

PART 1 GENERAL

1.1 SUMMARY OF WORK

- .1 Title and description of Work: City of Winnipeg Transit – Fort Rouge Garage, Diesel Fuel Storage Capacity Increase
- .2 Contract method: City of Winnipeg construction contract.
- .3 The City's occupancy: The City will occupy the premises over the course of the Work.

1.2 RELATED SECTIONS

- .1 Part D – Supplemental Conditions.

1.3 CODES AND STANDARDS

- .1 Perform Work in accordance with National Building Code of Canada (NBCC) and all other codes of provincial or local application. 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).

1.4 ALLOWANCES

- .1 Cash Allowance:
 - .1 Include in Contract Price cash allowance for testing of various portions of the Work:
 - .1 Amount of allowance: \$15,000.

1.5 PERMITS

- .1 Contractor shall secure and pay for all permits required for the Work.

1.6 SITE SAFETY

- .1 Contractor shall be responsible to ensure the safety of the Work site including all occupants of the existing building and the general public. Provide protection from all equipment, supplies, work debris, etc.

1.7 WORK RESTRICTIONS

- .1 Existing Services:
 - .1 Notify City and utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give City minimum 48 hours of notice for necessary interruption. Keep duration of interruptions to a minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.

.2 Interruptions to Operations:

- .1 Provide for personnel and vehicular traffic, especially during bus returns from both morning and afternoon rush hours.
- .2 Existing fuelling and maintenance operations are not to be interrupted except for short periods of time when tie-ins are performed.
- .3 Times for performing tie-ins will be specified by the City and are likely to occur during off shifts.
- .4 Time duration for tie-ins not to exceed six (6) hours each unless otherwise agreed to by the City.

1.8 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

1.9 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.

1.10 FIELD ENGINEERING

- .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 E2. HAZARDOUS MATERIALS.
 - .2 Asbestos discovery: Demolition of asbestos can be hazardous to health. Should material resembling asbestos be encountered in the course of Work, stop Work and notify Contract Administrator immediately. Do not proceed until written instructions have been received from the Contract Administrator.

1.11 PROJECT MEETINGS

- .1 Preconstruction Meeting
 - .1 A preconstruction meeting will be held with the Contractor and his Subcontractor representatives and 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 City will 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.

1.12 SUBMITTALS

- .1 Administrative
 - .1 Submit to Contract Administrator submittals listed and/or as requested 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 the Contract Administrator listed in D3.
 - .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 (in formats and quantities as indicated below) for review to Contract Administrator for all items requested in the specification and as Contract Administrator may reasonably request. Shop Drawings will be returned to the Contractor in format submitted:
 - .1 Paper documents: 6 copies
 - .2 Electronic: pdf format
 - .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.
 - .2 Accurately and neatly record deviations from Contract Documents caused by Site conditions and changes ordered by Contract Administrator.
 - .3 Record locations of concealed components of mechanical and electrical services.
 - .4 Identify drawings as "Project Record Copy". Maintain in new condition and make available for inspection on Site by Contract Administrator.
 - .5 On completion of Work and prior to final inspection, submit record documents to Contract Administrator.

1.13 QUALITY CONTROL

- .1 Independent Inspection Agencies
 - .1 Independent Inspection/Testing Agencies may be engaged by Contractor for purpose of inspecting and/or testing portions of Work. Work to be tested includes, but may not be limited to:
 - .1 Backfill compaction;
 - .2 Concrete quality/strength;
 - .3 Asphalt paving.
 - .2 Provide equipment required for executing inspection and testing by appointed agencies.

- .2 Reports
 - .1 Submit inspection and test reports promptly to Contract Administrator.
 - .2 Provide copies to Subcontractor of Work being inspected/tested.

1.14 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

- .1 Barriers
 - .1 Construct barriers as required to meet safety requirements.
- .2 Installation/Removal
 - .1 Provide construction facilities and temporary controls in order to execute Work expeditiously.
 - .2 Remove from Site all such facilities after use.
- .3 Scaffolding
 - .1 Provide and maintain scaffolding, ramps, ladders, and platforms.
 - .2 Design and construct scaffolding in accordance with CSA S269.2-M87(R1998).
- .4 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.
- .5 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.
- .6 Dewatering
 - .1 Provide temporary drainage and pumping facilities to keep excavations and Site free from standing water.
- .7 Site Storage/Loading
 - .1 Provide adequate storage for materials delivered to the site.
 - .2 Delivery, loading and unloading of materials shall be coordinated with the City as to not disrupt Transit operations.
- .8 Sanitary Facilities
 - .1 Provide sufficient sanitary facilities for workers in accordance with local health authorities.
- .9 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.
- .10 Temporary Power and Lighting
 - .1 Provide and 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.

- .11 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.

- .12 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.
 - .3 Use of City supplies, tools and portable equipment is not permitted at any time.

- .13 Construction Parking
 - .1 Parking as directed by The City will be permitted on Site provided it does not disrupt the performance of Work.

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

1.15 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.

1.16 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 disfigurations 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 REFERENCE STANDARDS

- .1 Canadian Council of Ministers of the Environment (CCME)
 - .1 PN 1326, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.
 - .2 PN 1180, Environmental Guideline for Controlling Emissions of Volatile Organic Compounds from Aboveground Storage Tanks.
- .2 National Research Council
 - .1 NRCC 30621, National Fire Code of Canada (NFC)-2010.
- .3 Underwriters' Laboratories of Canada (ULC)
 - .1 ULC/ORD-C58.15-92, Overfill Protection Devices for Flammable Liquid Storage Tanks.
 - .2 ULC-S601-00, Shop Fabricated Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids.
 - .3 ULC-S653-94, Contained Aboveground Steel Tank Assemblies for Flammable Liquids.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01001 – General Requirements.
- .2 Submit operation and maintenance data for tank, appurtenances and accessories for incorporation into manual specified in Section 01001 – General Requirements.

PART 2 PRODUCTS

2.1 GENERAL

- .1 Diesel fuel storage tanks:
 - .1 Three (3) tanks are similar and can generally be described as follows:
 - .1 Constructed and labeled to ULC-S601 and ULC-S653 and to come complete with extra wide support saddles.
 - .2 Primary containment capacity of 50,280 L (actual) 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 75mm diameter vent pipes complete with open vent cap;
 - .2 75mm diameter in-load system consisting of aluminum drop tube, overfill protector and external piping;
 - .3 gauge stick dip opening complete with gauge stick;
 - .4 paint touch-up kit;
 - .5 user's manuals complete with 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 and water draw-off tube,
 - .6 1 – 200mm diameter emergency vent as per code.
- .3 Secondary tank 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 diameter coupling for secondary tank drain;
 - .4 1 – 75mm diameter top nozzle.
- .2 Stair and Platform:
 - .1 Stair and platform shall access fill area of the tank, be supplied loose to Site for installation by others, meet current OSHA requirements and be designed and mounted so as to maintain minimum spacing between the tanks.
- .3 Identification, markings and labels:
 - .1 Supply and install all required identification, markings and labels to meet applicable codes. Other markings and the Owner’s tank identification shall be supplied and installed by others.
- .4 Acceptable material:
 - .1 Westeel Ltd. manufactured tank matching the existing (see Appendix A) except stair and platform on opposite side and no “ship loose section” as shown on drawing no. 20373-IP.

2.2 TANK ACCESSORIES

- .1 Diesel fuel storage tanks:
 - .1 Clay and Bailey 95% fill limiting device.

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 the paint 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 the 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, "orange peel", etc.
- .7 Top coat colour to be white.

3.3 TANKS 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 Section 01001 – 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 Section 01001 – 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 Section 01001 – 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-up and commissioning, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).
 - .3 Submit to 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.

PART 2- PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
 - .1 MSS SP-58-2009, Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application and Installation.

1.2 DESIGN REQUIREMENTS

- .1 Construct pipe hangers and supports to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
- .2 Base maximum load ratings on allowable stresses prescribed by ANSI/ASME B31.3-2014, Process Piping.
- .3 Design pipe 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. Factory manufactured material to MSS SP-58.

2.2 PIPE SUPPORTS

- .1 Shop and field-fabricated assemblies as indicated.
 - .1 Finish: as specified on the structural drawings unless indicated to be galvanized.
- .2 U-bolts: Anvil Fig. 137 or approved equal in accordance with B7.
 - .1 Finish: galvanized.
- .3 Clevis hangers: Anvil Fig. 260 or approved equal in accordance with B7.
 - .1 Finish: galvanized.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install in accordance with manufacturer's instructions and recommendations, or as indicated.

3.2 HANGER INSTALLATION

- .1 Install hangers 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 members.

3.3 HANGER SPACING

- .1 Within 300mm of each elbow.
- .2 In accordance with CAN/CSA B139-09, Installation Code for Oil-Burning Equipment.

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.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 24.3-92, Identification of Piping Systems.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section 01001 – 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 IDENTIFICATION OF PIPING

- .1 Identify contents by background colour marking, legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.
- .2 Legend:
 - .1 Block capitals to sizes listed in CAN/CGSB 24.3.
- .3 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.
- .4 Primary colour to be entire length and circumference of pipe.
- .5 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 temperature range of minus 40° C to plus 65° C.

.6 Colours and Legends:

.1 Colours for legends, arrows: to following table:

Background Colour: Legends, Arrows

Yellow Black

.2 Background colour marking and legend for piping:

System	Primary Color	Secondary Color	Canadian Government Safety Board No.	Rustoleum No.	Legend
Fuel Oil	Federal Safety Yellow		505-110	944	DIESEL FUEL

2.3 IDENTIFICATION OF VALVES, PUMPS AND PRESSURE SWITCHES

.1 Identify with tags, octagonal anodized aluminum, flammable liquids resistant, fireproof, and permanently inscribed with clear legible characters 12 mm high.

.2 Provide tag directory including flow diagram and table indicating device type, service, function, normal position, location, etc. Provide copy of directory in maintenance manuals.

2.4 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, PUMPS AND PRESSURE SWITCHES

.1 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

Not Used

PART 2 PRODUCTS

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 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.
- .2 Install exposed piping, equipment and similar items parallel or perpendicular to building lines.
- .3 Valves:
 - .1 Install in accessible locations.
 - .2 Install with stems above horizontal position unless otherwise indicated.
 - .3 Accessible for maintenance without removing adjacent piping.

3.5 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.

3.6 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.

3.7 EXISTING SYSTEMS

- .1 Connect into existing piping 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 REFERENCE STANDARDS

- .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 A 105- 01, Specification for Carbon Steel Forgings for Piping Applications.
 - .3 ASTM A 181- 01, Specification for Carbon Steel Forgings for General Purpose Piping.
 - .4 ASTM A 193- 01a, Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service.
 - .5 ASTM A 194- 01, Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both.
 - .6 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 Government of Manitoba
 - .1 Manitoba Regulation 188/2001, Storage and Handling of Petroleum Products and Allied Products Regulation.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01001 – General Requirements.
- .2 Indicate on manufacturer's catalogue literature the following: valves, flexible connectors, adapters, dust caps and pressure gauges.
- .3 Submit shop drawings for spill basin.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in Section 01001 – General Requirements.

PART 2 PRODUCTS

2.1 PIPE

- .1 Black, carbon steel, to ASTM A 53, Grade B, Schedule 40, seamless, plain ends NPS 1 ½ and under, bevelled ends NPS 2 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: suitable compound or tape.

2.3 FITTINGS

- .1 NPS 1 ½ and under: forged steel, to ASTM A105, Class 3000, threaded to ANSI/ASME B1.20.1.
- .2 NPS 2 and over: carbon steel, seamless, to ASTM A234 WPB, Schedule 40, butt-welding to ANSI/ASME B16.9.
- .3 Unions: NPS 1 ½ 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: black, carbon steel, Schedule 40, to ASTM A 53, Grade B, seamless.
- .6 Instrument fittings: forged steel, to ASTM A105, Class 3000, threaded couplings and half-couplings.

2.4 BALL VALVES

- .1 NPS 1 ½ and under:
 - .1 Carbon steel threaded ball valves shall be one piece bar stock type, minimum 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 to ASTM A105 or A108.
- .2 Trim material : 316 stainless steel ball, RTFE seat.
- .3 Acceptable material : Crane #9401-LC, Apollo 73A-10X-24-27 or approved equal in accordance with B7.

2.5 GATE VALVES

- .1 NPS 2 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 body to ASTM A216 WCB, flexible wedge disc, seal-welded stellite-faced seat rings.
 - .2 Acceptable material: Crane Fig. 47XU-F or approved equal in accordance with B7.

2.6 SWING CHECK VALVES

- .1 NPS 1 ½ and under, screwed, bolted cap:
 - .1 Body: ASTM A105, Class 800.
 - .2 Acceptable material: Crane Fig. FB-3675XU-T or approved equal in accordance with B7.
- .2 NPS 2 and over: Class 150 raised-face flanged ends to ANSI/ASME B16.5:
 - .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 or approved equal in accordance with B7.

2.7 THERMAL PRESSURE RELIEF VALVE

- .1 Thermal pressure relief by-pass valves shall be PM Systems Ltd. model PME153, complete with male NPT threaded ends with stainless steel spring, poppet and adjusting screw, and Teflon seat. Set pressure shall be 172 kPa.

2.8 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: corrugated stainless steel.
- .4 Braided stainless steel wire mesh outer jacket.
- .5 End connections: Class 150 forged steel raised face flanges.

- .6 Operating conditions:
 - .1 Working pressure: 680 kPa.
 - .2 Working temperature: minus 40° to plus 45° C.
- .7 Acceptable material: Senior Flexonics.

2.9 ADAPTERS AND DUST CAPS

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

2.10 FUEL OIL SOLENOID AND ANTI-SYPHON SHUT-OFF VALVES

- .1 Valve : full port ball valve, line size, fire rated, Class 150 raised-face flanged ends to ANSI/ASME B16.5, 1030 kPa, cast carbon steel body to ASTM A216 WCB, 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 40° C with built-in heater and thermostat.
 - .1 Acceptable material : Texsteam RCS model SURE.

2.11 PRESSURE GAUGES

- .1 Acceptable material: Trerice model 700LFSS-40-04-L-D-///.

PART 3 EXECUTION

3.1 PIPING

- .1 Install fuel oil piping system in accordance with CAN/CSA-B139 and provincial regulations
- .2 Technicians to be listed with Manitoba Conservation and Water Stewardship under Manitoba Regulation 188/2001 as being licensed 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 upon request.
- .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 towards storage tanks unless otherwise indicated.
- .9 Use eccentric reducers at pipe size change in horizontal piping, installed to provide positive drainage. Use concentric reducers at pipe size change in vertical piping.
- .10 Provide clearance for access and maintenance of equipment, valves and fittings.
- .11 Ream pipes and clean of scale and dirt inside and out.
- .12 Coordinate size and location of instrument fittings with Division 16.
- .13 Provide flanges and unions to facilitate disassembly, and as indicated.
- .14 Install flanges with bolt holes centered on vertical axis. Tighten bolts evenly, in a balanced fashion. Do not use flanges to force parts into position.

3.2 VALVES

- .1 Install valves with stems upright or horizontal unless approved otherwise by Contract Administrator.
- .2 Install as indicated.

3.3 FIELD QUALITY CONTROL

- .1 Test system in accordance with CAN/CSA-B139 and authorities having jurisdiction.
- .2 Isolate tanks from piping pressure tests.

3.4 TESTING

- .1 Prior to testing, remove foreign matter, flush piping 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. 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.

3.5 ADJUSTING

- .1 Adjust system for proper operation.

END OF SECTION

PART 1 GENERAL

Not Used

PART 2 PRODUCTS

2.1 CONTROLS AND INSTRUMENTATION PRODUCTS

.1 By Division 16.

PART 3 EXECUTION

3.1 INSTALLATION

.1 By Division 16.

3.2 SEQUENCES OF OPERATION

.1 Diesel Fuel Pumping

The pumps are started and stopped from a push button station at the fuelling area. Fuel is drawn from only one tank at a time. On selecting the tank to draw from and pushing the start button of the associated pump the associated solenoid and anti-syphon shut-off valves will commence opening. When both valves are fully open limit switches on the valves will start the pump. When the pump stop button is depressed the pump will stop and both valves will commence closing immediately. (Typical of six tanks.)

When the emergency stop button is depressed all pumps stop and all solenoid and anti-syphon shut-off valves commence closing immediately.

.2 Tank Monitoring

Level and interstitial space leakage in the new and existing diesel fuel tanks is to be monitored by a new Veeder-Root monitoring unit.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 15010 - Mechanical General Requirements.
- .2 Section 15916 - Controls.
- .3 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, installation and termination of all equipment depicted in the drawings and specifications.
- .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 owners 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 work with architectural drawings.
- .7 Unless otherwise approved by the engineer all equipment and material shall be new and be CSA approved.
- .8 Coordinate with mechanical contractor the exact locations and electrical requirements of mechanical equipment. Coordinate with the Mechanical contractor for installation of tank interstitial and level monitoring sensors.
- .9 The contractor is responsible to ensure the controls and related equipment operates as indicated in the sequence of operations. Refer to specification section Controls 15916
- 10. The contractor will coordinate with the mechanical division ensure proper operation of the system as intended prior to turn over to the client.
- 11. Submit to engineer all shop drawings of equipment to be installed for approval.

1.3 SCOPE OF WORK

- .1 Supply , install and terminate new power distribution equipment as indicated. Modify existing power distribution equipment as required to accommodate new configuration.
- .2 Install and terminate new equipment supplied by Owner.
- .3 Install and terminate new equipment supplied by Division 15. Refer to Division 15 and Division 16 drawings and specifications for details.
- .4 Supply, install and terminate of all new circuit breakers, switch boxes, junction boxes, local disconnect switches, lighting, lighting switches.

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- .5 Supply, install and terminate a new 120 volt Class 1 Zone 1 rated LED outdoor wall mounted wall pack light fixture on pump house exterior. Light fixture to be photocell controlled. Manufacturer AZZ model SXPJ LED-06-L2-12-GG-W or approved equal in accordance with B7. See detail 2 in Electrical Layout and Details, drawing number 1429720100-DWG-E0001.
- .5 Remove existing Veeder – Root TLS-300 monitoring console and return to owner in good condition. Care must be taken in the removal process so as to not damage the TLS-300 unit. The unit is returnable for credit to the manufacturer.
- .6 Supply, install and terminate a new Veeder-Root TLS – 350 monitoring console in the same location that the existing TLS-300 unit was at.
- .7 Supply, install and terminate new Veeder-Root tank mounted monitoring devices, typical of all six sensors. There are 3 new sensors for tank interstitial monitoring and 3 new sensors for tank level. There are required 2 new sensors per new tank; one of each new sensor type on each of the 3 new tanks. The contractor is to duplicate the sensor installation on the new 3 (three) tanks as previously completed on the existing 3 (three) tanks. All wiring methods on tanks and in pump house Class 1 zone 1 per CEC section 18.

Tank Level Probe Model Number: 847390-109

Interstitial Sensor Model Number: 794390-409
- .8 Supply, install and terminate a new static cable and clamp system as shown in the drawings. See detail 3 in Electrical Layout and Details, drawing number 1429720100-DWG-E0001.
- .9 Supply, install and terminate three new start/stop control stations above existing start stop stations and in identical configuration as existing. Re configure existing conduit attached to existing start stop stations to accommodate the new start stop stations to be above and in line with the existing. Keep vertical distance between start stop stations to within 150 mm for ease of access and reach. The manufacturer, Cooper Crouse Hinds model numbers as follows;

Quantity 3 - Start/stop –DSD922-5A

Quantity 3 - 1 Gang Boxes – EDSC371
10. Remove existing 300VA control power transformer (CPT). Supply, install and terminate a new CPT to replace the existing 300VA CPT. Refer to note 5 on drawing number 1429720100-DWG-E0002. Use Hammond Power Solutions model PH??MQMJ or approved equal in accordance with B7. Refer to section 16223 Part 2 sub section 2.2 Control transformers. Submit shop drawing for approval.
- .8 Supply, install, and connect all required motor control and protection equipment for the fuel pumps operation as indicated in the sequence of operations.
- .9 The work 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 facilitating the addition of the new fuel tanks, related control equipment, wire methods and other associated components as necessary to make the system complete and functional .

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 engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with 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 CSA 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 Lamicoïd 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 Engineer 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 LIGHTING AND SWITCHING

- .1 Lighting and associated accessories in hazardous area should be suitable for class I, installation, zone as specified.
- .2 Locate light switches on latch side of doors.

1.15 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.

1.16 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.

1.17 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.

1.18 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 Engineer.
 - .7 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
 - .8 Submit test results for Engineer's review.

1.19 APPROVAL AND TRAINING

- .1 Submit 3 copies of draft operation and maintenance manual of electrical and control equipment to consultant for approval.
- .2 Provide training for Owner's staff about the operation and maintenance of the new electrical equipment as required and pay associated fees.

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 Engineer 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 3 m on centre spacing or as required per code for conduit trade size support requirements.
- .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 Engineer.
- .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 installation.
 - .2

PART 3 EXECUTION

- .1 Install cables.
 - .1 Install 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

1.1 NOT USED

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 Splitter in hazardous location should be suitable for class I installations, zone as indicated.
- .5 Splitter in Non-hazardous area 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 box 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, 12 mm dia., to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2 Factory elbows 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 and installed per manufacturer instructions to “seal conduit after conductors are pulled into completed conduit system.

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 or equipment such as valves.
- .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 engage five threads and be of sufficient length to draw conduits up tight. Running thread is not allowed.
- .9 Install fish cord in empty conduits.
- .10 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .11 Dry/clean 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 Division 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 Division 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 secureness tests in accordance with CSA C22.2 No.65.

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

Not Used

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 switch in hazardous area should be NEMA Type 7 Enclosure class 1, suitable for class I, zone 1 installation.
- .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, division 1 installation.
- .4 Panels in non- hazardous area should be dust tight and moisture proof.
- .5 Panel c/w main breaker as per single line diagram shown.
- .6 Sequence phase bussing sequentially numbered, with each breaker identified by permanent number identification as to circuit number and phase.
- .7 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .8 Two keys for each panelboard and key panelboards alike.
- .9 Copper bus with neutral of same ampere rating as mains.
- .10 Mains: suitable for bolt-on breakers.

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- .11 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