where no ULC or cUL design exists.
59. All listed assemblies or approved alternatives shall appear in specifications under spray applied fireproofing, and on design drawings in structural and/or architectural drawings.

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60. Spray-applied fireproofing shall be tested for thickness and density of the material applied in accordance with American Society for Testing and Materials (ASTM) E605: *Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material Applied to Structural Members*.

61. Spray-applied fireproofing shall be tested for cohesion/adhesion of the material applied in accordance with ASTM E736: *Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members*.
62. Intumescent fireproofing shall be tested in accordance with AWCI's Technical Manual 12-B: *Standard Practice for the Testing and Inspection of Field Applied Thin Film Intumescent Fire-Resistive Materials*
63. Test reports shall be submitted for review and approval by responsible authority prior to acceptance and concealment.

Firestopping

64. In addition to the locations required by the NBCC, firestopping shall be installed at:
 - 64.1 Head-of-wall joints;
 - 64.2 The point of intersection between dissimilar fire separation assemblies – e.g. between concrete block and gypsum;
 - 64.3 Penetrations through any membrane forming part of a fire separation, including electrical back boxes in gypsum fire separations;
 - 64.4 Fire dampers – only where permitted by damper manufacturer's installation instructions;
 - 64.5 Structural penetrations; and
 - 64.6 Floor – curtain-wall intersections (perimeter firestop systems). UL listed systems are acceptable for this application where no ULC listed system exists.
65. Fire resistance ratings of firestop systems shall be based on test results in accordance with CAN/ULC-S115: *Fire Tests of Firestop Systems*.
66. Firestopping shall consist of a ULC or cUL listed firestop system. The responsible authority will evaluate UL or other recognized designs only where no ULC or cUL design exists.

67. Engineering Judgments (EJ) shall be submitted for every situation where a listed firestop system does not exist. EJ's shall be prepared by the manufacturer or by a licensed engineer, in cooperation with a firestop manufacturer.
68. Mortar patching to seal a service penetration may only be used to seal service penetrations where the thickness of the mortar is not greater than the thickness of the courses, and set at the same time as the remainder of the wall.
69. Specifications shall specify use of a ULC listed firestop system for all fire-stopping.
70. Sleeves shall only be used in concrete block and cast-in-place concrete assemblies and then only if the sleeve is built in to the assembly at the time of construction of the assembly. Sleeves shall not be installed where penetrations are made following construction of an assembly.
71. All firestop materials shall be from one manufacturer.
72. One installer shall install all fire-stopping on the project. Each trade shall not firestop their own work.
73. The firestop installer or company shall have been registered in good standing with the Firestop Contractors International Association (FCIA) or CFFM approved equivalent for at least 2 years prior to contract award.

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74. Firestopping shall be inspected and evaluated as per ASTM E2174 Standard Practice for On-site Inspection of Installed Firestops and ASTM E2393 Standard Practice for On-site Inspection for Installed Fire Resistive Joint Systems and Perimeter Fire Barriers. Reports shall be submitted to the responsible authority for review as per the above standard.
75. An examination of the firestopping system shall determine if the assembly is installed as per its ULC listing.
76. Specifications shall allow for destructive testing and subsequent repair of installed firestopping.

- 77. The examination shall take place prior to close up to confirm assembly components and installation configuration.
- 78. Any and all deviations from the ULC listed system or an approved EJ shall be considered grounds for rejection and replacement.

Water Supply for Fire Protection and Fire Hydrants

- 79. In addition to the NBCC and DND/CAF Civil Engineering Guideline requirements, fire hydrants shall be located along all required fire routes.
- 80. Maximum spacing between hydrants along accessible routes shall be 120 metres in residential areas, and 90 metres in all other locations.
- 81. Good engineering and fire protection practice provides a looped supply for fire protection supplies to help ensure water supply during maintenance and water main service interruption and/or breaks. Where practical, fire protection supplies for both buildings and hydrants shall be supplied from a looped configuration.
- 82. For unsprinklered buildings, the needed fire flow shall conform to the ISO Guide for Determination of Needed Fire Flow. For sprinklered buildings, the needed fire flow shall be the demand of the sprinkler system including inside / outside hose allowance. Calculations for existing sprinkler systems shall include reliability analysis as defined in the ISO Guide.
- 83. For evaluation of water distribution network and available fire flows at DND/CAF locations, consult CFFM for assistance.

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- 84. Fire hydrants shall be flow tested following installation. The flow shall be measured and documented and the hydrant marked as per the requirements of NFPA 291 Recommended Practice for Fire Flow Testing and Marking of Hydrants.

Automatic Sprinkler Systems

85. Automatic sprinkler protection shall be provided in all new buildings and structures meeting any of the following conditions:
 - 85.1 Required by the NBCC to be sprinklered;
 - 85.2 Over 150m² in building area; or
 - 85.3 Where sleeping accommodation exceeding 10 persons per building is provided.
86. All new automatic sprinkler systems shall be designed, installed, and tested in accordance with NFPA 13: *Standard for the Installation of Sprinkler Systems* or NFPA 13R: *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height* as appropriate.
87. In addition to the requirements of the NBCC and NFPA 13 or 13R, the following additional features shall be incorporated in all new automatic sprinkler systems:
 - 87.1 All new automatic sprinkler systems shall be hydraulically designed using water supply test data obtained by testing to NFPA 291 Recommended Practice for Fire Flow Testing and Marking of Hydrants. Tests shall be conducted by, or under the direct supervision of, the sprinkler system designer;
 - 87.2 Design shall be based on water supply data not less than 1 year old as required by NFPA 13. The Consultant shall perform a flow test of the water supply system in the vicinity of construction for the purposes of design;
 - 87.3 Project specifications shall require a flow test by the installing contractor for the purposes of detailed design and production of hydraulic calculations;
 - 87.4 Sprinkler system design shall incorporate a minimum safety factor of 35 kPa (5psi) at the system's design flow rate;
 - 87.5 Earthquake bracing in accordance with NFPA 13 shall be provided where required by the NBCC;

- 87.6 All sprinkler system main drains shall be piped to discharge to the exterior and not into interior building drains. Where drain piping is below grade, a small auxiliary drain shall be installed to a floor drain;
- 87.7 Rooms containing the sprinkler system main valve assembly shall be provided with direct access to the exterior for Fire Department and maintenance access;
- 87.8 Fire department connections shall be installed within 45m of a fire hydrant and within 15m of both the fire department building entrance and fire alarm annunciator;
- 87.9 Outside post indicator valves (PIV) shall not be used unless specifically required either by code or the local responding Fire Department;
- 87.10 Where backflow preventers are required, these devices shall be ULC listed for fire protection service. All backflow preventers shall be selected, installed, verified, and tested in accordance with CAN/CSA-B64.10: *Manual for the Selection and installation of Backflow Prevention Devices*.
- 87.11 Means shall be provided to test backflow preventers at maximum system design flow. This flow shall discharge to the exterior in a location and manner so as to not cause damage to landscape or flooding, and not to a building interior drain. A copy of the verification and annual test certificate shall be permanently posted at the backflow prevention device;
- 87.12 Because of the additional maintenance required, glycol loops shall not be used. Dry pendent or dry sidewall sprinklers shall be used for small areas, and dry-pipe sprinkler systems shall be used for larger areas.
- 87.13 Where possible, rack storage shall be protected by ceiling level sprinklers only in order to allow maximum flexibility should a reconfiguration of the racking be necessary in the future.
- 87.14 Fire department connections shall be fitted with fittings compatible with the equipment of the responding fire department. The responding fire department shall be consulted to confirm. For DND/CAF fire

departments, Storz connections are common. Consult responsible authority for clarification.

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- 88. Flushing of the underground main and submittal of Contractor's Material and Test Certificate for Underground Piping shall be coordinated with Civil trades. Piping shall be flushed from riser to exterior of the building;
- 89. Automatic sprinkler systems shall be inspected and accepted by the responsible authority in accordance with the requirements of the standard used in system design.
- 90. Installing contractor shall submit Contractor's Material and Test Certificates for both Aboveground and Underground piping and any other related documentation to the responsible authority prior to acceptance.

Standpipe and Hose Systems

- 91. Standpipe and hose systems shall be provided where required by the NBCC.
- 92. Standpipe and hose systems shall be specified as a Class I system in accordance with NFPA 14.
- 93. All new standpipe and hose systems shall be designed and installed in accordance with NFPA 14: *Standard for the Installation of Standpipe and Hose Systems*.
- 94. Earthquake bracing in accordance with NFPA 13 shall be provided where required by the NBCC.
- 95. Manual wet standpipes as defined in NFPA 14 may be specified where permitted by NBCC. Manual standpipes must include signage at the fire department connection showing required input pressure from the fire department pumper apparatus.

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- 96. Standpipe and hose systems shall be inspected and accepted by the responsible authority in accordance with the requirements of NFPA 14.

- 97. Installing contractor shall submit a Contractor's Material and Test Certificate for Aboveground Piping to the responsible authority prior to acceptance.

Fire Pumps

- 98. All new fire pumps and fire booster pumps shall be designed and installed in accordance with NFPA 20: *Standard for the Installation of Stationary Pumps for Fire Protection*.
- 99. Where a fire pump is required to meet the required flow and pressure, a minimum of two independent pumps and drivers shall be provided. Pumps shall be capable of supplying full demand with the largest pump out of service. A maximum of one half of the pump drivers may be powered by electricity.
- 100. Where there is an existing water supply and a fire booster pump is required to meet the demand pressure of a fire suppression system, the pump shall be either a diesel engine or electric motor driven.
- 101. Where an electric driven fire booster pump is provided, back-up emergency power for the electric motor shall be provided by a diesel power generator designed and installed to NBCC, NFPA 20 and CAN/CSA-282: *Emergency Electrical Power Supply for Buildings*.

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- 102. Acceptance test of fire pumps and fire booster pumps shall be performed by the installing contractor as per NFPA 20 and witnessed by the responsible authority. The manufacturer representative shall be present for testing conducted by responsible authority.
- 103. Installing contractor shall submit acceptance and testing documentation required by NFPA 20 to the responsible authority.

Fixed Fire Suppression Systems

- 104. All fixed fire suppression systems shall be designed and installed in accordance with the requirements of the relevant NFPA standards. These include but are not limited to:

- 104.1 Low, medium and high expansion foam extinguishing systems;
 - 104.2 Carbon dioxide extinguishing systems;
 - 104.3 Water spray fixed extinguishing systems;
 - 104.4 Foam water sprinkler and foam water spray systems;
 - 104.5 Dry chemical extinguishing systems;
 - 104.6 Wet chemical extinguishing systems;
 - 104.7 Commercial kitchen extinguishing systems;
 - 104.8 Water mist fire protection systems; and
 - 104.9 Clean agent extinguishing systems.
105. Where NFPA standards refer to alarm, detection and actuation for suppression systems, these systems shall be installed to the requirements of CAN/ULC-S524, Installation of Fire alarm Systems, and not NFPA 72.
106. Control panels for fire suppression systems shall be of the same manufacturer and networked with the building fire alarm system.
107. Control panels for fixed fire suppression systems shall be capable of stand-alone operation.
108. Where fixed fire suppression systems are specified, all design calculations and assumptions shall be submitted to the CFFM for review in accordance with the relevant NFPA standard. CFFM is available for assistance with acceptance testing.
109. Designs for kitchen suppression systems under NFPA 96 Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations and standard wet and dry sprinkler systems need not be submitted to CFFM for review. CFFM is available to assist with review and interpretation as required.

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110. Acceptance of fixed fire suppression shall be performed by the installing contractor in accordance with the relevant NFPA standard and witnessed by the responsible authority. Consult the responsible authority for specific testing requirements.

111. For clean agent fire suppression systems, the door blower fan unit and smoke pencil test method shall be conducted by a third party to demonstrate the integrity of the enclosure.
112. For kitchen fire suppression systems, a balloon test with nitrogen test gas shall be performed to verify the integrity of the piping network as required by NFPA 96.

Portable Fire Extinguishers

113. Portable fire extinguishers shall be provided in accordance with the NBCC and NFCC.
114. All fire extinguishers shall be multi-purpose dry chemical type. Other types of extinguishers shall be used only where required for special hazards where dry chemical is incompatible with the materials stored. I.e., combustible metals may require a Class D fire extinguisher, clean rooms may require clean agent extinguishers, grease appliances may require a Class K extinguisher, aircraft hangars may require portable foam extinguishers.

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115. An examination of the fire extinguishers provided shall determine if the extinguishers are appropriately installed for:
 - 115.1 Type;
 - 115.2 Sizing; and
 - 115.3 Distribution (travel distance between extinguishers).

Fire Alarm, Detection and Monitoring Systems

116. A fire alarm system shall be installed wherever a sprinkler system or other fire suppression system is installed or when required by NBCC.
117. All fire alarm systems, including fire suppression releasing systems/panels, shall be designed, installed, tested, and verified in accordance with:

- 117.1 NBCC;
 - 117.2 CAN/CSA-C22.1: *Canadian Electrical Code (CEC)*;
 - 117.3 CAN/ULC-S524 *Installation of Fire Alarm Systems*;
 - 117.4 CAN/ULC-S536 *Inspection and Testing of Fire Alarm Systems*; and
 - 117.5 CAN/ULC-S537 *Verification of Fire Alarm Systems*.
118. In addition to the requirements of the NBC, CEC, and CAN/ULC-S524, *Installation of Fire Alarm Systems*, the following features shall be incorporated in all fire alarm systems and fire suppression releasing systems:
- 118.1 All systems having more than two zones shall be addressable;
 - 118.2 All wiring shall be Class A;
 - 118.3 Signalling shall be via combination electronic audible/visible devices with supplementary visible devices distributed as necessary.
 - 118.4 Strobes shall be minimum 30cd intensity;
 - 118.5 Strobes shall not be silenceable;
 - 118.6 Where Barrier Free requirements apply as per C-98-007-000/AF-Z01 Universal Design and Barrier-Free Access Guidelines and Standards for DND/CAF Facilities, the fire alarm signal shall be visible from within every room. Compliance can be achieved by careful placement of signals so that light from a strobe can be seen through windows and through doorways of rooms not occupied with the door closed (e.g. janitor and communications closets);
 - 118.7 Addressable loops shall serve no more than one floor;
 - 118.8 Zones shall be annunciated individually by dedicated LED indicators.
 - 118.9 No circuit is to be loaded to more than 80% of its maximum capacity;
 - 118.10 Where an emergency power generator is installed, it shall supply the fire alarm system in addition to fire alarm back-up batteries;
 - 118.11 AC power supply to a transponder shall be from a dedicated circuit complete with a breaker lock;
 - 118.12 Fan shut down shall only be provided where required by the NBCC;

- 118.13 Where required by NBCC, duct smoke detectors shall be installed on the supply side of an air handling unit, and shall shut down only the unit to which it is connected. Shut down shall be achieved directly from the fire alarm to the motor controller or unit, and not through a building management system;
 - 118.14 Fire alarm system wiring shall be permanently labelled at each end of every conductor;
 - 118.15 Fire alarm system wiring should be continuous from panel to device. Where splices are required, they shall be within accessible junction boxes and only on labelled terminal blocks;
 - 118.16 Outdoor patios and rooftop areas, contained by a fence or railing, used for assembly occupancies and having an egress path other than immediately at grade, i.e. via ramps or stairs, shall be provided with both visible and audible fire alarm signalling;
 - 118.17 All buildings shall have an annunciator installed at the designated fire department building entrance as identified by the local responding Fire Department; and
 - 118.18 Fire alarm panels shall be provided with the bypasses for HVAC shutdown, door hold open devices, kitchen system power shutdown and overhead door hold open devices.
- 119. Fire alarm monitoring systems installed on and monitoring DND properties shall be installed as per ULC S561, Installation and Services for Fire Signal Receiving Centres and Systems as a proprietary fire signal receiving centre.
 - 120. All wiring for alarm monitoring shall be installed in conduit as required by CAN/ULC-S561.
 - 121. Fire alarm graphics/diagrams provided at fire department entrance shall be active where required by responsible authority. Passive graphics are acceptable in most cases.

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- 122. Fire alarm active and/or passive graphics shall be reviewed as part of shop drawing submission to responsible authority.

123. All fire alarm systems shall be verified in accordance with CAN/ULC-S537: *Verification of Fire Alarm Systems*.
124. The responsible authority shall perform a spot inspection and acceptance tests prior to substantial completion and occupancy of the building. Any faults / deficiencies found during the inspection shall be rectified prior to granting occupancy.
125. A report conforming to CAN/ULC-S537 shall be submitted to the responsible authority prior to acceptance.

Emergency Lighting

126. Emergency lighting shall be provided as required in the NBCC. In addition to the NBCC requirements, the following provisions shall be provided:
 - 126.1 Outdoor patios, decks, and rooftop areas, contained by a fence or railing, used for assembly occupancies and having an egress path other than immediately at grade, shall be provided with emergency lighting at an average level of 10 lx with no area less than 1 lx. Emergency lighting shall be provided for both the entire patio area and egress route to grade;
 - 126.2 Where emergency lighting is provided in residential “quarters” type buildings, emergency lighting shall be designed with 30, 60, or 120-minute power supply, and a reserve 30, 60, or 120-minute power supply upon activation of the fire alarm. Upon power failure, the emergency lighting shall activate for the amount of time required by the NBCC. After this period, the emergency light unit shall deactivate the lighting, reserving an equal amount of lighting capacity to be activated in the event of a fire alarm during an extended power failure; and
 - 126.3 In hazardous locations, as defined by CAN/CSA-C22.1 *Canadian Electrical Code*, emergency lighting requiring more than six lighting heads in any area shall be provided via the building lighting fixtures, powered by either an emergency power generator, or an approved emergency lighting UPS/inverter system, located in a non-hazardous area.

127. Where an emergency power generator is provided, the generator shall supply power for emergency lighting.
128. If self-contained emergency lighting units are used, they shall conform to CAN/CSA-C22.2 No. 141: *Unit Equipment for Emergency Lighting*.

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129. The installing contractor shall measure lighting levels of installed emergency lighting with a lux meter to confirm compliance with the minimum lighting requirements as found in the NBCC. This testing shall be performed after dark, during a full-building power failure.
130. The installing contractor shall submit a shop drawing summary floor plan of the installed emergency lighting locations and lighting level measurements found in those areas. Report shall be submitted to the responsible authority for review prior to acceptance.

Exit Signs

131. Exit signs shall be provided as required by the NBCC.
132. Where an emergency power generator is provided, the generator shall supply power for all internally illuminated exit signs.

ACCEPTANCE INSPECTION

133. An examination of the exit signs by the responsible authority shall determine any areas which do not sufficiently direct the occupant to an exit or any non-functional signs.

Emergency Power

134. Emergency power supply installation shall comply with the requirements of CAN/CSA-C282: *Emergency Electrical Power Supply for Buildings*.
135. All buildings designated as post-disaster buildings in accordance with the NBCC shall be provided with an emergency power generator. Where an emergency power generator is provided, it shall supply the following fire and life safety equipment:

- 135.1 Fire alarm and detection system;
 - 135.2 Fire suppression releasing panels;
 - 135.3 Emergency lighting;
 - 135.4 Internally illuminated exit signs;
 - 135.5 Area of refuge smoke control systems; and
 - 135.6 Firefighter elevator.
136. Wiring supplying emergency power to smoke control systems and fire fighter elevators and the wiring between the generator and the transfer switch shall be provided with a fire resistance rating where required by the NBCC.

ACCEPTANCE INSPECTION

- 137. Emergency power shall be tested as part of the overall building acceptance process. All fire safety engineering systems supplied with emergency power shall be verified by the responsible authority for functionality prior to acceptance.

Fire Protection of Dwelling Units

138. All DND/CAF dwelling units and residential housing shall conform to NBCC.
139. In addition to the requirements of the NBCC, the following shall be provided in all dwelling units owned by DND/CAF.
140. Carbon monoxide and smoke alarms:
- 140.1 Carbon monoxide detectors and smoke alarms shall be designed and installed as per NBCC;
 - 140.2 In addition to the requirements of the NBCC and the NFCC, smoke alarms and carbon monoxide detectors shall:
 - 140.2.1 Have battery back-up, in addition to their electrical connection;

140.2.2 Incorporate a manually operated device within the circuitry so that the signal emitted by the smoke alarm can be silenced for a period of not more than 10 minutes; and

140.2.3 Be photoelectric when installed on the same level as a kitchen;

140.3 Smoke alarms are required to be run on a lighting circuit as per CSA C22.2 Canadian Electrical Code. Lighting circuit shall be on the ground floor or other common area;

140.4 Combination smoke alarm / carbon monoxide alarms are acceptable in any location that requires either a smoke alarm or carbon monoxide alarm.

ACCEPTANCE INSPECTION

141. Carbon monoxide detection and smoke alarms shall be inspected and tested by the responsible authority for functionality.

Fire Protection of Information Technology and Equipment

142. Fire protection of information technology buildings, rooms and spaces shall comply with the requirements of FMD 4011 Fire Protection of Information Technology and Equipment.

143. Automatic sprinkler protection is required in all spaces serving IT equipment.

144. Automatic sprinkler protection may be required under raised floor spaces. See NFPA 13 for further detail.

Hazardous Processes

145. All hazardous processes shall be designed in accordance with the NBCC and the NFCC.

146. Where no Canadian standard or Code regulates the protection of a specific hazardous process, the system shall be designed and installed as per the



requirements of the relevant NFPA standard or other standard acceptable to the CFFM. See the responsible authority for clarification.

ACCEPTANCE INSPECTION AND CLOSE-OUT DOCUMENTATION

147. All hazardous processes shall be tested and accepted by the responsible authority in accordance with the relevant NFPA design standard.

REFERENCES

Realty Asset Management Manual, Chapter 10: Fire Protection and Emergency Services
(C-08-005-120/AG-000)

National Fire Code of Canada, latest edition

National Building Code of Canada, latest edition

Construction Engineering Technical Orders (CETO)

C-98-001-003-MS-003: Handbook - Siting

C-98-007-000-AF-Z01: Universal Design and Barrier Free Access Directives and Standards
for DND/CAF Facilities

C-98-010-001 DD-003: Design and Construction Requirements for Battery Charging and
Storage Rooms

C-09-153-001/TS-000: Ammunition and Explosives Safety Manual Volume 1: Storage and
Transportation

C-98-15F-001/DD-001: Design Criteria Fuel Facilities

Fire Marshal Directives

FMD 2000: *Fire Protection Services Standard on Deployed Operations*

FMD 4000: *Electromagnetic Door Locks*

FMD 4005: *Partial Occupancy*

FMD 4009: *Trailers and Tension Fabric Buildings*

FMD 4010: *Security and Safe Egress*

FMD 4011: *Fire Protection of Information Technology and Equipment*

National Fire Protection Association

NFPA 11: *Standard for Portable Fire Extinguishers*

NFPA 13: *Standard for the Installation of Sprinkler Systems*

NFPA 13R: *Standard for the Installation of Sprinkler Systems in Residential Occupancies
up to and Including Four Stories in Height*

NFPA 14: *Standard for the Installation of Standpipe and Hose Systems*

NFPA 20: *Standard for the Installation of Stationary Pumps for Fire Protection*

NFPA 80: *Standard for Fire Doors and Other Opening Protectives*

NFPA 291 *Recommended Practice for Fire Flow Testing and Marking of Hydrants*

NFPA 409: *Standard on Aircraft Hangars*

Underwriters' Laboratories of Canada

CAN/ULC-S101: *Fire Endurance Tests of Building Construction and Materials*

CAN/ULC-S115: *Fire Tests of Firestop Systems*

CAN/ULC-S524: *Installation of Fire Alarm Systems*



CAN/ULC-S536: *Inspection and Testing of Fire Alarm Systems*

CAN/ULC-S537: *Verification of Fire Alarm Systems*

Canadian Standards Association

CAN/CSA-B64.10: *Manual for the Selection of Backflow Prevention Devices*

CAN/CSA-C22.1: *Canadian Electrical Code*

CAN/CSA-C22.2 No. 141: *Unit Equipment for Emergency Lighting*

CAN/CSA-C282: *Emergency Electrical Power Supply for Buildings*

CAN/CSA-C860: *Performance of Internally Lighted Exit Signs*

American Society for Testing and Materials

ASTM E605: *Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material Applied to Structural Members*

ASTM E736: *Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members*

ASTM E2174: *Standard Practice for On-site Inspection of Installed Firestops*

ASTM E2393: *Standard Practice for On-site Inspection for Installed Fire Resistive Joint Systems and Perimeter Fire Barriers*

RCMP Guidelines

G1-029 RCMP Guide – Secure Rooms;

Association of the Wall and Ceiling Industry

AWCI's Technical Manual 12-B: *Standard Practice for the Testing and Inspection of Field Applied Thin Film Intumescent Fire-Resistive Materials*

The International Organization for Standardization (ISO)

Guide for Determination of Needed Fire Flow

APPENDIX B



PSPC Storage Tank System Withdrawal and Removal Form

Instructions	For use by the National Storage Tank Subject Matter Expert
<ul style="list-style-type: none">Complete one form for each Storage Tank System that is:<ul style="list-style-type: none">temporarily withdrawn from servicepermanently withdrawn from serviceremovedComplete applicable sections onlyEnsure all required signatures are included in Section 6 (Certification)Return completed form to: EnregistrementRS.STRegistration@tpsgc-pwgsc.gc.ca	Date first received
	Subsequent date received <small>(due to incomplete information, if applicable)</small>
	Date entered into FIRSTS
	Entered by
	Comments
PSPC Registration Process for Storage Tank Systems	For use by the Regional Storage Tank Subject Matter Expert
https://gcdocs.gc.ca/tpsgc-pwgsc/llisapi.dll/link/76006565	Comments

SECTION 1: PURPOSE OF NOTIFICATION (Check all that apply)

<input type="checkbox"/> Component(s) temporary withdrawal <i>(complete sections 2, 3 & 6)</i>	Environment and Climate Change Canada Storage Tank Identification Number: EC - _____
<input type="checkbox"/> Component(s) permanent withdrawal <i>(complete sections 2, 4 & 6)</i>	
<input type="checkbox"/> Storage tank system temporary withdrawal <i>(complete sections 2, 3 & 6)</i>	
<input type="checkbox"/> Storage tank system permanent withdrawal <i>(complete sections 2, 4 & 6)</i>	
<input type="checkbox"/> Component(s) removal <i>(complete sections 2, 5 & 6)</i>	
<input type="checkbox"/> Storage tank system removal <i>(complete sections 2, 5 & 6)</i>	

SECTION 2: LOCATION OF STORAGE TANK SYSTEM AND DOCUMENTS

Facility Name	Street address where tank system is located <small>(or provide GPS coordinates or latitude & longitude)</small>
Street address where tank system records are located	Street address where environmental emergency response plan is located
<input type="checkbox"/> Same location as the storage tank system	<input type="checkbox"/> Same location as the storage tank system
	<input type="checkbox"/> Not applicable (storage tank system has been removed)

SECTION 3: TEMPORARY WITHDRAWAL FROM SERVICE¹

	Tank / Component ____	Tank / Component ____	Tank / Component ____	Tank / Component ____	Tank / Component ____
Tank / Component Description (main, day, #)					
Description for temporary withdrawal from service					
Internal tank identification number					
Date withdrawn from Service <i>SOR/2008-197 Section 43</i>	YYYY/MM/DD	YYYY/MM/DD	YYYY/MM/DD	YYYY/MM/DD	YYYY/MM/DD
Date returned to Service <i>SOR/2008-197 Section 42</i>	YYYY/MM/DD	YYYY/MM/DD	YYYY/MM/DD	YYYY/MM/DD	YYYY/MM/DD

Section 4: PERMANENT WITHDRAWAL FROM SERVICE

	Tank ____		Tank ____		Tank ____		Tank ____		Tank ____	
	Tank	Component	Tank	Component	Tank	Component	Tank	Component	Tank	Component
Tank or Component Description (main, day, #)										
Description of component being withdrawn from service										
Date permanently withdrawn from service <i>SOR/2008-197 Section 44.(2)</i>	YYYY/MM/DD		YYYY/MM/DD		YYYY/MM/DD		YYYY/MM/DD		YYYY/MM/DD	
Withdrawn by an approved person	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Withdrawal records kept²	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
All liquids and sludge removed and disposed of <i>SOR/2008-197 Section 44.(3(a))</i> <i>Keep records of waste manifests</i>	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Vapours purged to less than 10% of lower flammability limit <i>SOR/2008-197 Section 44.(3(b))</i> <i>Keep records of readings</i>	<input type="checkbox"/> Yes <input type="checkbox"/> No Reading: _____		<input type="checkbox"/> Yes <input type="checkbox"/> No Reading: _____		<input type="checkbox"/> Yes <input type="checkbox"/> No Reading: _____		<input type="checkbox"/> Yes <input type="checkbox"/> No Reading: _____		<input type="checkbox"/> Yes <input type="checkbox"/> No Reading: _____	
Combustible Gas Meter:	<div style="display: flex; justify-content: space-between; align-items: flex-end;"> <div>_____</div> <div>_____</div> <div>_____</div> </div> <div style="display: flex; justify-content: space-between; font-size: small; margin-top: 5px;"> <div>Make/model</div> <div>Serial number</div> <div>Last calibration date</div> </div>									
Evidence of contamination detected <i>SOR/2008-197 Section 44.(3(c))</i> <i>Keep determination report</i>	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
*if yes, please describe below the action taken and provide PSPC project number										

¹ If any component of the system is out of service more than two years, then permanent withdrawal is required.

² Records must be kept at the owner's or operator's place of work nearest to the system for five (5) years after the day on which the withdrawal and/or removal record was made (*SOR/2008-197 Section 46.(1)*)

Description of action taken on contamination (please provide summary only or attach reports)										
No long-term harmful effects³	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Label attached to fill pipe <i>SOR/2008-197 Section 44.(4)</i>	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Name of person withdrawing component or storage tank system (print): _____ Certification Number: _____										
Must be withdrawn by a person approved to do so in the province in which the system or component is located, or withdrawal is supervised by a professional engineer in accordance with SOR/2008-197 Section 44.(1)										

SECTION 5: REMOVAL FROM SERVICE										
	Tank _____		Tank _____		Tank _____		Tank _____		Tank _____	
	Tank	Component	Tank	Component	Tank	Tank	Component	Tank	Component	Tank
Date removed <i>SOR/2008-197 Section 45</i>	YYYY/MM/DD		YYYY/MM/DD		YYYY/MM/DD		YYYY/MM/DD		YYYY/MM/DD	
Removed by an approved person	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Withdrawal records kept⁴	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Name of person removing component or storage tank system (print): _____ Certification Number: _____										
(Must be withdrawn by a person approved to do so in the province in which the system or component is located, or withdrawal is supervised by a professional engineer) in accordance with SOR/2008-197 Section 45.										

³ Has the withdrawal been done in a way such that there will be no immediate or long-term harmful effect on the environment and it will not constitute a danger to human life or health?

⁴ Records must be kept at the owner's or operator's place of work nearest to the system for five (5) years after the day on which the withdrawal and/or removal record was made (*SOR/2008-197 Section 46.(1)*).

SECTION 6: CERTIFICATION

This section to be completed by the Building Technician/Operator/Contractor/Consultant/Project Manager:

I hereby certify that the information provided with respect to the identification of the storage tank system under Section 28 of the *Storage Tank Systems for Petroleum and Allied Petroleum Products Regulations* (SOR 2008-197) is accurate and complete.

Name _____ Title _____

Signature _____ Date (YYYY/MM/DD) _____

This section to be completed by PSPC Regional Storage Tank Subject Matter Expert:

I hereby certify that I have reviewed the contents of this form to ensure that information provided with respect to the identification of the storage tank system under Section 28 of *Storage Tank Systems for Petroleum and Allied Petroleum Products Regulations* (SOR 2008-197) is complete and accurate to the best of my knowledge.

Regional PSPC Storage Tank Subject
Matter Expert

Name _____ Title _____

Signature _____ Date (YYYY/MM/DD) _____

This section to be completed by the PSPC Asset Manager:

I hereby certify that the information provided with respect to the identification of the storage tank system under Section 28 of the *Storage Tank Systems for Petroleum and Allied Petroleum Products Regulations* (SOR 2008-197) is complete.

PSPC Asset Manager

Name _____ Title _____

Signature _____ Date (YYYY/MM/DD) _____

APPENDIX C



Storage Tank System Identification and Registration Form

Instructions	For use by the National Storage Tank Subject Matter Expert
<ul style="list-style-type: none">Complete one form for each Storage Tank System. A system can be a single independent tank or several tanks that are interconnected.Section 6 must be signed to confirm information accuracy/completenessReturn the complete form to: enregistrementRS-STregistration@tpsgc-pwgsc.gc.ca	Date first received
	Subsequent date received <small>(due to incomplete information, if applicable)</small>
	Date entered into FIRSTS
	Entered by
	Comments
PSPC Registration Process for Storage Tank Systems	For use by the Regional Storage Tank Subject Matter Expert
https://gcdocs.gc.ca/tpsgc-pwgsc/lisapi.dll/link/76006565	Comments
SECTION 1: PURPOSE OF NOTIFICATION (Check all that apply)	
<div><input type="checkbox"/> This is a newly installed system <i>(complete sections 2, 3, 5 & 6)</i></div> <div><input type="checkbox"/> Existing operating system that has not been identified previously <i>(complete sections 2, 3, 5 & 6)</i></div> <div><input type="checkbox"/> Modification to the current storage tank system registration record on Environment and Climate Change Canada's Federal Identification Registry for Storage Tank Systems (FIRSTS) database. <i>(complete sections 2, 3, 5 & 6)</i></div> <div><input type="checkbox"/> Transfer of ownership <i>(complete sections 2, 4 and 6)</i></div> <div><input type="checkbox"/> Other (Specify)</div>	Environment and Climate Change Canada (EC) Storage Tank Identification Number: EC - _____ <div>(if applicable)</div>
SECTION 2: LOCATION OF STORAGE TANK SYSTEM AND DOCUMENTS	
Facility Name	Street address where tank system is located
Street address where tank system records are located	Street address where environmental emergency response plan is located
<input type="checkbox"/> Same location as the storage tank system	<input type="checkbox"/> Same location as the storage tank system

SECTION 3: STORAGE TANK OWNER AND OPERATOR INFORMATION

Owner Name	Name of operating company or operator (if different from owner)
Address of Owner (include: City, Province/Territory, Postal Code)	Address of operator (if different from owner)
Name of Contact Person	Name of operator (if different from owner)
Title of Contact Person	Title of operator (if different from owner)
Phone Number	Phone Number (if different from owner)
E-mail Address	E-mail Address if different from owner)

SECTION 4: TRANSFER OF OWNERSHIP

Name of previous owner	Name of new owner
Address of previous owner (include: City, Province/Territory, Postal Code)	Address of new owner (include: City, Province/Territory, Postal Code)
Name of previous contact person	Name of new contact person
Title of previous contact person	Title of new contact person
Phone number of previous owner	Phone number of new owner
E-mail Address of previous owner	E-mail address of new owner

SECTION 5: STORAGE TANK SYSTEM DESCRIPTION

PART 5a: GENERAL INFORMATION

	Tank ____	Tank ____	Tank ____	Tank ____	Tank ____
Tank Description (main, day, #)					
PSPC Tank Identification Number					
Year of Installation of tank(s)					
Storage Tank System Use (ex. auxiliary power, vehicle, refueling, waste oil, heating etc.)					
Storage Tank Service Status (check all that apply)	<input type="checkbox"/> Active <input type="checkbox"/> Seasonally active <input type="checkbox"/> Temporarily out of service	<input type="checkbox"/> Active <input type="checkbox"/> Seasonally active <input type="checkbox"/> Temporarily out of service	<input type="checkbox"/> Active <input type="checkbox"/> Seasonally active <input type="checkbox"/> Temporarily out of service	<input type="checkbox"/> Active <input type="checkbox"/> Seasonally active <input type="checkbox"/> Temporarily out of service	<input type="checkbox"/> Active <input type="checkbox"/> Seasonally active <input type="checkbox"/> Temporarily out of service
If storage tank system is seasonally active please specify months in service					
Type of Tank	<input type="checkbox"/> Underground <input type="checkbox"/> Aboveground	<input type="checkbox"/> Underground <input type="checkbox"/> Aboveground	<input type="checkbox"/> Underground <input type="checkbox"/> Aboveground	<input type="checkbox"/> Underground <input type="checkbox"/> Aboveground	<input type="checkbox"/> Underground <input type="checkbox"/> Aboveground
Type of Piping (Check all that apply)	<input type="checkbox"/> Underground <input type="checkbox"/> Aboveground <input type="checkbox"/> Aboveground and Underground <input type="checkbox"/> No piping	<input type="checkbox"/> Underground <input type="checkbox"/> Aboveground <input type="checkbox"/> Aboveground and Underground <input type="checkbox"/> No piping	<input type="checkbox"/> Underground <input type="checkbox"/> Aboveground <input type="checkbox"/> Aboveground and Underground <input type="checkbox"/> No piping	<input type="checkbox"/> Underground <input type="checkbox"/> Aboveground <input type="checkbox"/> Aboveground and Underground <input type="checkbox"/> No piping	<input type="checkbox"/> Underground <input type="checkbox"/> Aboveground <input type="checkbox"/> Aboveground and Underground <input type="checkbox"/> No piping
Range of piping diameter (mm)					
Nominal Tank Capacity (in Liters)					
Product Stored	Tank ____	Tank ____	Tank ____	Tank ____	Tank ____
Heating Oil	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Used Oil	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Diesel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Jet Fuel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kerosene	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bunker Oil	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gasoline	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Uninhibited Ethylene Glycol	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify					

PART 5b: ULC or API STANDARD NUMBER					
	Tank ____	Tank ____	Tank ____	Tank ____	Tank ____
Name of tank manufacturer					
Year of manufacture (YYYY)					
Certificate # of person certified by province at time of installation, as applicable					
Aboveground					
API Specification 12B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
API Specification 12D	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
API Specification 12F	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
API Standard 650	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ULC-C142.14	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ULC-C142.15	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ULC-C142.17	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ULC-C142.18 (replaced by S601)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ULC-C142.20	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ULC-C142.21 (withdrawn)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ULC-C142.22 (withdrawn-rectangular part of S601)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ULC-C142.23 (withdrawn)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ORD-C142.5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ULC-C58-10 (withdrawn and superseded by S603)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ULC-C80-1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ULC-S601	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ULC-S601 and ULC-S653	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ULC-S602	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ULC-S630 (withdrawn, superseded by S601)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ULC-S643 (withdrawn, superseded by S601)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ULC-S653	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ULC-S655	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Underground					
ULC-S603	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ULC-S615	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ULC-S652	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ORD-C58.10 (replaced by S603)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Others / Unknown					
Collapsible fabric storage tank ("bladder")	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unknown- underground tank	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unknown-field erected vertical aboveground tank	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unknown-shop fabricated vertical aboveground tank	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unknown-shop fabricated horizontal aboveground tank	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unknown-horizontal aboveground tank	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (Specify)					

PART 5c: MATERIAL OF CONTRUCTION										
(Check all that apply)	Tank ____		Tank ____		Tank ____		Tank ____		Tank ____	
	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping
Concrete Encased Steel	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Fiberglass Reinforced Plastic (FRP) (including thermoset tanks)	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Jacketed Steel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Steel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Collapsible Fabric Storage Tank (ie. Polymer fabric, bladders)	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Black Iron		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Copper		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Galvanized Steel		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Flexible Metallic		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Nonmetallic Thermoplastic		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Polyethylene		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
PVC		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Thermoset (rigid)		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Other (specify)										
Has tank and/or piping ever been repaired?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

PART 5d: SECONDARY CONTAINMENT										
(Check all that apply)	Tank ____		Tank ____		Tank ____		Tank ____		Tank ____	
	Tank	Piping	Tank	Piping	Tank	Tank	Piping	Tank	Piping	Tank
Double Walled	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Containment Tank Assembly	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Concrete Encased Steel Assembly	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Reinforced secondary containment liner for aboveground tanks	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Dike with Impermeable Liner	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Impermeable Liner with double bottom tank	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Non-reinforced secondary containment liner for aboveground tanks	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Secondary containment liner (spray-on type) for aboveground tanks	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Liner for underground tanks	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Synthetic Membrane Liner	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Other (specify)										
None	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PART 5e: CATHODIC / CORROSION PROTECTION										
(Check all that apply)	Tank ____		Tank ____		Tank ____		Tank ____		Tank ____	
	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping
Factory attached sacrificial anode	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Field attached sacrificial anode	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Impressed current system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Non-corroding material	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Painted	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coating - bonded plastic, resin, epoxy or polyurethane coating		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Unknown	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
None	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PART 5f: TYPE OF TRANSFER PUMP FOR OIL-WATER SEPARATOR					
(Associated with this tank system)	Tank ____	Tank ____	Tank ____	Tank ____	Tank ____
No oil-water separator	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
No pump	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Centrifugal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not centrifugal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PART 5g: LEAK DETECTION										
(Check all that apply)	Tank ____		Tank ____		Tank ____		Tank ____		Tank ____	
	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping
Internal monitoring										
Automatic Tank Gauging	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Continuous In-Tank/Piping Leak Detection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electronic Line Leak Detection		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Inventory Reconciliation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
External monitoring										
Ground water monitoring wells	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vapour monitoring wells	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Visual Inspection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Continuous External Horizontal Aboveground Tank Leak Monitoring (sensor cable system)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Interstitial monitoring										
Interstitial monitoring – double walled	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other testing or programs										
Precision Leak Detection Test	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Corrosion Analysis Program		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Tank (API Standard 653) or Tank Floor Inspection	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Other (specify)										
None	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PART 5h: SUMP LEAK DETECTION					
(Check all that apply)	Tank ____	Tank ____	Tank ____	Tank ____	Tank ____
Visual inspection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Continuous Sump Leak Monitoring (petroleum product probe)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Static liquid media leak detection test	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
No sump	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
None	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify)					

PART 5i: TANK SPILL CONTAINMENT DEVICES					
	Tank ____	Tank ____	Tank ____	Tank ____	Tank ____
Spill containment devices for Aboveground Tanks (ULC-S663) or ULC/ORD-C-142.19 (Withdrawn; replaced by ULC-S663)	<input type="checkbox"/> or <input type="checkbox"/>	<input type="checkbox"/> or <input type="checkbox"/>	<input type="checkbox"/> or <input type="checkbox"/>	<input type="checkbox"/> or <input type="checkbox"/>	<input type="checkbox"/> or <input type="checkbox"/>
Spill Box at Fill Point (aboveground tank)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spill Containment Devices for Underground Tanks (ORD-C58.19)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spill box at fill point – no standard (underground tank)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
None	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify)					

PART 5j: TANK OVERFILL PREVENTION					
(Check all that apply)	Tank ____	Tank ____	Tank ____	Tank ____	Tank ____
API RP 2350 Overfill Protection for Storage Tanks in Petroleum Facilities (field erected tanks)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CAN/ULC –S661 (Overfill Protection Devices Storage Tanks) Or ORD-C58.15 (Overfill Protection Devices Storage Tanks) (Withdrawn; replaced by ULC-S661)	<input type="checkbox"/> or <input type="checkbox"/>	<input type="checkbox"/> or <input type="checkbox"/>	<input type="checkbox"/> or <input type="checkbox"/>	<input type="checkbox"/> or <input type="checkbox"/>	<input type="checkbox"/> or <input type="checkbox"/>
Overfill alarm and overfill automatic shutoff	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overfill Alarm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overfill Automatic Shut Off	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overfill Ball Float Valve	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Method – Trained Personnel in Constant Attendance)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
None	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify)					

PART 5k: PRODUCT TRANSFER AREA (PTA)

PTA requirement applicable (section 15 of SOR 2008-197)	<input type="checkbox"/>	PTA not required due to tank configuration (section 2(c) of SOR 2008-197)	<input type="checkbox"/>
i. Physical Description of PTA	Check all that apply	ii. PTA Documentation	Check all that apply
No containment	<input type="checkbox"/>	Copy of the EERP located near PTA	<input type="checkbox"/>
Paved	<input type="checkbox"/>	PTA risk assessment completed	<input type="checkbox"/>
Diked or Curbed	<input type="checkbox"/>	PTA risk management plan completed	<input type="checkbox"/>
Sewer grate /manhole cover nearby	<input type="checkbox"/>	Fuel Transfer Standard Operating Procedure located nearby	<input type="checkbox"/>
Permanent Impermeable Liner	<input type="checkbox"/>	iii. Other	Check if applicable
Spill kit nearby	<input type="checkbox"/>	Presence of trained personnel in constant attendance during refueling	<input type="checkbox"/>

List of temporary PTA equipment deployed (if applicable):

☐ adsorbent pads
 ☐ adsorbent rolls
 ☐ adsorbent pillows
 ☐ drain cover
 ☐ collapsible containment berm
 ☐ collapsible containment pool
☐ other temporary PTA (specify) _____

Additional information (if required)

SECTION 6: CERTIFICATION

This section to be completed by the Building Technician/Operator/Contractor/Consultant/Project Manager:

I hereby certify that the information provided with respect to the identification of the storage tank system under Section 28 of the *Storage Tank Systems for Petroleum and Allied Petroleum Products Regulations* (SOR 2008-197) is accurate and complete.

Name _____ Title _____

Certification number (if applicable) _____

Signature _____ Date (YYYY/MM/DD) _____

This section to be completed by PSPC Regional Storage Tank Subject Matter Expert:

I hereby certify that I have reviewed the contents of this form to ensure that information provided with respect to the identification of the storage tank system under Section 28 of *Storage Tank Systems for Petroleum and Allied Petroleum Products Regulations* (SOR 2008-197) is complete and accurate to the best of my knowledge.

Regional PSPC Storage Tank Subject
Matter Expert

Name _____ Title _____

Signature _____ Date (YYYY/MM/DD) _____

This section to be completed by the PSPC Asset Manager:

I hereby certify that the information provided with respect to the identification of the storage tank system under Section 28 of the *Storage Tank Systems for Petroleum and Allied Petroleum Products Regulations* (SOR 2008-197) is complete.

PSPC Asset Manager

Name _____ Title _____

Signature _____ Date (YYYY/MM/DD) _____