

PART 1 GENERAL

1.1 SUMMARY OF WORK

- .1 Title and description of Work: City of Winnipeg, Transit Department, Petroleum Tank Replacement.
- .2 Contract method: stipulated price contract.
- .3 Work by others: Testing for soil contamination following removal of existing tanks.
- .4 Future Work: There is potential for additional Work involving removal and disposal or contaminated soil if found. This Work would be extra to the contract.
- .5 The City's occupancy: The the City will occupy the premises over the course of the Work. Existing fuelling and maintenance operations are not to be interrupted except for short periods of time when tie-ins are performed; times for performing tie-ins will be specified by the Contract Administrator and are likely to occur during off shifts. Time duration for tie-ins not to exceed 6 hours each unless otherwise agreed to by the City. Returning buses from rush hour services not to be interrupted.

1.2 CODES AND STANDARDS

- .1 Perform Work in accordance with National Building Code of Canada (NBC) and any other code of provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.
- .2 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and references documents.
 - .3 Workers'/Workmens' Compensation Board and municipal authority
 - .4 Requirements of FCC No. 30.1-Standard for Construction Operations, June 1982, issued by Fire Commissioner of Canada.
 - .5 Falsework design and construction in accordance with CSA S269.1-1975.
 - .6 Workplace Hazardous Materials Information System (WHMIS).

1.3 WORK RESTRICTIONS

- .1 Existing Services:
 - .1 Notify Contract Administrator and utility companies of intended interruption of services and obtain required permission.
 - .2 Where Work involves breaking into or connecting to existing services, give Contract Administrator 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of Work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on.
 - .3 Provide for personnel and vehicular traffic, especially during bus returns from both morning and afternoon rush hours.
 - .4 Construct barriers as required to meet safety requirements

1.4 PROJECT COORDINATION

- .1 Coordinate progress of the Work, progress schedules, submittals, use of Site, temporary utilities and construction facilities and controls.
- .2 Maintain at job Site, one copy each of the following:
 - .1 Contract drawings and specifications.
 - .2 Addenda.
 - .3 Reviewed shop drawings.
 - .4 Change Orders/Instructions.
 - .5 Other modifications to Contract.
 - .6 Field test reports.
 - .7 Approved Work schedule.
 - .8 Manufacturer's installation and application instructions.
 - .9 Safety Program

1.5 CUTTING AND PATCHING

- .1 Approvals
 - .1 Submit written request in advance of cutting or alteration which affects:
 - .1 Structural integrity of any element of Project.
 - .2 Integrity of weather-exposed or moisture-resistant elements.
 - .3 Efficiency, maintenance, or safety of any operational element.
 - .4 Visual qualities of sight-exposed elements.
 - .5 Work of The City or separate contractor.
- .2 Inspection
 - .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
 - .2 After uncovering, inspect conditions affecting performance of Work.
 - .3 Beginning of cutting or patching means acceptance of existing conditions.
- .3 Execution
 - .1 Perform cutting, fitting, and patching including excavation and fill, to complete the Work.
 - .2 Remove and replace defective and nonconforming Work.
 - .3 Provide openings in nonstructural elements of Work for penetrations of mechanical and electrical Work.
 - .4 Perform Work to avoid damage to other Work.
 - .5 Prepare proper surfaces to receive patching and finishing.
 - .6 Cut rigid materials using power saw or core drill. Pneumatic or impact tools not allowed.
 - .7 Restore Work with new products in accordance with Contract Documents.

- .8 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces. Penetrations through exterior walls to be flashed and sealed water tight.
- .9 At penetration of fire-rated wall, ceiling, or floor construction, completely seal voids with fire-rated material, full thickness of construction element.
- .10 Refinish surfaces to match adjacent finishes.

1.6 FIELD CONTRACT ADMINISTRATORING

- .1 Qualifications of Surveyor
 - .1 Qualified Surveyor, acceptable to the City.
- .2 Survey Requirements
 - .1 Locate, confirm and protect control points prior to starting Site Work. Preserve permanent reference points during construction.
 - .2 Establish lines and levels, locate and lay out, by instrumentation.
- .3 Records
 - .1 Maintain a complete, accurate log of control and survey Work as it progresses.
- .4 Setting Out
 - .1 Establish all lines and levels required for construction of the Work, from existing buildings. Provide all lines and stakes and provide required instruments and labour for placing and maintenance of such lines and stakes.
- .5 Toxic and Hazardous Substances and Materials
 - .1 Also refer to General Conditions, GC9.3, TOXIC AND HAZARDOUS SUBSTANCES AND MATERIALS.
 - .2 Asbestos discovery: Demolition of spray or trowel-applied asbestos can be hazardous to health. Should material resembling spray or trowel-applied asbestos be encountered in the course of demolition Work, stop Work and notify Contract Administrator immediately. Do not proceed until written instructions have been received from the Contract Administrator.

1.7 PROJECT MEETINGS

- .1 Preconstruction Meeting
 - .1 A preconstruction meeting will be held with the Contractor and his Subcontractor representatives and the The City. The meeting will be scheduled by the Contract Administrator after Contract Award and prior to commencement of construction.
- .2 Construction Meetings
 - .1 Contract Administrator will Schedule and administer project progress meetings throughout progress of Work.
 - .2 Contractor shall Provide physical space and make arrangements for meetings.
 - .3 Contract Administrator will Record minutes and include significant proceedings and decisions and identify "action by" parties.

1.8 SUBMITTALS

- .1 Administrative
 - .1 Submit to Contract Administrator submittals listed for review. Submit with reasonable promptness and in an orderly sequence so as to not cause delay in the Work.
 - .2 To ensure prompt attention, address all submittals to: Mr. Lorne Stone c/oWardrop Contract Administrators Inc. 400-386 Broadway Winnipeg, MB R3C 4M8.
 - .3 Work affected by submittals shall not proceed until review is complete.
 - .4 Review submittals prior to submission to Contract Administrator. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of the Work and Contract Documents.
 - .5 Verify field measurements and affected adjacent Work are coordinated.
- .2 Shop Drawings and Product Data
 - .1 Shop Drawings shall carry the stamp of a Professional Contract Administrator licensed to practice in the Province of Manitoba where called for.
 - .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connection, explanatory notes and other information necessary for completion of Work.
 - .3 Adjustments made on shop drawings by Contract Administrator are not intended to change Contract Price.
 - .4 Make changes in shop drawings as Contract Administrator may require. Contract Administrator will require 10 working days for review of shop drawings.
 - .5 Submit shop drawings (numbers as indicated below) for review to Contract Administrator for all items requested in the specification and as Contract Administrator may reasonably request where shop drawings will not be prepared due to standardized manufacture of product:
 - .1 Letter sizes: 210 mm x 280 mm 6 copies
 - .2 Other than above: 6 copies
 - .6 Identify all shop drawings in lower right-hand corner as follows:
 - .1 Name of Project
 - .2 The City project number (if applicable)
 - .3 Contract Administrator project number
 - .4 Title of shop drawing
 - .5 Specification section number
 - .6 Date (revised for each submission)
 - .7 Submissions shall include:
 - .1 Name and address of:
 - .1 Subcontractor (if applicable)
 - .2 Supplier (if applicable)
 - .3 Manufacturer (if applicable)
 - .2 Contractor's review stamp, signed by an authorized representative certifying approval of submission, verification of field measurements and compliance with Contract Documents.

- .3 Details of appropriate portions of Work as applicable indicating:
 - .1 Fabrication.
 - .2 Layout; showing dimensions, including identified field dimensions and clearance.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Relationship to adjacent Work.
- .3 Operating and Maintenance Manuals
 - .1 Two weeks prior to the anticipated date of Substantial Performance of the Work, submit to Contract Administrator, 1 copy of operating and maintenance manuals for review. Upon receipt of final comments from Contract Administrator, revise manuals as required and submit 3 copies of manuals to Contract Administrator.
 - .2 Manuals to contain operational information on equipment, cleaning and lubrication schedules, filters, overhaul and adjustment schedules and similar maintenance information.
 - .3 Bind contents in a three-ring, hard covered, plastic -jacketed binder. Organize contents into applicable categories of Work, parallel to specifications sections.
- .4 Record Drawings
 - .1 After award of Contract, Contract Administrator will provide 1 set of prints for purpose of maintaining record drawings. Accurately and neatly record deviations from Contract Documents caused by Site conditions and changes ordered by Contract Administrator.
 - .2 Record locations of concealed components of mechanical and electrical services.
 - .3 Identify drawings as "Project Record Copy". Maintain in new condition and make available for inspection on Site by Contract Administrator.
 - .4 On completion of Work and prior to final inspection, submit record documents to Contract Administrator.

1.9 TIME

- .1 Time is of the essence for this Work.

1.10 SCHEDULE

- .1 Schedules Required
 - .1 Construction Progress Schedule.
 - .2 Submittal Schedule for Shop Drawings, etc.
- .2 Format
 - .1 Indicate the following:
 - .1 Anticipated delivery dates for tanks
 - .2 Commencement and completion of work of each section of the specification conforming to the Project milestones.

.3 Final completion date within time period required by Contract Documents.

- .3 Submission
 - .1 Submit initial schedules within 15 days after award of Contract.
 - .2 Submit one opaque reproduction, plus 2 copies to be retained by Contract Administrator.
 - .3 Contract Administrator will review schedule and return reviewed copy within 10 days after receipt.
 - .4 Resubmit finalized schedule within 7 days after return of reviewed copy.

1.11 QUALITY CONTROL

- .1 Inspection
 - .1 Refer to General Conditions, GC2.3, REVIEW AND INSPECTION OF THE WORK.
- .2 Independent Inspection Agencies
 - .1 Independent Inspection/Testing Agencies will be engaged by Contractor for purpose of inspecting and/or testing portions of Work. Work to be tested includes backfill compaction, concrete quality/strength and Asphalt paving.
 - .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Reports
 - .1 Submit 4 copies of inspection and test reports promptly to Contract Administrator.
 - .2 Provide copies to Subcontractor of Work being inspected/tested.

1.12 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

- .1 Installation/Removal
 - .1 Provide construction facilities and temporary controls in order to execute Work expeditiously.
 - .2 Remove from Site all such facilities after use.
- .2 Scaffolding
 - .1 Provide and maintain scaffolding, ramps, ladders, and platforms.
 - .2 Design and construct scaffolding in accordance with CSA S269.2-M87(R1998).
- .3 Hoisting
 - .1 Provide, operate and maintain hoists and cranes required for moving of equipment and materials.
 - .2 Hoists and cranes shall be operated by qualified operator.
- .4 Guard Rails and Barricades
 - .1 Provide as required by governing authorities, secure, rigid guard railings and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.
- .5 Dewatering

- .1 Provide temporary drainage and pumping facilities to keep excavations and Site free from standing water.

- .6 Site Storage/Loading
 - .1 Refer to General Conditions, GC3.12, "USE OF THE WORK".
- .7 Sanitary Facilities
 - .1 Provide sufficient sanitary facilities for workers in accordance with local health authorities.
- .8 Water Supply
 - .1 The City will provide a continuous supply of potable water for construction use. Provide connections from designated takeoff points.
 - .2 The City assumes no responsibility for inconvenience or costs incurred due to loss of water or interruptions.
- .9 Temporary Power and Lighting
 - .1 The City will pay for temporary power required during construction for temporary lighting and operating of power tools, to maximum supply of 230 volts 30 amps.
 - .2 Provide connections from designated take-off points.
 - .3 Provide and maintain temporary lighting throughout the Project. The level of illumination on all Work areas shall be not less than 30-foot candles; walkways shall be not less than 5-foot candles.
 - .4 Temporary power for electric cranes and other equipment requiring a supply in excess of above shall be the responsibility of the Contractor.
 - .5 Pay for damage to existing plant if caused by Contractor negligence.
 - .6 The City assumes no responsibility for inconvenience or costs incurred due to loss of power or interruptions.
- .10 Construction Offices
 - .1 Provide and maintain in clean condition during progress of Work, adequately lighted, heated and ventilated Contractor's office with space for filing and layout of Contract Documents and Contractor's normal Site office staff.
 - .2 Provide adequate required first aid facilities.
 - .3 Subcontractors may provide their own offices as necessary. Direct the locations of these offices.
- .11 Equipment/Tool/Materials Storage
 - .1 If required Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
 - .2 Locate materials not required to be stored in weatherproof sheds on Site in manner to cause least interference with Work activities.
- .12 Construction Parking
 - .1 Parking as directed by The City will be permitted on Site provided it does not disrupt the performance of Work.

- 13 Project Cleanliness
 - .1 Maintain the Work in tidy condition, free from accumulation of waste products and debris.

1.13 MATERIAL AND EQUIPMENT

- .1 Product and Material Quality
 - .1 Products, materials, equipment and articles (referred to as Products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of Products provided.
 - .2 Defective Products, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
 - .3 Should any dispute arise as to quality or fitness of Products, decision rests strictly with Contract Administrator based upon requirements of Contract Documents.
- .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 when applicable.
 - .2 Store products subject to damage from weather in weatherproof enclosures.
- .3 Manufacturer's Instructions
 - .1 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.
 - .2 Notify Contract Administrator in writing, of conflicts between specifications and manufacturer's instructions, so that Contract Administrator may establish course of action.
- .4 Workmanship
 - .1 Workmanship shall be best quality, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Contract Administrator if required Work is such as to make it impractical to produce required results.
 - .2 Decisions as to quality or fitness of workmanship in cases of dispute rest solely with Contract Administrator, whose decision is final.

1.14 PROJECT CLOSEOUT

- .1 Final Cleaning
 - .1 Remove waste materials and debris from Site at regularly scheduled times or dispose of as directed by Contract Administrator. Do not burn waste materials on Site.
 - .2 Leave Work broom clean before inspection process commences.
 - .3 Broom clean and wash exterior walks, steps and surfaces.
 - .4 Remove dirt and other disfigurements from exterior surfaces.

- .2 Systems Demonstration
 - .1 Prior to final inspection, demonstrate operation of each system to The City and Contract Administrator.
 - .2 Instruct personnel in operation, adjustment, and maintenance of equipment and systems, using provided operation and maintenance data as basis for instruction.
- .3 Documents
 - .1 Collect reviewed submittals and assemble documents executed by Subcontractors, suppliers, and manufacturers.
 - .2 Submit material prior to final Application for Payment.
 - .3 Submit operation and maintenance data, record (as-built) drawings.
 - .4 Provide warranties and bonds fully executed and notarized.
 - .5 Execute transition of Performance and Labour and Materials Payment Bond to warranty period requirements.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 15010: Mechanical General Requirements.

1.2 REFERENCES

- .1 All applicable Provincial Environmental Regulations.
- .2 Manitoba Regulation 188/2001, Storage and Handling of Petroleum Products and Allied Products Regulation.
- .3 Manitoba Regulation 439/87, Environmental Accident Reporting Regulation.
- .4 Manitoba Workplace Safety & Health Act 1987 as amended.
- .5 National Fire Code of Canada - 1995.
- .6 Canadian Environmental Protection Act (CEPA).
 - .1 Section 53 Technical CEPA Guidelines for Underground Storage Tank Systems Containing Petroleum Products and Allied Petroleum Products.
- .7 Canadian Council of Ministers of the Environment (CCME).
 - .1 CCME EPC-LST-61E, March 1993, Environmental Code of Practice for Underground Storage Tank Systems Containing Petroleum Products and Allied Petroleum Products.
 - .2 CCME-EPC-CS34, Interim Canadian Environmental Quality Criteria for Contaminated Sites.

1.3 SUBMITTALS

- .1 Provide written description of tank, its former contents, location and reason for removal to Provincial authorities and Contract Administrator.

1.4 QUALIFICATIONS

- .1 Contractor must be licensed by Province of Manitoba for removal of underground storage tanks. License number must accompany tender document.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Segregate and deliver all reusable or recyclable materials to salvage dealers or recyclers.
- .2 Segregate and deliver all non-salvageable or non-recyclable materials to a licensed disposal facility.
- .3 Direct waste materials not destined for reuse to provincially approved waste processing Sites for alternative disposal. Certificate of approval required for each facility chosen.
- .4 Manage or dispose of all materials not recycled, salvaged or reused in accordance with applicable Federal, Provincial, and Local Regulations.

PART 2 EXECUTION

2.1 APPROVALS

- .1 Ensure that the tank is registered with Manitoba Conservation. If not, obtain registration.
- .2 Prepare and submit to Manitoba Conservation, at least 15 days prior to commencing Site Work, an application for permit to remove the tank. Obtain written approval to proceed before initiating Site Work.
- .3 Provide documentation and all Site registrations and permits to the Contract Administrator.
- .4 Notify Manitoba Conservation at least 48 hours prior to commencing fieldwork to confirm that Work will proceed as proposed.

2.2 PREPARATION, SAFETY, AND SECURITY

- .1 Conform to or exceed all federal and provincial codes, local municipal bylaws, and all codes and regulations of authorities having jurisdiction.
- .2 Protection
 - .1 Meet safety requirements of the Occupational Safety and Health Fourth Edition, Canada Labour Code Part II and Regulations for Construction Projects.
 - .2 Disconnect or remove any source of ignition from the vicinity of the tank.
 - .3 Provide temporary protection for safe movement of personnel and vehicle traffic, as well as segregation of impacted soils to be temporarily stockpiled.
 - .4 Cut, braze or weld metal only in monitored areas established to be free of ignitable vapour concentrations.
 - .5 Ground and bond metal equipment, i.e., tank and transfer pipes, before operating equipment or transferring flammable materials.
 - .6 Use nonsparking tools and intrinsically safe electrical equipment.
 - .7 Smoking is not permitted.
- .3 Prepare a Safe Work Plan for submission to Contract Administrator.

2.3 DRAINING

- .1 Drain and flush piping into tank.
- .2 Pump out all flammable liquid from tank. Use hand pump to remove bottom few inches if required.
- .3 Remove sludge from tank bottom. Dispose of product and sludge in accordance with Local and Provincial regulations using a waste disposal carrier licensed by authority having jurisdiction.

2.4 EXCAVATION

- .1 Provide protective material around excavation.
- .2 Provide constant supervision during excavation.
- .3 Excavation
 - .1 Excavate until top of tank and all connections and openings are exposed.
 - .2 Disconnect piping.
 - .1 Remove fill tube.
 - .2 Disconnect fill gauge, product and vent lines.
 - .3 Cap or plug open ends of lines that are not to be used further.
 - .4 Remove piping from ground.
 - .3 Temporarily plug all tank openings.
 - .4 Continue excavation until tank is completely exposed.

2.5 TANK REMOVAL

- .1 Tank removal will consist of the removal of storage tanks at two locations as follows:
 - .1 Osborne Street Facility
 - .1 One (1) direct bury steel underground methanol storage tank (approximately 25,000 L) complete with product delivery pipe, vent pipe, supply pipe, and dispenser;
 - .2 Three(3) steel underground diesel fuel storage tanks (approximately 35,000 L each) in concrete vaults complete with product delivery pipe, vent pipe, supply pipe, and return pipe, from a location inside the existing building to the connections at the tank;
 - .3 One (1) steel underground gasoline storage tank (approximately 22, 000 L) in concrete vault complete with product delivery pipe, vent pipe, supply pipe and dispenser
 - .4 One (1) steel waste oil storage tank (approximately 9000 L) in concrete vault complete with associated piping.
 - .2 Main Street Facility
 - .1 four(4) steel underground diesel fuel storage tanks (approximately 9000 L each) in concrete vaults complete with product delivery pipe, vent pipe and supply pipe. Underground piping to the garage is to be cleaned, pressure tested and abandoned in place.
 - .2 The waste oil storage tank in concrete vault is not to be removed but is to be abandoned in place. The tank is to be cleaned and purged of vapors, piping removed and tank filled with pea gravel.
- .2 Remove tanks and place in a secure location.
- .3 Block tanks to prevent movement.

- .4 Contact Contract Administrator immediately if there is evidence of contamination in tank excavation, stop Work until further notice.
- .5 Allow Contract Administrator to collect the required soil samples and to inspect tank for corrosion or structural failure.
- .6 Remove from Site as soon as possible.
- .7 Remove and replace excavated soil with compacted granular material as specified. Perform backfill only when advised by the Contract Administrator after testing for contamination.

2.6 VAPOUR REMOVAL

- .1 Purge vapours in accordance with Manitoba Conservation Guidelines. Take all necessary precautions to prevent ignition in the entire area.
- .2 Purge vapours to less than 10% of the lower flammable limit.
- .3 Verify with combustible gas meter.
- .4 Provide Contract Administrator with copy of test results.
- .5 Water Method.
 - .1 Fill tank with water to expel vapours.
 - .2 Remove and dispose of contaminated water in accordance with regulations, after tank is removed from Site.
- .6 Dry Ice Method.
 - .1 Add solid carbon dioxide (dry ice). Add 1.85 gm for each 100 litre capacity.
 - .2 Crush and distribute ice evenly over greatest area to secure rapid evaporation. Avoid skin contact.
 - .3 Verify all dry ice has vaporized.
- .7 Air Method.
 - .1 Ventilate tank with air using small gas exhauster operated by suitable means.
 - .2 Air to enter opening at one end and to exit opening at other end to quickly remove vapour.
 - .3 Test interior of tank to determine when tank is free of vapour.
 - .4 Provide Contract Administrator with copy of test results.

2.7 CAPPING

- .1 Plug all holes after tank has been freed of vapours and before tank is moved from Site.
- .2 Plug any corrosion leak holes using screwed (boiler) plugs.
- .3 Leave 3-mm vent hole in one plug to prevent tank from being subjected to excessive pressure differential caused by extreme temperature change.

2.8 SECURING AND REMOVAL FROM SITE

- .1 Dispose of tank in accordance with local, Provincial and Federal regulations.
- .2 Truck removal.
 - .1 Secure tank on truck for transport to disposal Site.
 - .2 Ensure 3 mm vent hole located at uppermost point on tank.

2.9 SITE REMEDIATION

- .1 As directed by Contract Administrator.
- .2 To CCME-EPC-CS34, Interim Environmental Quality Criteria for Contaminated Sites.
- .3 Repair/replace finish grade to match surrounding area, including but not limited to paving.

2.10 WORKMANSHIP AND DISPOSAL

- .1 Tanks destined for disposal.
 - .1 Dismantle, cut sufficient openings or otherwise render unusable.
 - .2 Forward affidavit of destruction to authority having jurisdiction.

2.11 TANK REMOVAL COMPLETION

- .1 Tank removal activities shall be completed with the following:
 - .1 Underground petroleum tank removal report has been completed and submitted to Manitoba Conservation.
 - .2 Work completion certificate has been filled out and submitted.
 - .3 Tank registration information has been revised.
 - .4 Tank disposal documentation has been provided to Manitoba Conservation.
 - .5 Copies of all above documents have been forwarded to the Contract Administrator.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 ANSI/NFPA 10-1990, Portable Fire Extinguishers.
- .2 CAN/ULC-S508-M02, Rating and Fire Testing of Fire Extinguishers and Class"D" Extinguishing Media.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with the General Requirements.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in the General Requirements.

PART 2 - PRODUCTS

2.1 MULTIPURPOSE DRY CHEMICAL EXTINGUISHERS

- .1 Cartridge operated type or stored pressure rechargeable type with hose and shut-off nozzle, ULC labeled for A, B and C class protection. Sizes 4.5 kg and 9 kg as indicated.

2.2 EXTINGUISHER BRACKETS

- .1 Type recommended by extinguisher manufacturer.

2.3 IDENTIFICATION

- .1 Identify extinguishers in accordance with recommendations of ANSI/NFPA 10, CAN/ULC-S508.
- .2 Attach tag or label to extinguishers, indicating month and year of installation. Provide space for service dates.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install or mount extinguishers on brackets as indicated.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 15191 – Fuel Supply System.

1.2 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI).
 - .1 ANSI/NFPA-329-1992, Underground Leakage of Flammable and Combustible Liquids.
- .2 American Petroleum Institute
 - .1 API RP 651, Cathodic Protection of Aboveground Petroleum Storage Tanks, 1997.
- .3 Canadian Council of Ministers of the Environment (CCME).
 - .1 CCME EPC-LST-71E, August 1994, Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products and Allied Petroleum Products.
 - .2 CCME-EPC/87E, Guideline for Controlling Emissions of Volatile Organic Compounds from Aboveground Storage Tanks.
- .4 Canadian Environmental Protection Act (CEPA).
 - .1 CEPA S53 AST Guidelines.
- .5 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.140- [M89], Oil-Alkyd Type Red Lead, Iron Oxide Primer.
- .6 National Research Council
 - .1 NRCC 30621, National Fire Code of Canada (NFC)-2005.
- .7 Underwriters' Laboratories of Canada (ULC)
 - .1 ULC/ORD-C58.15-92, Overfill Protection Devices for Flammable Liquid Storage Tanks.
 - .2 ULC-S601-93, Shop Fabricated Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids.

1.3 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with the General Requirements.
- .2 Submit operation and maintenance data for tank appurtenances and accessories for incorporation into manual specified in the General Requirements.

PART 2- PRODUCTS

2.1 GENERAL

- .1 Diesel Storage Tanks
 - .1 Four (4) tanks are similar and can generally be described as:
 - .1 Constructed and labeled to ULC-S653 and to come complete with extra wide support saddles.

- .2 Primary containment capacity of 50,280L (nominal) in sealed compartment to be surrounded by secondary tank jacket capable of holding 110% of the total capacity of the primary tank. Primary containment to be supplied with the following:
 - .1 75 dia vent pipes c/w open vent cap
 - .2 75 dia in-load system kit consisting of aluminum drop tube, overfill protector, piping, swing check valve, 305 x 610 spill preventer, ball valve and kamlok cap and collar.
 - .3 gauge stick dip opening kit c/w gauge stick
 - .4 paint touch-up kit
 - .5 the City's and user's manual c/w dip chart
 - .6 blast, prime and paint with white enamel finish
 - .7 Primary tank nozzles as follows:
 - .1 3 – 100mm diameter
 - .2 1 – 50mm diameter
 - .3 3 – 75mm diameter
 - .4 1 – 32mm diameter
 - .5 1- 50mm diameter coupling water draw-off tube
 - .6 1 – 200mm diameter Emergency vent as per code
- .3 Secondary tanks to be sealed and prevent precipitation or airborne particles from entering. Secondary tank to be supplied with the following:
 - .1 1 - 50mm diameter interstitial instrument connection.
 - .2 1 - 200mm diameter secondary emergency vent with inspection hatch and cover.
 - .3 1 - 50mm coupling for secondary tank drain.
 - .4 1 -75mm top nozzle.
- .2 Gasoline Storage Tank
 - .1 Constructed and labeled to ULC-S653 and to come complete with extra wide support saddles
 - .2 Primary containment capacity of 4,500L (nominal) in sealed compartment to be surrounded by secondary tank jacket capable of holding 110% of the total capacity of the primary tank.
 - .3 Primary containment to be lined with coating compatible to gasoline fuel. Primary containment to be supplied with the following:
 - .1 50mm dia vent pipes c/w pressure/vacuum vent cap
 - .2 aluminum drop tube, 50mm diameter Kamlok cap and collar.
 - .3 Gasboy 120V, 0.25kw pump c/w meter/register, 16Ø x 3658 hose and standard nozzle with lock.

- .4 vacuum breaker kit for Gasboy pump
- .5 19mm diameter automatic shut-off nozzle for Gasboy pump
- .6 suction pipe 25mm diameter x 1485 t.o.e. for Gasboy pump
- .7 gauge stick dip opening kit c/w gauge stick
- .8 paint touch-up kit
- .9 the City's and users manual c/w dip chart
- .10 blast, prime and paint with white enamel
- .11 spill box at fill connection
- .12 tank nozzles as follows:
 - .1 3 – 100mm diameter
 - .2 2 – 50mm diameter
 - .3 1 – 32mm diameter
 - .4 1- 50mm diameter coupling water draw-off tube
 - .5 1 – 150mm diameter Emergency vent as per code
- .4 Secondary tank to be sealed to prevent precipitation or airborne particles from entering. Secondary tank to be supplied with the following tank nozzles:
 - .1 1 - 50mm diameter interstitial instrument connection.
 - .2 1 - 150mm diameter secondary emergency vent with inspection hatch and cover.
 - .3 1 - 50mm coupling secondary tank drain.
 - .4 1-75mm top nozzle
- .3 Waste Oil Storage Tanks.
 - .1 Double contained waste oil storage tank constructed and labeled to ULC – S652, one (1) 2500 liter capacity and one (1) 4500 liter capacity.
 - .2 50mm vent pipe
 - .3 50mm waste oil Inlet coupling (top)
 - .4 50mm minimum pump-out connection with drop pipe, cam lock connector and dust cap
 - .5 Top mounted level sensor coupling.
 - .6 Inlet funnel with strainer and hinged cover.
 - .7 Gauge stick
 - .8 Step and platform
 - .9 50mm open style vent cap
 - .10 Blast, prime and paint with blue urethane (exterior)

- .11 Acceptable material : Westeel model "Recycoil"
- .4 Steps and Platform
 - .1 Step and platform shall access fill area of the tank. Stair shall be supplied loose to Site and installed by others. Stair shall meet current OSHA requirements and shall be designed and mounted so as to maintain minimum spacing between the tanks.
- .5 Identification, Markings and Labels
 - .1 Supply and install all required identification, markings and labels to meet applicable codes. Other markings and the City tank identification shall be supplied and installed by others.

2.2 TANK ACCESSORIES

- .1 Diesel Fuel Storage Tanks:
 - .1 Clay and Bailey 95% fill limiting device.
- .2 Waste Oil Storage Tanks:
 - .1 Pneumatic Indicator, 89mm (90 degree) dial.
 - .2 Acceptable material: Kodon Midget Model 277.

PART 3 - EXECUTION

3.1 WELDING

- .1 Use qualified and licensed welders possessing certificates for each procedure to be performed, from the authority having jurisdiction.

3.2 PAINT

- .1 All painting to be performed in accordance with manufacturer's recommendations and in accordance with SSPC (Steel Structures Painting Council), Volumes 1 and 2 for good painting practice and systems. Primer and paint from different manufacturers shall not be used. Vendor to ensure compatibility of paint system.
- .2 Areas to be primed and top coated include the exterior of the secondary tank, exposed structural steel (access stairway, posts, handrails, toe plate, etc.), exposed mechanical appurtenances and all other areas that will be exposed to the elements.
- .3 Surface preparation shall be to SSPC SP10 – near white metal blast cleaning.
- .4 Shop primer to be applied to a dry film thickness of 3.0 mils. All areas to be field welded shall be left unprimed for a minimum width of 50 mm.
- .5 Prior to applying top coat, all grease, oil and other foreign contaminants shall be removed as required by solvent cleaning to SSPC SP1.
- .6 A top mist coat shall initially be applied to approximately 1.0 to 2.0 mils wet film thickness in accordance with manufacturer's recommendations, to ensure no entrapped air bubbles upon application of final coat. Final top coat to be applied to approximately 4.0 mils dry film thickness with care taken to ensure no runs, etc.

.7 Top coat colour to be white.

3.3 Tank Accessories

.1 Size and install vent/overflow devices in accordance with manufacturer's recommendations.

END OF SECTION

PART 1 GENERAL

1.1 PROTECTION OF OPENINGS

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

1.2 PAINTING

- .1 Paint all new piping and pipe supports refer to notes on structural drawings.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged too extensively to be merely primed and touched up.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for incorporation into manual specified in the General Requirements.
- .2 Operation and Maintenance Manual to be approved by, and final copies deposited with Contract Administrator before final inspection.
- .3 Maintenance data shall include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .4 Performance data to include:
 - .1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
- .5 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Contract Administrator for approval. Submission of individual data will not be accepted unless so directed by Contract Administrator.
 - .2 Make changes as required and re-submit as directed by Contract Administrator.

1.4 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with the General Requirements.
- .2 Shop drawings and product data shall show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.

- .3 Shop drawings and product data shall be accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Points of operation on performance curves.
 - .3 Manufacturer to certify as to current model production.
 - .4 Certification of compliance to applicable codes.
- .4 In addition to transmittal letter referred to in the General Requirements: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

1.5 CLEANING

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

1.6 AS-BUILT DRAWINGS

- .1 Site records:
 - .1 Contract Administrator will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of the Work. Mark thereon all changes as Work progresses and as changes occur.
 - .2 On a weekly basis, transfer information to reproducibles, revising reproducibles to show all Work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection at all times.
- .2 As-built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing (TAB), 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 Contract Administrator for approval and make corrections as directed.
 - .4 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

1.7 ESCUTCHEONS

- .1 Install on pipes passing through walls, partitions, floors and ceilings in finished areas.
- .2 Construction: one piece type with set screws. Chrome or nickel plated brass or Type 302 stainless steel.
- .3 Sizes: outside diameter to cover opening or sleeve. Inside diameter to fit around pipe.

1.8 FIRESTOPPING

- .1 Material and installation within annular space between pipes, and adjacent fire separation to conform to requirements of Authority having jurisdiction.

PART 2- PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 16010 – Electrical General Requirements

1.2 REFERENCES

- .1 Electrical Equipment Manufacturers' Advisory Council (EEMAC)

1.3 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 15010 – Mechanical General Requirements.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for motors, drives and guards for incorporation into manual specified in Section 15010 – Mechanical General Requirements.

PART 2 PRODUCTS

2.1 GENERAL

- .1 Motors to be high efficiency, in accordance with Manitoba Hydro standards and the requirements of ASHRAE 90.1.

2.2 MOTORS

- .1 Provide motors for mechanical equipment as specified.
- .2 If delivery of specified motor will delay delivery or installation of equipment, install motor approved by Contract Administrator for temporary use. Final acceptance of equipment will not occur until specified motor is installed.
- .3 Motors 373 W and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, totally enclosed fan cooled, ball bearing, maximum temperature rise 40 oC, 3 phase, 575 V, unless otherwise specified or indicated.

2.3 TEMPORARY MOTORS

- .1 If delivery of specified motor will delay completion or commissioning Work, install motor approved by Contract Administrator for temporary use. Work will only be accepted when specified motor is installed.

2.4 BELT DRIVES

- .1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.
- .2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise specified.
- .3 For motors under 7.5 kW: standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.
- .4 Correct size of sheave to be determined during commissioning.
- .5 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.
- .6 Motor slide rail adjustment plates to allow for centre line adjustment.
- .7 Supply one set of spare belts for each set installed.

2.5 DRIVE GUARDS

- .1 Provide guards for unprotected drives.
- .2 Guards for belt drives;
 - .1 Expanded metal screen (non sparking aluminum) welded to frame.
 - .2 Minimum 1.2 mm thick sheet metal tops and bottoms.
 - .3 38 mm dia holes on both shaft centres for insertion of tachometer.
 - .4 Removable for servicing.
- .3 Provide means to permit lubrication and use of test instruments with guards in place.
- .4 Install belt guards to allow movement of motors for adjusting belt tension.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Fasten securely in place.
- .2 Make removable for servicing, easily and positively returned into position.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM A 36-00a, Standard Specification for Carbon Structural Steel.
 - .2 ASTM A 563- 94, Specification for Carbon and Alloy Steel Nuts.
- .2 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
 - .1 MSS SP-69-1991, Pipe Hangers and Supports - Erection and Application.
- .3 Factory Mutual (FM).
- .4 Underwriter's Laboratory of Canada (ULC)

1.2 DESIGN REQUIREMENTS

- .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
- .2 Base maximum load ratings on allowable stresses prescribed by applicable code and by ASME B 31-3.
- .3 Design hangers and supports to support systems under all conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
- .4 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment to be in accordance with MSS SP-58.

PART 2 PRODUCTS

2.1 GENERAL

- .1 Use components for intended design purpose only. Do not use for rigging or erection purposes. Material to MSS SP58.

2.2 PIPE SUPPORTS

- .1 Shop and field-fabricated assemblies as indicated.
 - .1 Finishes: painted with zinc-rich paint after fabrication.
- .2 U-bolts: carbon steel to MSS SP-69 with 2 nuts at each end to ASTM A 563.
 - .1 Finishes for steel pipework: black.
- .3 Clevis hangers Grinnell Fig. 260 or equivalent in accordance with B6, UL / FM approved.

2.3 EQUIPMENT SUPPORTS

- .1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of ASTM A36. Provide housekeeping pads under equipment 100mm high and 50mm larger than equipment all around, chamfered edges.

2.4 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

- .1 Stud type expansion anchors, zinc plated, hex head nut and washer.
 - .1 Acceptable material: Hilti Kwik Bolt II.

PART 3- EXECUTION

3.1 INSTALLATION

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

3.2 HANGER INSTALLATION

- .1 Install hanger so that rods are vertical under operating conditions.
- .2 Adjust hangers to equalize load.
- .3 Support from structural members. Where structural bearing does not exist, provide supplementary structural steel members.

3.3 HANGER SPACING

- .1 Within [300]mm of each elbow.

Maximum Pipi Size:NPS	Maximum Spacing Steel	Maximum Spacing Copper
Up to 1-1/4	2.1 m	1.8 m
1-1/2	2.7m	2.4 m
2	3.0 m	2.7 m
2-1/2	3.6 m	3.0 m
3	3.6 m	3.0 m
3-1/2	3.9 m	3.3 m
4	4.2 m	3.6 m

3.4 FINAL ADJUSTMENT

- .1 Adjust hangers and supports:
 - .1 Ensure that rods are vertical under operating conditions.
 - .2 Equalize loads.
 - .3 Tighten hanger load nuts securely to ensure proper hanger performance.
 - .4 Tighten upper nuts after adjustment.

- .2 C-clamps:
 - .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam or supplementary structural steel member.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01001 - General Requirements.

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-1.60-M89, Interior Alkyd Gloss Enamel.
 - .1 CAN/CGSB-24.3-92, Identification of Piping Systems.

1.3 PRODUCT DATA

- .1 Submit product data in accordance with the General Requirements.
- .2 Product data to include paint colour chips, all other products specified in this section.

PART 2 PRODUCTS

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

- .1 Metallic nameplate mechanically fastened to each piece of equipment by manufacturer.
- .2 Lettering and numbers to be raised or recessed.
- .3 Information to include, as appropriate:
 - .1 Equipment: manufacturer's name, model, size, serial number, capacity.
 - .2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

- .1 Black letters on white background, 3 mm thick laminated plastic, min height of letters 8mm.

2.3 PIPING SYSTEMS GOVERNED BY CODES

- .1 Identification:
 - .1 Fuel Oil: to CAN/CSA B139.

2.4 IDENTIFICATION OF PIPING SYSTEMS

- .1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.
- .2 Pictograms:
 - .1 Where required, to Workplace Hazardous Materials Information System (WHMIS) regulations.
- .3 Legend:
 - .1 Block capitals to sizes and colours listed in CAN/CGSB-24.3.
- .4 Arrows showing direction of flow:
 - .1 Outside diameter of pipe less than 75mm: 100mm long x 50mm high.
 - .2 Outside diameter of pipe 75mm and greater: 150mm long x 50mm high.
 - .3 Use double-headed arrows where flow is reversible.
- .5 Primary colour to be entire length and circumference of pipe.
- .6 Materials for secondary colour marking, legend, arrows:
 - .1 Pipes and tubing 20mm and smaller: waterproof and heat-resistant, pressure sensitive plastic marker tags.
 - .2 All other pipes: pressure sensitive plastic-coated cloth with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100%RH and continuous operating temperature of 150C and intermittent temperature of 200C.
- .7 Colours and Legends:
 - .1 Where not listed, obtain direction from Contract Administrator.
 - .2 Colours for legends, arrows: to following table:

<u>Background Colour:</u>	<u>Legend, arrows</u>
Yellow	Black
Purple	White
Brown	White
Red	White

- .3 Background colour marking and legends for piping systems:

System	Primary Color	Secondary Color	Canadian Government Safety Board No.	Rustoleum No.	Legend
Fuel Oil	Federal Safety Yellow		505-110	944	DIESEL FUEL
Lube Oil (used)	Chestnut Brown		504-103	977	LUBE OIL (USED)
Gasoline	Yellow				GASOLINE
Compressed Air	Green				COMP. AIR

2.6 VALVES

- .1 Identify with tags, octagonal anodized aluminum, flammable liquids resistant, fireproof, and permanently inscribed with clear legible characters 12 mm high.
- .2 Provide value tag directory including flow diagram and table indicating value type, service, function, normal position, location, etc. Provide copy of directory in maintenance manuals.

2.7 LANGUAGE

- .1 Identification to be in English.

PART 3 EXECUTION

3.1 TIMING

- .1 Provide identification only after all painting has been completed.

3.2 INSTALLATION

- .1 Perform Work in accordance with CAN/CGSB-24.3 except as specified otherwise.
- .2 Provide ULC or CSA registration plates as required by respective agency.

3.3 NAMEPLATES

- .1 Protection
 - .1 Do not paint, or cover in any way.

3.4 VALVES

- .1 Valves: secure tags with non-ferrous chains or closed "S"hooks.

3.5 LOCATION OF IDENTIFICATION ON PIPING

- .1 On long straight runs in open areas: at not more than 17m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.
- .2 Adjacent to each change in direction.
- .3 On both sides of visual obstruction or where run is difficult to follow.
- .4 At beginning and end points of each run and at each piece of equipment in run.
- .5 At point immediately upstream of major manually operated or automatically controlled valves. Where this is not possible, place identification as close as possible, preferably on upstream side.

- .6 Identification to be easily and accurately readable from usual operating areas and from access points.
 - .1 Position of identification to be approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 EXECUTION

3.1 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.

3.2 CLEARANCES

- .1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.
- .2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other systems, equipment, components.

3.3 AIR VENTS

- .1 Install manual air vents at high points in piping systems.

3.4 PIPEWORK INSTALLATION

- .1 Screwed fittings jointed with Teflon tape.
- .2 Protect openings against entry of foreign material.
- .3 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.
- .4 Assemble piping using fittings manufactured to ANSI standards.
- .5 Install exposed piping, equipment and similar items parallel or perpendicular to building lines.

- .6 Slope piping, except where indicated, in direction of flow for positive drainage and venting.
- .7 Group piping wherever possible.
- .8 Ream pipes, remove scale and other foreign material before assembly.
- .9 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.
- .10 Valves:
 - .1 Install in accessible locations.
 - .2 Install with stems above horizontal position unless otherwise indicated.
 - .3 Valves accessible for maintenance without removing adjacent piping.
- .11 Check Valves:
 - .1 Install swing check valves on discharge of pumps and elsewhere as indicated.

3.5 SLEEVES

- .1 General: Install where pipes pass through masonry, concrete structures, fire rated assemblies, and elsewhere as indicated.
- .2 Material: Schedule 40 black steel pipe.
- .3 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe.
- .4 Installation:
 - .1 Concrete, masonry walls: Terminate flush with finished surface.
 - .2 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.
- .5 Foundation walls: Fire retardant, waterproof non-hardening mastic.
- .6 Elsewhere: Provide space for firestopping. Maintain fire rating integrity.

3.6 PREPARATION FOR FIRESTOPPING

- .1 Material and installation within annular space between pipes.
- .2 Uninsulated unheated pipes not subject to movement: No special preparation.

3.7 FLUSHING OUT OF PIPING SYSTEMS

- .1 Before start-up, clean interior of piping systems as specified in relevant sections of the specifications.
- .2 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including cleaning of strainers in piping systems.

3.8 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

- .1 Advise Contract Administrator 48 hours minimum prior to performance of pressure tests.
- .2 Pipework: Test as specified in relevant sections of the specifications.
- .3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant sections of the specifications.
- .4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.
- .5 Conduct tests in presence of Contract Administrator.
- .6 Pay costs for repairs or replacement, retesting, and making good. Contract Administrator to determine whether repair or replacement is appropriate.

3.9 EXISTING SYSTEMS

- .1 Connect into existing piping systems at times approved by Contract Administrator.
- .2 Request written approval 10 days minimum, prior to commencement of Work.
- .3 Be responsible for damage to existing plant by this Work.
- .4 Ensure daily clean-up of existing areas.

END OF SECTION

PART 1 GENERAL

1.1 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with the General Requirements.
- .2 Submit manufacturer's product data for following items:
 - .1 Pressure gauges.

PART 2 PRODUCTS

2.1 GENERAL

- .1 Design point to be at mid point of scale or range.

2.2 PRESSURE GAUGES

- .1 100 mm dial size complete with stainless steel bourdon tube and socket, white finished dial face with black graduations and figures, 304 stainless steel satin finish case, adjustable pointer, dual range (0-413kpa, 0-60 PSIG) unless otherwise noted, liquid filled., ½ "NPT lower male connection, use compound vacuum / pressure gauges at pump suction piping.
 - .1 Acceptable material: Trerice Model 700 LFSS.

PART 3 EXECUTION

3.1 GENERAL

- .1 Install between equipment and first fitting or valve.

3.2 PRESSURE GAUGES

- .1 Install in locations as indicated, complete with gauge cocks.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 13202 – Fuel Storage Tanks.

1.2 REFERENCES

- .1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)
 - .1 ANSI/ASME-B16.5- 1988, Pipe Flanges and Flanged Fittings.
 - .2 ANSI/ASME-B16.9- 1986, Factory-Made Wrought Steel Buttwelding Fittings.
 - .3 ANSI/ASME-B16.11- 1996, Forged Steel Fittings, Socket-Welding and Threaded.
 - .4 ANSI/ASME-B16.21- 1992, Nonmetallic Flat Gaskets for Pipe Flanges.
 - .5 ANSI/ASME-B16.34- 1996, Valves – Flanged, Threaded, and Welding End.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM A 53/A53M-01, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
 - .2 ASTM B 61- 93, Specification for Steam or Valve Bronze Castings.
 - .3 ASTM A 105- 01, Specification for Carbon Steel Forgings for Piping Applications.
 - .4 ASTM A 181- 01, Specification for Carbon Steel Forgings, for General Purpose Piping.
 - .5 ASTM A 193- 01a, Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service.
 - .6 ASTM A 194- 01, Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both.
 - .7 ASTM A 307- 00, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .3 Canadian Standards Association (CSA)
 - .1 CAN/CSA-W48- 01, Filler Materials and Allied Materials for Metal Arc Welding.
 - .2 CAN/CSA-W117.2- 01, Safety in Welding, Cutting and Allied Processes.
- .4 Underwriter’s Laboratories of Canada (ULC)
 - .1 CAN/ULC-S602- 92, Aboveground Steel Tanks for Fuel Oil and Lubricating Oil.
- .5 Canadian Council of Ministers of the Environment (CCME)
 - .1 CCME-EPC-LST-71E, August 1994, Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products.
- .6 Government of Manitoba
 - .1 Manitoba Regulation 9788R, Respecting the Storage and Handling of Gasoline and Associated Products.

- .7 Manufacturer's Standardization Society of the Valve and Fittings Industry, Inc. (MSS)
 - .1 SP-80-1999, Bronze Gate, Globe, Angle and Check Valves

1.3 PRODUCT DATA

- .1 Submit product data in accordance with the General Requirements.
- .2 Indicate on manufacturer's catalogue literature the following: - valves, strainers, hose assemblies, flexible connectors, pumps, filters, meters, tanks.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in the General Requirements.

PART 2 PRODUCTS

2.1 PIPE

- .1 Black, carbon steel, to ASTM A 53, Grade B, Schedule 40, electric resistance welded, plain ends NPS 2 and under, bevelled ends NPS 2 ½ and over.
- .2 Protect piping against external corrosion by painting.

2.2 JOINT MATERIALS

- .1 Welding electrodes: in accordance with CSA W48 Series.
- .2 Flanged connections:
 - .1 Bolts and nuts: carbon steel to ASTM A307 Grade B, American Standard Machine, Class 2 fit, to ANSI B18.2 and B1.1.
 - .2 Gaskets: non-metallic, 1.6 mm thick, flat ring, Class 150, to ANSI B16.21.
- .3 Threaded connections: teflon tape.

2.3 FITTINGS

- .1 NPS 2 and under: forged steel, to ASTM A105, Class 3000, threaded to ANSI/ASME B1.20.1.
- .2 NPS 2 ½ and over: carbon steel, seamless, to ASTM A234 WPB, Schedule 40, butt-welding to ANSI/ASME B16.9.
- .3 Unions: NPS 2 and under: forged steel, to ASTM A105, Class 3000, threaded, stainless steel seats, Bonney Forge Rockwood type.
- .4 Flanges: forged steel, to ASTM A181, Class 150, to ANSI B16.5, welding neck.

- .5 Nipples: NPS 2 and under: carbon steel, Schedule 40, to ASTM A 53, Grade B, electric resistance welded.
- .6 Instrument fittings: NPS 2 and under: forged steel, to ASTM A105, Class 3000, threaded couplings and half-couplings.

2.4 BALL VALVES

- .1 NPS 2 and under:
 - .1 Carbon steel threaded ball valves shall be one piece bar stock type, min. rating 6895 kPa, WOG at 38°C, complete with handle. Valves to be fire safe to API 607 and as follows:
 - .1 Body material : Carbon steel ASTM A-105 or A-108.
 - .2 Trim material : Ball-stainless steel 316. Seat – RTFE.
 - .3 Standard of Acceptance : Crane #9401-LC. Apollo 73A-10X-24-27 or approved equal in accordance with B6.
 - .2 NPS 2 ½ and over :
 - .1 Cast steel or stainless steel body with 150# RF. flanged ends to API 607.
 - .2 Acceptable material : Crane Fig. CSC 2 FB150

2.5 GATE VALVES

- .1 NPS 2 and under :
 - .1 Forged steel threaded gate valves shall have conventional port opening, bolted bonnet, O.S.&Y., ANSI Class 600 and as follows:
 - .1 Body material : Carbon steel to ASTM A105N.
 - .2 Trim material: Wedge – stainless steel 316 stellited.
Seat – stainless steel 316 stellited.
Stem – stainless steel 316B.
 - .3 Standard of Acceptance : Crane#B3604 LU-T.
Bonney Forge HL-1-L 3S-T-NACE or approved equal in accordance with B6.
 - .2 NPS 2 ½ and over:
 - .1 Rising stem, OS&Y, Class 150 raised-face flanged ends to ANSI/ASME B16.5, bolted bonnet, 1030 kPa, cast carbon steel ASTM A216 WCB body, flexible wedge disc, seal-welded satellite-faced seat rings.
 - .2 Acceptable material: Crane Fig. 47XU-F.

2.6 SWING CHECK VALVES

- .1 NPS 2 and under, screwed:
 - .1 Body: ASTM – A105, Class 800
 - .2 Bolted Cap
 - .3 Acceptable material: Crane Fig. FB-3675XU-T or equivalent.
- .2 NPS 2 ½ and over: Class 150 raised-face flanged ends to ANSI/ASME B16.5, outside lever and weight:
 - .1 Body and multiple-bolted cap: cast carbon steel to ASTM A216 WCB.
 - .2 Cap studs: to ASTM A193, Type B7.
 - .3 Cap nuts: to ASTM A194, Type 2H.
 - .4 Body/cap joint: male-female face with corrugated metallic gasket.
 - .5 Disc: heat treated corrosion and heat resistant 13% chromium steel.
 - .6 Seat rings: heat treated corrosion and heat resistant 13% chromium steel, slipped in, seal welded, ground to match disc.
 - .7 Acceptable material: Crane Fig. 147XU complete with outside lever and weight.

2.7 EMERGENCY SHUT-OFF VALVES

- .1 NPS 3 and over:
 - .1 Horizontal type, Class 150, 1 MPa, flanged body, 71C fusible link.
 - .2 Acceptable material: Keywin Fig. 346.

2.8 THERMAL PRESSURE RELIEF VALVE

- .1 Thermal pressure relief by-pass valves shall be Emco Wheaton Model E-0153, Male NPT threaded ends with stainless steel spring, poppet, lock screw and adjusting screw, o-ring to be low temperature Buna-N. Set pressure shall be 520 kPa.

2.9 STRAINERS

- .1 Basket type, ductile iron construction, complete with weatherseal breech lock type lid, drain plug, flanged ports and inner 40 mesh stainless steel screen supported by a perforated stainless steel basket.
 - .1 Acceptable material: Viking Lid-Ease.

2.10 WASTE OIL TRANSFER HOSE ASSEMBLIES

- .1 Hose: 38 mm dia. by 1 m long flexible hose, for handling petroleum lubricating oil. Hose to be suitable for operation under negative pump suction pressure.
 - .1 Acceptable material: Goodyear Petroleum suction hose with wire Helix. AR 4-24 SAE100R4-1 ½”.
- .2 1 ½” Dry Break Coupler.
 - .1 Acceptable material: OPW Model 2275 – D.

- .3 1 ½” Dry Break Adaptor
 - .1 Acceptable material: OPW KAMVALOK Model 1673-A.

2.11 FLEXIBLE CONNECTORS

- .1 Applications: as indicated.
- .2 Minimum length in accordance with manufacturer’s recommendations to suit lateral offset of ±25 mm.
- .3 Inner hose: stainless steel corrugated.
- .4 Braided wire mesh stainless steel outer jacket.
- .5 Type of end connections: Class 150 forged steel raised face flanges.
- .6 Operating conditions:
 - .1 Working pressure: 680 kPa.
 - .2 Working temperature: – 40 to 45C.
- .7 Acceptable material: Senior Flexonics.

2.12 FUEL OIL TRANSFER PUMPS

- .1 Positive displacement, self-priming, rotary gear type, V-belt driven from TEFC motor mounted on common steel base. Complete with mechanical seal, bronze bushings, iron casing and rotor, steel shaft, relief valve, non-sparking aluminum guard.
- .2 Capacity (each):
 - .1 Pumped fluid: #2 fuel oil.
 - .2 Flow rate: 4.72 L/s.
 - .3 Motor:
 - .1 Osborne St. facility: 3.73 kW, 575 V, 3 ph., 60 Hz, 1800 r/min.
 - .2 Main St. facility: 3.73 kW, 208 V, 3 ph., 60 Hz, 1800 r/min.
- .3 Relief Valve: piped to return petroleum product from the pump discharge to the suction side storage tank. Relief valve to be adjustable over the entire operating pressure range (100-520 Kpa) and to handle total pump flow.
- .4 Acceptable material: Viking Series KK-124 Heavy Duty Pump.

2.13 USED LUBRICATION OIL TRANSFER PUMP

- .1 Air driven diaphragm pump, aluminum construction with BUNA – N checks balls and diaphragms. Capacity 37.8 L/M at 140 kPa pressure differential, PTFE valve seat.
- .2 C/W muffler and 24 VDC Coil solenoid kit.

2.14 DRIP TRAYS

- .1 Provide drip trays at diesel fuel delivery connections and at portable waste oil drum hose connection locations.
 - .1 Drip pans at waste oil hose locations to be constructed of 14 gage welded type 304 SS, 300 X 300 X 50 mm deep minimum dimensions with removable, framed 12 X 12 SS wire mesh cover.

2.15 FUEL OIL METER

- .1 Accuracy: tested and certified by manufacturer for accuracy of 0.05% (plus or minus 0.025%) of reading over entire range.
- .1 Acceptable material: Liquid Controls positive displacement flow meter Model M25A1 suitable for capacities to 1100 L/m and 1MPa non-shock continuous working pressure. Aluminum construction with Buna-N elastomers. Direct-reading, non-resettable totallizer. Max. working temperature 71 degrees C, 76 dia. ANSI flanged ends.

2.16 ADAPTERS AND DUST CAPS

- .1 Stainless steel construction, Buna N gaskets.
 - .1 Adapters: FNPT.
- .2 Acceptable material:
 - .2 Adapters: Bayco model A.
 - .3 Dust Caps: Bayco model DC.

2.17 FUEL OIL ANTI SYPHON SHUT-OFF VALVES

- .1 Valve : Full Port Ball Valve NPS 3, fire rated, Class 150 raised-face flanged ends ANSI/ASME B16.5, 1030 kPa, cast carbon steel ASTM A216 WCB body, 316 stainless steel ball and stem, TFE seats and coated seal, threaded end plug.
 - .1 Acceptable material : Worcester series FZ51.
- .2 Actuator: electro-mechanical, two-position, fail safe spring return to close valve on loss of power, 50% duty cycle, 120V/1PH/60Hz, CSA approved for Class 1 Div. 1 Group C and D hazardous locations, complete with torsion spring, reversible motor, solenoid brake, high visibility position indicator, NEMA 4,6 and 7 enclosure, two (2) SPDT limit switches, suitable for outdoor use to minus 40C with built-in heater and thermostat.
 - .1 Acceptable material : Texsteam RCS Model SURE.

PART 3 EXECUTION

3.1 PIPING

- .1 Install fuel oil piping system in accordance with CAN/CSA-B139, CAN/CSA-B140.0, ASME B31.3 and CCME "Code of Practice."

- .2 Contractor to be listed with Manitoba Environment under Manitoba Regulation 9788R as being qualified to do the Work of this section.
- .3 Use qualified welders licensed by the Manitoba Department of Labour for the welding procedures to be performed. Furnish welder's qualifications to Contract Administrator.
- .4 Safety in welding, cutting and allied processes to be in accordance with CAN/CSA-W117.2.
- .5 All materials shall be dry and protected from the weather during a welding operation.
- .6 Assemble piping using fittings manufactured to ANSI standards.
- .7 Connect to equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- .8 Slope piping down in direction of storage tanks unless otherwise indicated.
- .9 Use eccentric reducers at pipe size change installed to provide positive drainage.
- .10 Provide clearance for access and maintenance of equipment, valves and fittings.
- .11 Ream pipes, clean of scale and dirt, inside and out.
- .12 Coordinate size and location of instrument fittings with Div. 16.
- .13 Provide flanges and unions to facilitate disassembly, and as indicated.

3.2 VALVES

- .1 Install valves with stems upright or horizontal unless approved otherwise by Contract Administrator.
- .2 Install swing check valves on discharge of pumps and as indicated.
- .3 Install as indicated.

3.3 FUEL OIL TRANSFER PUMPS

- .1 Install as indicated.
- .2 Install gate valves on inlet and discharge piping.
- .3 Install pressure gauge at pump discharge and compound gauge on pump inlet connection.
- .4 Anchor pumps to base. Protect from impact and damage from vehicular traffic.
- .5 Install relief valve in pump discharge piping with relief valve discharge piped to return to tank.

3.4 FUEL OIL METER

- .1 Install as indicated.

3.5 FIELD QUALITY CONTROL

- .1 Test system in accordance with CAN/CSA-B139 and CAN/CSA-B140.0 and authorities having jurisdiction.

.2 Isolate tanks from piping pressure tests.

3.6 Testing

- .1 Prior to testing, remove foreign matter, flush piping and equipment using diesel fuel.
- .2 After pressure test, flush with diesel fuel for a minimum of 2 hours. Clean permanent and temporary strainers and filters.
- .3 Handle fuel oil used for flushing in accordance with requirements of authority having jurisdiction.
- .4 Pressure test with air to 1.5 times maximum operating pressure (775 Kpa). Hold pressure for 24 hours. Submit certificate of tests and test results to Contract Administrator.
- .5 Isolate tanks and dispensing equipment from piping system pressure tests.

3.7 ADJUSTING

- .1 Adjust system for proper operation. Adjust relief valves at pump discharges to obtain suitable fuelling flow rates without excessive splashing, premature nozzle click-off etc.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 15010 – Mechanical General Requirements.

1.2 REFERENCES

- .1 American Society of Mechanical Contract Administrators (ASME)
 - .1 ASME Boiler and Pressure Vessel Code Section VIII Pressure Vessels -1998.
 - .2 ASME B16.11-96, Forged Fittings, Socket-Welding and Threaded
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM A53/A53M-01, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded Seamless.
 - .2 ASTM A181/181M-01, Specification for Carbon Steel Forgings for General Purpose Piping.
- .3 Canadian Standards Association (CSA)
 - .1 CSA B51-97, Boiler, Pressure Vessel, and Pressure Piping Code.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with the General Requirements.
- .2 Submit manufacturer's product data for following items:
 - .1 Combination Pressure Regulator.
 - .2 Ball Valves.
 - .3 Couplers/Connectors.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into maintenance manual

PART 2 PRODUCTS

2.1 COMBINATION FILTER-REGULATOR

- .1 Factory assembled, heavy-duty with mounting bracket and low pressure side relief valve.
- .2 Maximum inlet pressure: 800 kPa.
- .3 Operating temperature: minus 18 °C to plus 52 °C.

- .4 Filter element: 40 micron. Bowls: polycarbonate.
- .5 Pressure range in regulator: 34 kPa to 800 kPa.
- .6 Gauge range: 0 kPa to 1100 kPa.
- .7 Acceptable material: ARO.

2.2 PIPING

- .1 Piping: to ASTM A53/A53M, schedule 80 seamless black steel.
- .2 Fittings:
 - .1 NPS2 and smaller: to ASME B16.11, schedule 80 steel, socket welded.
- .3 Couplings: to ASME B16.11, socket welded or threaded half coupling type.
- .4 Unions: 1000 kPa malleable iron with brass-to-iron ground seat.
- .5 Dissimilar metal junctions: use dielectric unions.
- .6 Joints:
 - .1 NPS2 and smaller: socket welded.

2.3 FLEXIBLE CONNECTION

- .1 Provide a flexible connector at air connection to pumps.
 - .1 Helical hose construction with single braid cover, 300 series stainless steel construction with male NPT with HEX nut one end, and welded FPT union other end, 400 mm length.
 - .2 Acceptable material : US Hose Corporation Falcon Flex

2.4 BALL VALVES

- .1 Three piece design or top entry for ease of in-line maintenance.
 - .1 To ASTM A181/A181M, Class 70, carbon steel body screwed ends associated trim suitable for compressed air application.
 - .2 To withstand 1034 kPa maximum pressure.

PART 3 EXECUTION

3.1 COMBINATION FILTER-REGULATOR

- .1 Install at inlet to waste oil diaphragm pumps.

3.2 COMPRESSED AIR PIPING

- .1 Install flexible connection at pumps.
- .2 Install shut-off valves at outlets and elsewhere as indicated.
- .3 Install tees in lieu of elbows at changes in direction of piping. Install plug in open ends of tees.
- .4 Grade piping at 1% slope minimum.
- .5 Make branch connections from top of main.
- .6 To ASME code and requirements of authority having jurisdiction.
- .7 Cleaning:
 - .1 Blow out piping to clean interior thoroughly of oil and foreign matter.
- .8 Testing:
 - .1 Pressure test for 4 h minimum, to 1550 kPa, with outlets closed. Pressure drop not to exceed 10 kPa. Isolate components not suitable for test pressure.

END OF SECTION

PART 1 GENERAL

1.1 PRODUCT DATA

- .1 Submit product data in accordance with Section 01001 – General Requirements.
- .2 Conform to CSA C22.2 No. 24

PART 2 PRODUCTS

2.1 CONTROL & INSTRUMENTATION PRODUCTS

- .1 Refer to division 16000 for instrumentation wiring and products.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Refer to Division 16000 for installation requirements.

3.2 SEQUENCE OF OPERATION

- .1 Sequence of operation for control systems shall be as follows:

- .1 Osborne Street Diesel Fuel Pumps

The pumps shall be started and stopped from a push button station at the fuelling area. On pushing the start button of a specific pump the associated pump suction shut-off valve will commence opening. When the valve is fully open a limit switch on the valve will start the pump. When the pump stop button is depressed the pump will stop and the suction valve will commence to close immediately. (Typical of three systems).

When the emergency stop button is depressed all pumps will stop and all suction shut-off valves will commence closing immediately.

- .2 Main Street Diesel Fuel Pumps

The Main Street Diesel fuel pumps operate similarly to the Osborne Street pumps with the exception that there are only two pumps and there is only one common suction valve instead of one per pump. When a specific pump start button is depressed the associated pump suction shut-off valve will commence opening. When the valve is fully open a limit switch on the valve will start the pump. When the second pump start button is depressed and the suction valve is already open the pump will start immediately. When the stop button for the second pump is depressed the pump will stop immediately. When the stop button for the first duty pump is depressed the pump will stop and the suction valve will commence to close immediately.

When the emergency stop button is depressed all pumps will stop and the suction shut-off valve will commence closing immediately.

.3 Gasoline Pump

The gasoline pump will start and stop from a local manual switch.

When the remote emergency stop button is depressed the pump will stop immediately.

.4 Waste Oil Pumping Systems

The waste oil pumps are air operated. The system is operated by first opening all manual valves in the waste oil and air supply piping of the selected pump. The pump start button is depressed which opens the solenoid valve in the pump air supply line starting the pump. When the pump stop button is depressed the solenoid valve closes stopping the pump. When a high level is detected in the waste oil tank via a level switch, the solenoid valve is closed stopping the pump and ensuring the tank is not overfilled. (Typical of two systems).

.5 Tank Monitoring

Level and interstitial space leakage in the diesel fuel tanks and gasoline tank at the Osborne Street facility is monitored by an existing Veeder-Root monitoring unit. Level and interstitial space leakage at the Main Street facility will be monitored by a new Veeder-Root monitoring unit.

Level in each of the two waste oil storage tanks will be monitored by a manual pump-up pneumatic monitoring system.

END OF SECTION

Part 1 GENERAL

1.1 RELATED SECTIONS:

- .1 Section 15010 - Mechanical General Requirements.
- .2 Section 16010 – Electrical general requirements.

1.2 GENERAL REQUIREMENT

- .1 The Electrical Contractor, hereinafter referred to as the “Contractor”, shall assume full responsibility for the entire electrical installation as noted in the specifications and drawings. The electrical contractor shall be responsible for any deviations by the electrical sub trades.
- .2 The Scope of Work includes the supply and installation of all equipment depicted in the drawings and specifications including the following:
- .3 The electrical installation shall be grounded in conformance with the latest edition of the Canadian Electrical Code.
- .4 Fire stop all penetrations through fire separations with CSA approved compound, maintaining fire separation rating. Confirm fire separation locations and wall ratings with architectural drawings.
- .5 Supply the City with “As Built” drawings and certificate of inspection upon completion.
- .6 Pay for all costs for cutting and patching made necessary by electrical work. Coordinate the the City with architectural drawings.
- .7 Unless otherwise approved by the Contract Administrator all equipment and material shall be new and be CSA approved.
- .8 Coordinate with mechanical contractors the exact locations and electrical requirements of mechanical equipment.

1.3 SCOPE OF WORK

- .1 Supply and installation of new power distribution equipment as indicated. Modification to existing power distribution equipment as required to accommodate new configuration.
- .2 Wiring and connection of new equipment supplied by The City.
- .3 Wiring and connection of new equipment supplied by Division 15. Refer to Division 15 and Division 16 drawings and specifications for details.
- .4 Supply and installation of all new switch boxes, junction boxes, local disconnect switches, lighting, lighting switches, Veedar-Root monitoring devices, starters and associated accessories.
- .5 Supply, installation, wiring and connection of all required motor control and protection equipment for the new fuel pumps.
- .6 The the City of this contract shall include removal of all unused existing power and control

wiring, fusible and non fusible disconnect switches, starters and other electrical equipment related to replacement of old fuel tanks, waste oil tanks, and fuel pumps. Disposal of the removed electrical equipment and wiring associated with removal of old fuel pumps, fuel tanks and waste oil tanks.

- .7 The removal of existing electrical equipment and wiring should be coordinated with the City.
- .9 Disconnection and removal of existing electrical equipment, wiring and conduit in areas affected by this project and no longer required as instructed by the The City.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

- .1 This Section covers items common to Sections of Division 16. This section supplements requirements of Division 1.

1.2 CODES AND STANDARDS

- .1 Do complete installation in accordance with the current edition of CSA C22.1 except where specified otherwise.

1.3 CARE, OPERATION AND START-UP

- .1 Instruct operating personnel in the operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service Contract Administrator 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 all aspects of its care and operation.
- .4 Do overhead and underground systems in accordance with CSA C22.3 No.1-M1987 except where specified otherwise.

1.4 VOLTAGE RATINGS

- .1 Operating voltages: to CAN3-C235-83.
- .2 Motors, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.5 PERMITS, FEES AND INSPECTION

- .1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of Work.
- .2 Pay associated fees.
- .3 Contract Administrator will provide drawings and specifications required by Electrical Inspection Department and Supply Authority at no cost.
- .4 Notify Contract Administrator of changes required by Electrical Inspection Department prior to making changes.
- .5 Furnish Certificates of Acceptance from authorities having jurisdiction on completion of Work to Contract Administrator.

1.6 MATERIALS AND EQUIPMENT

- .1 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department.
- .2 Factory assemble control panels and component assemblies.
- .3 Junction boxes and associated accessories in hazardous area must be CAS approved, explosion proof and suitable for Class I installations, zone as specified.

1.7 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Supplier and installer responsibility is indicated in Motor Schedule or elsewhere on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.
- .2 Control wiring requirements are specified in Division 16 and corresponding sections in Division 15 and are diagrammatically shown on electrical and mechanical drawings.

1.8 FINISHES

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

1.9 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates as follows:
- .2 Nameplates:
 - .1 Lamicoid 3 mm thick plastic engraving sheet, black face, white core, mechanically attached with self tapping screws.

NAMEPLATE SIZES			
Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

- .3 Wording on nameplates to be approved by Contract Administrator prior to manufacture.
- .4 Allow for average of twenty-five (25) letters per nameplate.
- .5 Identification to be English.
- .6 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.
- .9 Transformers: indicate capacity, primary and secondary voltages.

1.10 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, either numbered or 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 code: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

1.11 WIRING TERMINATIONS

- .1 Lugs, terminals, screws used for termination of wiring to be suitable for copper conductors.

1.12 MANUFACTURERS AND CSA LABELS

- .1 Visible and legible, after equipment is installed.

1.13 WARNING SIGNS

- .1 As specified and to meet requirements of Electrical Inspection Department.
- .2 Porcelain enamel signs, minimum size 175 x 250 mm.

1.14 SINGLE LINE ELECTRICAL DIAGRAMS

- .1 Provide as built single line electrical diagram on completion installation.

1.15 LIGHTING AND SWITCHING

- .1 Lighting and associated accessories in hazardous area should be suitable for Class I, Zone 1 installation.
- .2 Lighting Switches and associated accessories in hazardous area should be suitable for Class I, Zone 1 installation.
- .3 Locate light switches on latch side of doors.

1.16 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Local switches: 1400 mm.
 - .2 Panelboards: as required by Code or as indicated.

1.17 LOAD BALANCE

- .1 Maintain load balanced and measure phase voltages at splitter, panel and transformer.
- .2 Submit, at completion of Work, report listing phase and neutral currents on panelboards, dry-core transformers and motor starters, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

1.18 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: plastic, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.
- .4 Conduit and associated accessories in hazardous area should be suitable for class I and division 1 installation.

1.19 FIELD QUALITY CONTROL

- .1 All electrical Work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks - the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.
- .2 The Work of this division to be carried out by a contractor who holds a valid Master Electrical contractor license as issued by the Province that the Work is being contracted.
- .3 Conduct and pay for following tests:
 - .1 Power distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Motors and associated control equipment including sequenced operation of systems where applicable.

- .4 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
- .5 Insulation resistance testing.
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .6 Carry out tests in presence of Contract Administrator.
- .7 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .8 Submit test results for Contract Administrator's review.

1.20 APPROVAL AND TRAINING

- .1 Submit 3 copies of draft operation and maintenance manual for electrical and control equipment to Contract Administrator for approval.
- .2 Provide training for staff about the operation and maintenance manual of controls and electrical equipments as required and pay associated fees.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 16010: Electrical General Requirements.

PART 2 PRODUCTS

2.1 CABLE PROTECTION

- .1 For underground installation, 38 x 140 mm planks pressure treated with copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

PART 3 EXECUTION

3.1 CABLE INSTALLATION IN CONDUITS

- .1 Install cables as indicated in metal conduits.
 - .1 Do not pull spliced cables inside conduits.
- .2 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .4 Before pulling cable into conduits and until cables are properly terminated, seal ends of lead covered cables.
- .5 After installation of cables, seal conduit ends with conduit sealing compound.

3.2 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 16010- Electrical General Requirements.
- .2 Perform tests using qualified personnel. Provide necessary instruments and equipment.
- .3 Pre-acceptance tests.
 - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.
 - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .4 Acceptance Tests
 - .1 Ensure that terminations and accessory equipment are disconnected.
 - .2 Ground shields, ground wires, metallic armour and conductors not under test.

- .3 High Potential (Hipot) Testing.
 - .1 Conduct hipot testing in accordance with manufacturer's recommendations.

- .4 Leakage Current Testing.
 - .1 Raise voltage in steps from zero to maximum values as specified by manufacturer for type of cable being tested.
 - .2 Record leakage current at each step.

- .5 Provide Contract Administrator with list of test results showing location at which each test was made, circuit tested and result of each test.

- .6 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 16010 - Electrical General Requirements.

1.2 REFERENCES

- .1 Canadian Standards Association, (CSA International)

PART 2 PRODUCTS

2.1 EQUIPMENT

- .1 Rod electrodes: copper clad steel 19 mm dia by 3 m long.
- .2 Grounding conductors: bare stranded copper, soft annealed, size as indicated.
- .3 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.
- .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 Thermit welded type conductor connectors.
 - .5 Bonding jumpers, straps.
 - .6 Pressure wire connectors.

PART 3 EXECUTION

3.1 INSTALLATION GENERAL

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections, and connections to electrodes using permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.
- .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 one end to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .8 Connect building structural steel to ground by welding copper to steel.
- .9 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

3.2 ELECTRODES

- .1 Install rod electrodes and make grounding connections.
- .2 Bond separate, multiple electrodes together.

3.3 EQUIPMENT GROUNDING

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list: transformers, frames of motors, motor control centres, starters, control panels, building steel Work, distribution panels, fuel storage and distribution equipment and piping.

3.4 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 16010 - Electrical General Requirements.
- .2 Perform ground continuity and resistance tests using method appropriate to Site conditions and to approval of Contract Administrator and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

END OF SECTION

PART 1 GENERAL

PART 2 PRODUCTS

2.1 SUPPORT CHANNELS

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, galvanized steel, surface mounted or suspended.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Secure equipment to poured concrete with expandable inserts.
- .2 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .3 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
 - .3 Beam clamps to secure conduit to exposed steel Work.
- .4 Suspended support systems.
 - .1 Support individual cable or conduit runs with 12 mm dia threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 12 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .5 For surface mounting of two or more conduits use channels at 1.5 m on centre spacing or as required.
- .6 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .7 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .8 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .9 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Contract Administrator.
- .10 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 16151 - Wire and Box Connectors - 0 - 1000 V.

1.2 REFERENCES

- .1 CSA C22.2 No .0.3, Test Methods for Electrical Wires and Cables.
- .2 CAN/CSA-C22.2 No. 131, Type TECK 90 Cable.

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 600 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90.

2.2 TECK CABLE

- .1 Cable: to CAN/CSA-C22.2 No. 131.
- .2 Conductors:
 - .1 Circuit conductors: copper, size as indicated.
- .3 Insulation:
 - .1 Chemically cross-linked thermosetting polyethylene rated type RW90, 600 V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: interlocking aluminum.
- .6 Overall covering: thermoplastic polyvinyl chloride material.
- .7 Suitable for Class 1 Zone 1 installations.
- .8 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 Channel type supports for two or more cables at 1500 mm centers.
 - .3 Threaded rods: 12 mm dia. to support suspended channels.
- .9 Connectors:
 - .1 Explosion-proof approved for TECK cable and suitable for Class I Zone 1 installations.

PART 3 EXECUTION

- .1 Install cables.
 - .1 Install building wires in conduit systems in accordance with Section 16-133 – Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Terminate cables in accordance with Section 16151-Wire and Box Connectors - 0 -1000 V.

END OF SECTION

PART 1 GENERAL

PART 2 PRODUCTS

2.1 SPLITTERS

- .1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.
- .3 At least three spare terminals on each set of lugs in splitters less than 400 A.
- .4 Splitters in hazardous locations should be suitable for class I installations, zone as indicated.
- .5 Splitters in Non-hazardous areas should be dust tight and moisture proof.
- .6 Maximum allowable Depth of splitter to be 8" max.

2.2 JUNCTION AND PULL BOXES

- .1 Welded steel construction with screw-on flat covers for surface mounting.
- .2 Cast gasketed boxes in Class I areas, suitable for such installations.

PART 3 EXECUTION

3.1 SPLITTER INSTALLATION

- .1 Install splitters and mount plumb, true and square to the building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION AND PULL BOXES INSTALLATION

- .1 The required junction and pull boxes are not necessarily shown on the drawings. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

3.3 IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 16010 - Electrical-General Provisions.
- .2 Install size 2 identification labels indicating system name, voltage and phase.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 CSA C22.1, Canadian Electrical Code, Part 1.

PART 2 PRODUCTS

2.1 CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger Switch boxes as required for special devices.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 120 V switch boxe for 120 V switching device.
- .6 Boxes in Class 1 areas to be suitable for such installations.

2.2 FITTINGS - GENERAL

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit switch bodies for conduit up to 32 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.
- .5 Fittings in Class I areas to be suitable for such installations.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of Work.
- .3 Provide correct size of openings in boxes for conduit and cable connections. Reducing washers are not allowed.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA C22.2 No. 18, Conduit Boxes, and Fittings and Associated Hardware.
 - .2 CSA C22.2 No. 45, Rigid Metal Conduit.

PART 2 PRODUCTS

2.1 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel, threaded.

2.2 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel Work.
- .3 Channel type supports for two or more conduits at 3 m oc.
- .4 Threaded rods, 2 mm dia., to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2 Factory "ells" where 90° bends are required for 25 mm and larger conduits.
- .3 Explosion proof connectors and couplings for Rigid metal conduit, suitable for class I , division 1 installation.

2.4 FISH CORD

- .1 Polypropylene.

PART 3 PRODUCTS

3.1 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 rigid hot dipped galvanized steel threaded conduit in hazardous areas.
- .4 Use explosion proof flexible connection for connection to explosion proof motors.

- .5 Minimum conduit size for lighting and power circuits: 19 mm.
- .6 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .7 Mechanically bend steel conduit over 19 mm dia.
- .8 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .9 Install fish cord in empty conduits.
- .10 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .11 Dry conduits out before installing wire.

3.2 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 suspended or 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.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Switches, wiring devices, cover plates and their installation.

1.2 RELATED SECTIONS

- .1 Section 16010 - Electrical General Requirements.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-C22.2 No.111, General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

PART 2 PRODUCTS

2.1 SWITCHES

- .1 15 A, 277 V, single pole switches to: CSA-C22.2 No.55 and CSA-C22.2 No.111.
- .2 Manually-operated general purpose ac switches with following features:
 - .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Urea or melamine moulding for parts subject to carbon tracking.
 - .4 Suitable for back and side wiring.
 - .5 Ivory toggle.
 - .6 Industrial grade.
- .3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
- .4 Switches in Class 1 Zone 1 areas suitable for such installations.
- .5 Switches of one manufacturer throughout project.

2.2 COVER PLATES

- .1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.
- .2 Cover plates from one manufacturer throughout project.
- .3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .4 Cover plates in Class 1 Zone 1 areas to be suitable for such installations.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Switches:

- .1 Install single throw switches with handle in "UP" position when switch closed.
- .2 Mount toggle switches at height in accordance with Section 16010 - Electrical General Requirements.

.2 Cover plates:

- .1 Protect stainless steel cover plate finish with paper or plastic film until painting and other Work is finished.
- .2 Install suitable common cover plates where wiring devices are grouped.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Materials and installation for wire and box connectors.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-C22.2 No.18-98, Conduit Boxes, Fittings and Associated Hardware.
 - .2 CSA C22.2 No.65-93(R1999), Wire Connectors.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.
- .2 Copper long barrel compression connectors as required sized for conductors.
- .3 Clamps or connectors for armored cable, flexible conduit, as required to: CAN/CSA-C22.2 No.18.
- .4 Conduit boxes in hazardous area should be suitable for Class I, Zone 1 installation.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and:
 - .1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secure ness tests in accordance with CSA C22.2 No.65.

END OF SECTION

PART 1 PRODUCTS

1.1 MATERIALS

- .1 Motors supplied by other divisions.

PART 2 EXECUTION

2.1 INSTALLATION

- .1 Dry out motor if dampness present in accordance with manufacturer's instructions.
- .2 Make wiring connections. Use flexible conduit suitable for Class I, Zone 1 installations for connection between rigid conduit and motor.
- .3 Make flexible conduit long enough to permit movement of motor over entire length of slide rails.
- .4 Check for correct direction of rotation, with motor uncoupled from driven equipment.

2.2 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 16010 - Electrical General Requirements .

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 16010 - Electrical General Requirements.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings in accordance with Section 16010 – Electrical General Requirements.
- .2 Indicate:
 - .1 Mounting method and dimensions.
 - .2 Starter size and type.
 - .3 Layout of identified internal and front panel components.
 - .4 Enclosure types. in non-hazardous area should be dust tight and moisture proof type and maximum allowable depth of the enclosure to be 8” deep.
 - .5 Enclosure types in hazardous area should be NEMA Type 7 Enclosure class 1, suitable for class I, division 1 installation and maximum allowable depth of the enclosure to be 8” deep.
 - .6 Wiring diagram for each type of starter.
 - .7 Interconnection diagrams.

1.3 EXTRA MATERIALS

- .1 Provide listed spare parts for each different size and type of starter:
 - .1 1 control transformer[s].
 - .2 1 operating coil.
 - .3 2 fuses.

PART 2 PRODUCTS

2.1 FULL VOLTAGE MAGNETIC STARTERS

- .1 Combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:
 - .1 Contactor solenoid operated, rapid action type.
 - .2 Motor overload protective device in each phase, manually reset from outside enclosure.
 - .3 Wiring and schematic diagram inside starter enclosure in visible location.
 - .4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.
 - .5 Maximum allowable depth of Starters enclosure is 8” deep.

- .2 Combination type starters to include fused disconnect switch with operating lever on outside of enclosure to control disconnect, and provision for:
 - .1 Locking in "OFF" position with up to 3 padlocks.
 - .2 Independent locking of enclosure door.
 - .3 Provision for preventing switching to "ON" position while enclosure door open.

2.2 CONTROL TRANSFORMER

- .1 Single phase, dry type, control transformer with primary voltage as indicated and 120 V secondary, complete with secondary fuse, installed in with starter as indicated.
- .2 Size control transformer for control circuit load plus 20% spare capacity.

2.3 FINISHES

- .1 Apply finishes to enclosure in accordance with Section 16010 - Electrical General Requirements.

2.4 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 16010 - Electrical General Requirements.
- .2 Magnetic starter designation label, white plate, black letters, size 1 engraved as indicated.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install starters, connect power and control as indicated.
- .2 Ensure correct fuses and overload devices elements installed.

3.2 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 16010 - Electrical General Requirements and manufacturer's instructions.
- .2 Operate switches, contactors to verify correct functioning.
- .3 Perform starting and stopping sequences of contactors and relays.
- .4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Materials and components for dry type transformers up to 600 V primary, equipment identification and transformer installation.

1.2 RELATED SECTIONS

- .1 Section 16010 - Electrical General Requirements.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-C22.2 No.47, Air-Cooled Transformers (Dry Type).
 - .2 CSA C9-M1981, Dry-Type Transformers.
- .2 National Electrical Manufacturers Association (NEMA)

1.4 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings in accordance with Section 16010 – Electrical General Requirements.

PART 2 PRODUCTS

2.1 TRANSFORMERS

- .1 3 phase, kVA as indicated, 600 V input, 120/240 V, 1phase, 3w output, 60 Hz.
- .2 Voltage taps: standard.
- .3 115 degrees C temperature rise.
- .4 Basic Impulse Level (BIL): standard.
- .5 Hipot: standard.
- .6 Average sound level: standard
- .7 Impedance at 17 degrees C: standard
- .8 Enclosure: CSA, removable metal front panel.
- .9 Mounting: wall
- .10 Finish: in accordance with Section 16010 - Electrical General Requirements.
- .11 Should be suitable for wet/damp and dusty type of environment.

2.2 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 16010 - Electrical General Requirements.
- .2 Label size: 7.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Mount dry type transformers as indicated.
- .2 Ensure adequate clearance around transformer for ventilation.
- .3 Install transformers in level upright position.
- .4 Remove shipping supports only after transformer is installed and just before putting into service.
- .5 Loosen isolation pad bolts until no compression is visible.
- .6 Make primary and secondary connections in accordance with wiring diagram.
- .7 Energize transformers after installation is complete.

END OF SECTION

PART 1 GENERAL

PART 2 PRODUCTS

2.1 BREAKERS GENERAL

- .1 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation.
- .2 Common-trip breakers: with single handle for multi-pole applications.
- .3 Interrupting capacity of circuit breakers installed in existing panels is to match existing panels/MCC.
- .4 120V and 208V circuit breakers to have minimum of 10,000 A symmetrical rms interrupting capacity rating.

PART 3 EXECUTION

- .1 Install circuit breakers as indicated.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 16010 - Electrical General Requirements.

PART 2 PRODUCTS

2.1 DISCONNECT SWITCHES

- .1 Fusible and non-fusible disconnect switch in non-hazardous area should be dust tight and moisture proof type and, size as required unless otherwise indicated.
- .2 Fusible and non-fusible disconnect switches in hazardous areas should be NEMA Type 7 Enclosure class 1, suitable for Class I, Zone 1 installations.
- .3 Provision for padlocking in on-off switch position by three locks.
- .4 Mechanically interlocked door to prevent opening when handle in ON position.
- .5 Fuses: size as indicated, to Section 16491- Fuses - Low Voltage.
- .6 Fuseholders: suitable without adaptors, for type and size of fuse indicated.
- .7 Quick-make, quick-break action.
- .8 ON-OFF switch position indication on switch enclosure cover.
- .9 Maximum allowable depth of the disconnect switches not more than 8" deep.

2.2 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 16010 - Electrical General Requirements.
- .2 Indicate name of load controlled on size 4 nameplate.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Materials and installation for standard and custom breaker type panelboards.

1.2 RELATED SECTIONS

- .1 Section 16010 - Electrical General Requirements.
- .2 Section 16412 - Moulded Case Circuit Breakers.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No.29, Panelboards and enclosed Panelboards.

1.4 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings in accordance with Section 16010 – Electrical General Requirements.

PART 2 PRODUCTS

2.1 PANELBOARDS

- .1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.
 - .1 Install circuit breakers in panelboards before shipment.
 - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 250 V panelboards: bus and breakers rated for 10,000 A (symmetrical) interrupting capacity or as indicated.
- .3 Panels in hazardous area should be suitable for Class I installations, Zone as indicated.
- .4 Panels in non- hazardous area should be dust tight and moisture proof.
- .5 Sequence phase bussing sequentially numbered, with each breaker identified by permanent number identification as to circuit number and phase.
- .6 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .7 Two keys for each panelboard and key panelboards alike.
- .8 Copper bus with neutral of same ampere rating as mains.

- .9 Mains: suitable for bolt-on breakers.
- .10 Trim and door finish: baked grey enamel.

2.2 BREAKERS

- .1 Breakers: to Section 16412 - Moulded Case Circuit Breakers.
- .2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .3 Lock-on devices for exit and night light circuits.

2.3 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 16010 - Electrical General Requirements.
- .2 Nameplate for each panelboard size 4.
- .3 Complete circuit directory with typewritten legend showing location and load of each circuit.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted panelboards on plywood backboards. Where practical, group panelboards on common backboard.
- .3 Mount panelboards to height specified in Section 16010 - Electrical General Requirements.
- .4 Connect loads to circuits.
- .5 Connect neutral conductors to common neutral bus.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 16010 - Electrical General Provisions.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2No.248.12, Low Voltage Fuses Part 12: Class R (Bi-National Standard with, UL 248-12 (1st Edition).

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit fuse performance data characteristics for each fuse type and size. Performance data to include: average melting time-current characteristics.

1.4 DELIVERY AND STORAGE

- .1 Ship fuses in original containers.
- .2 Do not ship fuses installed in switchboard.
- .3 Store fuses in original containers in moisture free location.

1.5 MAINTENANCE MATERIALS

- .1 Six spare fuses of each type and size installed up to and including 600 A.

PART 2 PRODUCTS

2.1 FUSES GENERAL

- .1 Fuse type references L1, L2, J1, R1, etc. have been adopted for use in this specification.
- .2 Fuses: product of one manufacturer for entire project.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install fuses in mounting devices immediately before energizing circuit.
- .2 Ensure correct fuses fitted to physically match mounting devices.
- .3 Ensure correct fuses fitted to assigned electrical circuit.

END OF SECTION