

## PIPE WELDING

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### 1. GENERAL

#### 1.1 Related Requirements

- .1 Division 1 – General Requirements.
- .2 Section 23 11 27 – Piping and Fittings.

#### 1.2 References

- .1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)
  - .1 ANSI/ASME B31.3-2010, Process Piping.
  - .2 ANSI/ASME Boiler and Pressure Vessel Code-2010:
    - .1 BPVC 2010 Section I: Power Boilers.
    - .2 BPVC 2010 Section V: Non-destructive Examination.
    - .3 BPVC 2010 Section IX: Welding and Brazing Qualifications.
- .2 American Welding Society (AWS)
  - .1 AWS C1.1M/C1.1-2000(R2006), Recommended Practices for Resistance Welding.
  - .2 AWS Z49.1-2005, Safety in Welding, Cutting and Allied Process.
  - .3 AWS W1-2000, Welding Inspection Handbook.
- .3 Canadian Standards Association (CSA International)
  - .1 CSA W47.2-M1987(R2008), Certification of Companies for Fusion Welding of Aluminum.
  - .2 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
  - .3 CSA B51-09, Boiler, Pressure Vessel and Pressure Piping Code.
  - .4 CSA-W117.2-2006, Safety in Welding, Cutting and Allied Processes.
  - .5 CSA W178.1-2008, Certification of Welding Inspection Organizations.
  - .6 CSA W178.2-2008, Certification of Welding Inspectors.
  - .7 CAN/CGSB 48.9712-2014 Non-destructive Testing - Qualification and certification of NDT personnel (ISO 9712:2012, IDT)
- .4 National Research Council/Institute for Research in Construction.

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- .1 NRCC 53303, National Fire Code of Canada (NFC)-2010.

### 1.3 Action and Informational Submittals

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

### 1.4 Quality Assurance

- .1 Qualifications:

- .1 Welders:

- .1 Welding qualifications in accordance with CSA B51.
- .2 Use qualified and licensed welders possessing certificate for each procedure performed from authority having jurisdiction.
- .3 Submit welder's qualifications to Contract Administrator.
- .4 Each welder to possess identification symbol issued by authority having jurisdiction.
- .5 Certification of companies for fusion welding of aluminum in accordance with CSA W47.2.

- .2 Inspectors:

- .1 Inspectors qualified to

- .1 CSA W178.2.
- .2 CAN/CGSB 48.9712-2014.

- .2 Security clearances for site access as per Part F of the Bid Opportunity.

- .3 Certifications:

- .1 Registration of welding procedures in accordance with CSA B51.
- .2 Copy of welding procedures available for inspection.
- .3 Safety in welding, cutting and allied processes in accordance with CSA-W117.2.

### 1.5 Delivery, Storage and Handling

- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

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- .3 Packaging Waste Management: remove for reuse all of pallets, crates, padding and packaging materials.

### 2. PRODUCTS

#### 2.1 Electrodes

- .1 Electrodes: in accordance with CSA W48 Series.

### 3. EXECUTION

#### 3.1 Application

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

#### 3.2 Quality of Work

- .1 Welding: in accordance with ANSI/ASME B31.3, ANSI/ASME Boiler and Pressure Vessel Code, Sections I and IX and ANSI/AWWA C206, using procedures conforming to AWS B3.0, AWS C1.1, applicable requirements of territorial authority having jurisdiction.

#### 3.3 Installation Requirements

- .1 Identify each weld with welder's identification symbol.
- .2 Backing rings:
  - .1 Where used, fit to minimize gaps between ring and pipe bore.
  - .2 Do not install at orifice flanges.
- .3 Fittings:
  - .1 NPS 2 and smaller: install welding type sockets.
  - .2 Branch connections: install welding tees or forged branch outlet fittings.

#### 3.4 Inspection and Tests - General Requirements

- .1 Review weld quality requirements and defect limits of applicable codes and standards with City Representative before work is started.
- .2 Formulate "Inspection and Test Plan" in co-operation with Contract Administrator.
- .3 Do not conceal welds until they have been inspected, tested and approved by inspector.
- .4 Provide for inspector to visually inspect welds during early stages of welding procedures in accordance with Welding Inspection Handbook. Repair or replace defects as required by codes and as specified.

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### 3.5 Specialist Examinations and Tests

- .1 General: Perform examinations and tests by specialist qualified to CSA W178.1 and CSA W178.2 and approved by Contract Administrator.
- .2 To ANSI/ASME Boiler and Pressure Vessels Code, Section V, CSA B51 and requirements of authority having jurisdiction.
- .3 Inspect and test 100% of welds in accordance with "Inspection and Test Plan" by non-destructive visual examination and 10% by non-destructive magnetic particle (hereinafter referred to as "particle") tests.
  - .1 Visual examinations: include entire circumference of weld externally and wherever possible internally.
  - .2 Failure of visual examinations:
    - .1 Upon failure of welds by visual examination, perform additional testing as directed by Contract Administrator of total of up to 10% of welds, selected at random by Contract Administrator.

### 3.6 Defects Causing Rejection

- .1 As described in ANSI/ASME B31.3 and ANSI/ASME Boiler and Pressure Vessels Code.

### 3.7 Repair of Welds Which Failed Tests

- .1 Re-inspect and re-test repaired or re-worked welds at Contractor's expense.

### 3.8 Cleaning

- .1 Clean in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

**PIPE HANGERS, SUPPORTS, ANCHORS AND SEALS**

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**1. GENERAL**

**1.1 Reference Standards**

- .1 ANSI/ASME B31.3-2010, "Process Piping".
- .2 ANSI/MSS-SP-58-1988, "Pipe Hangers and Supports – Materials, Design and Manufacture".
- .3 CAN/CSA B51-09, "Boiler, Pressure Vessel, and Pressure Piping Code".

**1.2 Action and Informational Submittals**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
    - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Shop Drawings:
    - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
    - .2 Submit drawings stamped and signed by Professional Engineer registered or licensed in Manitoba for any custom fabricated assemblies.
  - .3 Submittals to include:
    - .1 Pipe Hangers.
    - .2 Rods.
    - .3 U-bolts.
    - .4 Building Attachments.
    - .5 Accessories.
  - .4 Indicate for each item as applicable:
    - .1 Manufacturer, model number, safe loads, pressure and temperature rating.
    - .2 Nominal size and dimensions including details of construction and assembly.

**1.3 Closeout Submittals**

- .1 Submit maintenance data including monitoring requirements for incorporation into manuals specified in Section 01 78 00 - Closeout Submittals.

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**1.4 Delivery, Storage, and Handling**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.

**1.5 Waste Management and Disposal:**

- .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.

**2. PRODUCTS**

**2.1 Design**

- .1 Some pipe hangers and supports may not be shown on Drawings.
- .2 Design hangers and supports to support piping shown on Drawings.
- .3 Pipe hangers and supports shall not become disengaged by movements of supported pipe or vibration of the support beams or building.
- .4 Design supports of strength and rigidity to suit normal operating pipe loading, but also for seismic and shipping loads without unduly stressing structure.
- .5 Space hangers and supports for service and in accordance with the manufacturer's recommended maximum loading.
- .6 All hangers and supports shall have a safety factor of 5 to 1.
- .7 Fabricate hanger, supports and sway braces in accordance with ANSI B31.3 and MSS-SP-58.

**2.2 Nuts and Bolts**

- .1 U.S. standard size bolts with hexagon heads and hexagon nuts.
- .2 All exterior bolts, nuts and washers shall be hot dip galvanized steel or stainless steel.
- .3 ASTM A307 Gr. B carbon steel bolts – hot dip galvanized for exterior use.
- .4 ASTM A563 Gr. A heavy hexagonal nuts – hot dip galvanized for exterior use.
- .5 Hot dip galvanized bolts and nuts in accordance with ASTM A153.
- .6 Project bolt end at least 3 mm beyond nut face, but not more than one bolt diameter.
- .7 U-bolts, washers and miscellaneous iron and steel parts used in pipe hangers and supports shall be hot dip galvanized unless otherwise noted.
- .8 All buried or submerged bolts, nuts and washers shall be stainless steel.

**PIPE HANGERS, SUPPORTS, ANCHORS AND SEALS**

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**2.3 Pipe Hangers and Supports**

- .1 Hangers and supports shall conform to MSS-SP-58.
- .2 Finishes:
  - .1 Pipe hangers, supports and hardware: hot dip galvanized unless otherwise noted.
- .3 Upper attachment to concrete ceiling:
  - .1 Concrete anchors: Stainless Steel Hilti Kwikbolt II, or approved equivalent in accordance with B7.
  - .2 Ceiling plate for threaded rod:
    - .1 Acceptable material: Anvil International Figure 52 or approved equivalent in accordance with B7.
  - .3 Threaded rod:
    - .1 Acceptable material: Anvil International Figure 146 or approved equivalent in accordance with B7.
- .4 Proprietary Channel Supports and Pipe Clamps
  - .1 Galvanized steel finish with a minimum of 1.9mm material thickness conforming to ASTM-A653/A653M, "Standard specification for steel sheet, zinc-coated (galvanized) or zinc-iron alloy-coated (galvanealed) by the hot dip process".
  - .2 Coating designation to be Z275 (G90) indicating 0.27 kg/sq.m. (0.90 oz./sq.ft.) total zinc deposition on both sides by triple spot test.
  - .3 Channel shall be cold formed into a standardized profile from pre-galvanized material. Composite channel profiles that involve a combination of two channel profiles are to be spot welded at 76mm centers maximum.
  - .4 Profile numbers shown on drawings are based on Unistrut manufacturer data, and are to be confirmed by calculations for any other manufacturer.
  - .5 Brackets and fasteners shall be provided as recommended by the manufacturer.
  - .6 Cushion clamps are to be carbon steel straps and threaded fasteners, yellow trivalent plated finish, with vibration-absorbing plastic insert formed to steel pipe-sized nominal outside diameter. Straps are to be formed to lock into the channels of the proprietary channel supports and to be held together by a single integral threaded fastener with removable nut. Product shall be UL classified to UL2043 and be resistant to diesel fuel. Size to suit pipe outside diameter, refer to drawings for model numbers.
    - .1 Acceptable material: Hydra-Zorb cushion clamp assemblies, nominal pipe series.

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- .5 Shop and field-fabricated assemblies.
  - .1 Trapeze hanger assemblies: MSS SP-89.
  - .2 Steel brackets: MSS SP-89.
- .6 Hanger rods: threaded rod material to MSS SP-58.
  - .1 Ensure that hanger rods are subject to tensile loading only.
  - .2 Provide linkages where lateral or axial movement of pipework is anticipated.
  - .3 Do not use 22 mm or 28 mm rod.
- .7 Pipe attachments: material to MSS SP-58.
  - .1 Attachments for steel piping: carbon steel galvanized.
- .8 Adjustable clevis: material to MSS SP-69, UL listed FM approved, where required clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
- .9 U-bolts: carbon steel to MSS SP-69 with 2 nuts at each end to ASTM A563.
  - .1 Finishes for steel pipework: galvanized.
- .10 All material to be hot dipped galvanized after metal fabrication unless otherwise noted.

**2.4 Exterior Pipe Supports**

- .1 Fabricate to elevations and details shown on the Drawings.
- .2 Exterior Pipe Support Beam System Attachments – on upper side of horizontal (flange) surfaces, or along vertical (web) of steel member:
  - .1 U-bolt – hot dip galvanized
    - .1 Acceptable Material: Anvil International Figure 137, or approved equivalent in accordance with B7.
  - .2 Pipe strap – hot dip galvanized
    - .1 Acceptable Material: Anvil International Figure 137, or approved equivalent in accordance with B7.
  - .3 One-Hole Clamp – hot dip galvanized
    - .1 Acceptable Material: Anvil International Figure 126, or approved equivalent in accordance with B7.

**2.5 Riser Clamps**

- .1 Steel pipe: carbon steel, galvanized.

**PIPE HANGERS, SUPPORTS, ANCHORS AND SEALS**

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**2.6 Seals**

- .1 Annual space compression seals:
  - .1 Nitrile elastomeric segment, sized to suit pipe O.D. and opening I.D., compatible with jet fuel and water.
  - .2 Glass reinforced nylon pressure plates.
  - .3 Type 304 stainless steel compression cap screw and nut.
  - .4 Service temperature: -40°C to +120°C.
  - .5 Acceptable material: Thunderline “Link Seal”, service type “O”.

**3. EXECUTION**

**3.1 Workmanship**

- .1 Hangers and supports are to secure all equipment in place, prevent vibration, maintain uniform slope and provide for expansion and contraction.
- .2 Locate supports adjacent to equipment to prevent undue stresses in piping and equipment.
- .3 Review all drawings prior to drilling for inserts and supports for piping systems.
- .4 Obtain Contract Administrator’s approval prior to using percussion type fastenings.
- .5 Use of piping or equipment for hanger supports or piercing of ductwork is not permitted.
- .6 Install all hanger, supports, anchors and seals in accordance with the manufacturer’s recommendations.

**3.2 Pipe Hangers and Supports**

- .1 Spacing of hangers and supports on straight runs shall not exceed the following span

<b>Pipe Size (mm)</b>	<b>Rod Diameter</b>	<b>Maximum Spacing Steel</b>
Up to 32 dia.	10 mm	2.0 m
38 dia.	10 mm	2.75 m
50 dia.	10 mm	3.0 m
63 dia.	13 mm	3.4 m
75 dia.	13 mm	3.7 m
100 dia.	16 mm	4.25 m
150 dia.	19 mm	6.1 m

- .2 Install hangers to provide minimum 12 mm clear space between finished covering and adjacent work.
- .3 Install hangers to maintain grades and allow for free expansion and contraction of all piping.

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- .4 Place 2 mm thick rubber sleeve around pipe at each support Type HS-1, HS-2 and HS-5 for full length of support.
- .5 Support pipes from top of pumphouse building structural members or on supports structures provided.
- .6 Support vertical piping at the top by placing hanger within 300 mm of the horizontal piping into which it connects.
- .7 Where several lines are run parallel to one another and at the same elevation, support by specified multiple or trapeze hangers, or a common hanger fabricated from structural steel angle or channel.
- .8 Place hanger or support within 300 mm of each horizontal elbow.
- .9 Use hangers and supports which are vertically adjustable 40 mm minimum after piping is erected.
- .10 Where practical, support riser piping independently of connected horizontal piping.

### **3.3 Pipe Hanger Sizing**

- .1 Size hangers to match pipe line size.

### **3.4 Hanger Installation**

- .1 Install hanger so that rod is vertical under operating conditions, at centre temperature of operating range.
- .2 Adjust hangers to equalize load.
- .3 Provide and tighten locknuts to lock middle attachment (rod) into upper attachment and in hanger.

### **3.5 Support Installation**

- .1 Provide shim plates as required to locate the support in the corrected position or elevation for the ambient temperature at the time of installation, and to provide support adjustment range of 20 mm in either direction.

### **3.6 Seals Installation**

- .1 Clean I.D. of sleeve for seal to fit into.
- .2 Assemble seal around pipe passing through opening.
- .3 Position and tighten seal fasteners in accordance with the manufacturer's recommendations.

### **3.7 Painting**

- .1 Any painting shall be in accordance with Division 9, Section 09 87 00 – Coating Systems for Steel Pipes and Miscellaneous Metal Fabrications.

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- .2 Supports, anchors and seals inaccessible after installation shall be painted prior to installation.

**END OF SECTION**

## MECHANICAL IDENTIFICATION

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### 1. GENERAL

#### 1.1 Summary

.1 Section Includes:

- .1 Materials and requirements for the identification of piping systems, duct work, valves and controllers, including the installation and location of identification systems.
- .2 Sustainable requirements for construction and verification.

.2 Related Requirements

- .1 Division 1 – General Requirements.
- .2 Section 23 11 27 – Piping and Fittings.

#### 1.2 References

.1 City of Winnipeg

- .1 Water and Waste Department Identification Standards.
- .2 CPPI 1990, Canadian Petroleum Products Institute Colour-Symbol System to Mark Equipment and Vehicles for Product Identification.

.2 National Research Council/Institute for Research in Construction

- .1 Manitoba / National Fire Code of Canada (NFC)-2010.

#### 1.3 Action and Informational Submittals

.1 Product Data:

- .2 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

#### 1.4 Quality Assurance

- .1 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

#### 1.5 Delivery, Storage, and Handling

.1 Packing, shipping, handling and unloading:

- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

- .2 Waste Management and Disposal:

## MECHANICAL IDENTIFICATION

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- .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.
- .2 Dispose of unused paint material at official hazardous material collections site approved by the City.
- .3 Do not dispose of unused paint or coating material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

## 2. PRODUCTS

### 2.1 Manufacturer's Equipment Nameplates

- .1 Metal nameplate mechanically fastened to each piece of equipment by manufacturer.
- .2 Lettering and numbers 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 Colours:
  - .1 Hazardous: red letters, white background.
  - .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).
- .2 Construction:
  - .1 3 mm thick white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core, characters filled with black paint.
- .3 Sizes:
  - .1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

- .2 Use maximum of 25 letters/numbers per line.

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- .4 Locations:
  - .1 Terminal cabinets, control panels: use size # 5.
  - .2 Equipment in Pumphouse: use size # 9.

### 2.3 Existing Identification Systems

- .1 Apply existing identification system to new work.
- .2 Where existing identification system does not cover for new work, use identification system specified this section.
- .3 Before starting work, obtain written approval of identification system from City Representative.

### 2.4 Fuel System Piping and Tanks

- .1 Identification:
  - .1 National Fire Code of Canada and the standards referenced therein.
  - .2 CPPI 1990.

### 2.5 Valves, Controllers

- .1 Brass tags with 12 mm stamped identification data filled with black paint.
- .2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

### 2.6 Controls Components Identification

- .1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.
- .2 Inscriptions to include function and (where appropriate) fail-safe position.

### 2.7 Language

- .1 Identification in English.

## 3. EXECUTION

### 3.1 Manufacturer's Instructions

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

### 3.2 Timing

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

## MECHANICAL IDENTIFICATION

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### 3.3 Installation

- .1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.
- .2 Provide ULC and or CSA registration plates as required by respective agency.
- .3 Identify systems, equipment to conform to PWGSC PMSS.

### 3.4 Nameplates

- .1 Locations:
  - .1 In conspicuous location to facilitate easy reading and identification from operating floor.
- .2 Standoffs:
  - .1 Provide for nameplates on hot and/or insulated surfaces.
- .3 Protection:
  - .1 Do not paint, insulate or cover.

### 3.5 Valves, Controllers

- .1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.
- .2 Install one plastic laminated copy of flow diagrams, valve schedules where directed by the City. Provide one copy (reduced in size if required) in each operating and maintenance manual.
- .3 Number valves in each system consecutively.

### 3.6 Cleaning

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**PERFORMANCE VERIFICATION MECHANICAL PIPING SYSTEMS**

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**1. GENERAL**

**1.1 Related Requirements**

- .1 Division 1 – General Requirements.
- .2 Section 23 11 27 – Piping and Fittings.

**1.2 References**

- .1 National Research Council/Institute for Research in Construction.
  - .1 NRCC 53303, National Fire Code of Canada (NFC)-2010.

**1.3 Cleaning and Start-Up of Mechanical Piping Systems**

- .1 In accordance with Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

**1.4 Fuel Systems**

- .1 Environmental protection systems:
  - .1 Test oil storage tank leakage detection system using manufacturer's recommended procedures.
  - .2 Test spill protection and over-fill protection systems using manufacturer's recommended procedures.
- .2 Fuel unloading and dispensing pumps:
  - .1 Check strainers on pump inlet, relief valve on pump outlet with discharge to tank or dispensing hose, pressure gauge on strainer inlet, pump inlet and pump discharge.
  - .2 Verify pump performance.
  - .3 Pump performance within plus and minus 10% of design.
- .3 Operational Tests:
  - .1 Tests all alarms conditions for each system.
  - .2 Supervise and demonstrate two successful unloading operations of 1,000L or more into each of the two diesel storage tanks.
  - .3 Supervise and demonstrate two successful unloading operations of 1,000L or more into the gasoline storage tank.
  - .4 Supervise and demonstrate one successful automatic transfer operation of 400L or more into each of the day tanks.

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.5 Supervise and demonstrate three successful dispensing operations of 25L or more from the diesel and gasoline dispensing tanks to vehicles, mobile equipment, or portable containers.

.4 Notify authorities having jurisdiction to enable witnessing of tests as required.

**1.5 Reports**

.1 In accordance with Section 01 79 00 Demonstration and Training.

**1.6 Training**

.1 In accordance with Section 01 79 00 Demonstration and Training.

**2. PRODUCTS (NOT USED)**

**3. EXECUTION (NOT USED)**

**END OF SECTION**

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**CLEANING AND START-UP OF MECHANICAL PIPING SYSTEMS**

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**1. GENERAL**

**1.1 Summary**

- .1 Section Includes:
  - .1 Procedures for flushing and cleaning mechanical piping systems.
- .2 Related Requirements
  - .1 Division 1 – General Requirements.
  - .2 Section 23 11 27 – Piping and Fittings.

**1.2 References**

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

**1.3 Action and Informational Submittals**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
  - .2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
    - .1 Instructions: submit manufacturer's installation instructions.

**1.4 Delivery, Storage and Handling**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.

**2. PRODUCTS**

**2.1 Cleaning Solutions**

- .1 Use fresh clean fuel to flush the new piping system for a minimum of 10 minutes and until strainers remain clean.

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**CLEANING AND START-UP OF MECHANICAL PIPING SYSTEMS**

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**3. EXECUTION**

**3.1 Manufacturer's Instructions**

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

**3.2 Cleaning Fuel Systems**

- .1 Timing: systems operational, hydrostatically tested and with safety devices functional, before cleaning is carried out.
- .2 Cleaning Agency:
  - .1 Retain licensed petroleum contractor.
- .3 Cleaning procedures:
  - .1 Provide detailed report outlining proposed flushing procedures at least 4 weeks prior to proposed starting date. Report to include: Flushing procedures, flow rates, elapsed time.
    - .1 Specific requirements for completion of work.
    - .2 Special precautions for protecting piping system materials and components.
    - .3 Complete analysis of diesel fuel or gasoline prior to releasing the fuel into tanks.
- .4 Temporary screening for protection of equipment and systems:
  - .1 Piping Systems and Equipment: free from construction debris, dirt and other foreign material.
  - .2 Control and isolation valves: operational, fully open to ensure that terminal units can be cleaned properly.
  - .3 Strainers: Install 60 mesh cone screens in piping to upstream of clean equipment prior to initial fill.
  - .4 Install pressure gauges on strainers to detect plugging.
- .5 Report on Completion of Cleaning:
  - .1 When flushing and cleaning is completed, submit report, complete with certificate of compliance with specifications.

**3.3 Start-Up of Fuel Systems**

- .1 After cleaning is completed and system is filled with Fuel:
  - .1 Establish circulation set pressure controls.

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**CLEANING AND START-UP OF MECHANICAL PIPING SYSTEMS**

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- .2 Ensure air is removed from all piping and equipment.
- .3 Check pumps to be free from air, debris, leakage.
- .4 Dismantle system pumps used for flushing and cleaning, inspect, replace worn parts, install new gaskets and new set of seals.
- .5 Clean out strainers repeatedly until system is clean.
- .6 Adjust pipe supports, hangers, u-bolts as necessary.
- .7 Monitor pipe movement, alignment of flexible pipe connectors. Adjust to prevent collection and formation of air pockets.
- .8 Check operation of valves.
- .9 Adjust valve stem packings as systems settle in.
- .10 Check operation of over-load protection devices on unloading and dispensing pumps.
- .11 Adjust alignment of piping at pumps to ensure flexibility, adequacy of pipe movement, absence of noise or vibration transmission.

**3.4 Cleaning**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

## FUEL DISPENSING SYSTEMS

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### 1. GENERAL

#### 1.1 Scope

- .1 The following statement generally describes the scope of work covered by this Section:
- .2 Provision of: pumps, meters, hoses, nozzles and accessories as required by: codes, standards, the authority having jurisdiction, as shown on the Contract Documents and as specified herein for the following equipment:
  - .1 Diesel dispensing systems.
  - .2 Gasoline dispensing systems.
- .3 Installation and testing of systems prior to shipment to site.
- .4 All items manufacturer approved for -40°C to +40°C operating temperatures.

#### 1.2 Related Work

- .1 Division 1 – General Requirements.
- .2 Section 23 08 01 – Performance Verification Mechanical Piping Systems.
- .3 Division 26 – Electrical.

#### 1.3 Action and Informational Submittals

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
- .2 Shop Drawings:
  - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Submittals to include:
  - .1 Pumps.
  - .2 Hoses.
  - .3 Nozzles.
  - .4 Accessories.
- .4 Indicate for each item as applicable:
  - .1 Manufacturer, model number, line contents, pressure and temperature rating.

## FUEL DISPENSING SYSTEMS

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- .2 Certified pump curve showing operating point, flow, pressure and maximum limits for the pump.
- .3 Pump motor data, wiring, materials of construction, seals etc.
- .4 Nominal size and dimensions including details of construction and assembly.

### 1.4 Closeout Submittals

- .1 Submit maintenance data including monitoring requirements for incorporation into manuals specified in Section 01 78 00 - Closeout Submittals.

### 1.5 Delivery, Storage, and Handling

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.

### 1.6 Waste Management and Disposal:

- .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.

## 2. PRODUCTS

### 2.1 Pumped Liquid Properties:

- .1 Number 2 Diesel fuel.
  - .1 Temperature: -40°C to 40°C.
- .2 Gasoline.
  - .1 Up to 10% ethanol blend.
  - .2 Temperature: -40°C to 40°C.

### 2.2 Dispensing System for Diesel and Gasoline P-A503, P-A504

- .1 Pumps:
  - .1 Top tank bung mounted.
  - .2 Type: direct drive positive displacement rotary vane type.
  - .3 Dry prime capacity: minimum 4 m lift.
  - .4 Discharge capacity: minimum 3 m head.
  - .5 Motor: explosion proof suitable for operation on single phase power, with built in thermal protection.

## FUEL DISPENSING SYSTEMS

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- .6 Integral switch to activate/deactivate pump.
  - .7 Remote Dispensing Head and actuator switch.
  - .8 Rated for environment and liquid being pumped. Class 1 Zone 2 electrical Hazardous area rated as applicable.
  - .9 ULC listed and CSA approved.
  - .10 Acceptable Material: as specified on the drawings, or approved equivalent in accordance with B7.
- .2 Dispenser:
- .1 Remote, pedestal mount cabinet type meter and dispenser unit.
  - .2 Mechanical metering head, litre readout, with manual reset knob.
  - .3 Dispensing nozzle cradle with integrated pump actuating switch unit.
  - .4 Padlock type nozzle/switch lock.
  - .5 Designed for use with selected dispensing pump.
  - .6 Minimum flow rating: 70 LPM.
  - .7 ULC listed for application.
  - .8 Refer schedule on drawings, or approved equivalent in accordance with B7.

### 2.3 Fuel Filtration.

- .1 Suitable for gasoline to 10%ethanol, and ultra-low sulfur diesel
- .2 Aluminum housing for spin-on filter.
- .3 Inlet/outlet connections: minimum 20mm nominal NPT.
- .4 Filtration capacity: to match dispensing pump output.
- .5 Rated operating pressure: 3.4 bar (50 psig) or more, to suit dispensing pump output.
- .6 Spin On filter with 1"-12 UNF thread mount.
  - .1 Water detection and particulate removal.
  - .2 Particulate filtration to 10 micron using cellulose resin impregnated media, or approved equivalent in accordance with B7.
- .7 Dirty filter indication.
- .8 ULC approved.

## FUEL DISPENSING SYSTEMS

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- .9 Acceptable Material: CIM-Tek Filtration 300 series or approved equivalent in accordance with B7.

### 2.4 Hoses

- .1 Flexible rubber hoses of 6 m total length.
- .2 Suitable for -54°C to +60°C operation, and complete with male threaded aluminum coupling ends.
- .3 Hoses shall be listed and labelled as conforming to CAN/ULC-S612-07, "Hose and Hose Assemblies for Flammable and Combustible Liquids".
- .4 Primary carrier: ultra-low temperature oil resistant synthetic rubber RMA Class A.
- .5 Reinforcement: spiral-ply synthetic fabric with wire helix.
- .6 Cover: ultra-low temperature oil resistant synthetic rubber RMA Class A, wrapped or smooth finish.
- .7 Connection is to be made between the couplings and the wire helix with sufficient resistance to act as a static dissipation wire for gasoline service.
- .8 Maximum working pressure of 1.03 MPa.
- .9 Acceptable material:
  - .1 Diesel: 25 mm Goodyear BC Cold Flex or approved equivalent in accordance with B7.
  - .2 Gasoline: 19 mm Goodyear BC Cold Flex Gasoline or approved equivalent in accordance with B7.

### 2.5 Nozzles

- .1 Provide UL/ULC listed automatic dispensing nozzles on the dispensing hoses conforming to CAN/ULC-S620-07, "Hose Nozzle Valves for Flammable and Combustible Liquids" as follows:
  - .1 Female NPT threaded inlet connection, aluminum body, with Viton main disc, and graphite with Teflon packing.
  - .2 The nozzle shall employ a dash-pot-type shut-off mechanism, have a three-position hold-open device, and have an angled spout with spout ring. 23.8 mm OD aluminum discharge spout is replaceable.
  - .3 Dual poppets make nozzle easy to open against high inlet pressure.
  - .4 Complete with built-in discharge shut-off valve that automatically closes when the spout is tipped up.
  - .5 Maximum pressure is 345 kPa.

## FUEL DISPENSING SYSTEMS

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- .2 Diesel Fuel low flow dispensing:
  - .1 25 mm NPT automatic shut-off nozzle.
  - .2 Yellow hand insulator boot over nozzle with splash guard.
  - .3 Acceptable Material: OPW Model 7HB-0900 c/w model 8HY-0900 Fillguard.
- .3 Gasoline dispensing:
  - .1 19 mm NPT automatic shut-off nozzle.
  - .2 Black hand insulator boot over nozzle with splash guard. Maximum pressure is 345 kPa.
  - .3 Acceptable Material: OPW Model 11BP-0400 c/w model 8BL-0400 Fillguard.

### 2.6 Hose Retractors

- .1 Counterweighted cable-type hose retractor.
- .2 Cable: 3 mm stainless steel and 6m in length.
- .3 Head: Swivel with 50 mm female NPT bottom connection.
- .4 Counterweight, hose clamps and mounting hardware, to suit hose application.
- .5 Aluminum or hot dip galvanized mounting post and base.
- .6 Acceptable Material" Pemco 360 Hose Retriever

### 2.7 Strain Relief

- .1 Molded urethane semi-circular strain relief with reinforcing web and woven UV resistant treated nylon sling and plated steel D-ring for field connection to the hose retractor.
  - .1 Gasoline and Diesel Dispensing Hoses: suitable for the OD of 25 mm and 19 mm ID hose.
  - .2 Acceptable material: Hosebun Model HB100ED.

### 2.8 Nozzle Breakaway Swivel Connector

- .1 Aluminum body with stainless steel spring
- .2 Viton seals, Nylon/HDPE sleeve
- .3 Maximum pull away force: 1.55 kNewton (350lbs)
- .4 Reconnectable after break apart.

## FUEL DISPENSING SYSTEMS

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- .5 Acceptable Material: OPW 66SB breakaway swivel, or approved equivalent in accordance with B7.

### 2.9 Spill Kit

- .1 Provide a Spill Response Kit consisting of a minimum 11.34 kg of granular sorbent, thirty sorbent pads (431 x 483 x 10 mm), one neoprene drain cover, five 76Ø x 1219 mm sorbent socks, three recovery bags and ties, one pair of nitrile gloves and one pair of goggles. Absorbents are to be non-combustible and conform to ULC/ORD-C410A, "Absorbents for Flammable and Combustible Liquids". These materials should be contained within a labeled overpack polyethylene drum container with tight-fitting lid, and clearly marked on the exterior.
- .1 Acceptable material: Seton #T4502 95 L Spill Response Kit (or approved equal in accordance with B7).

## 3. EXECUTION

### 3.1 General Installation

- .1 Obtain written installation instructions from manufacturer.
- .2 Install equipment, piping and controls in accordance with manufacturers' recommendations.
- .3 Supply templates for anchor bolt placement and furnish anchor bolts with sleeves.
- .4 Place level. shim unit and align base in accordance with manufacturer's recommended tolerance.
- .5 Ensure that pump body does not support piping or equipment. Provide supports for this purpose.
- .6 Check rotation prior to start-up.
- .7 Shim and level pump bases after installation and prior alignment of pumps.
- .8 Thoroughly clean and touch up shop painting.

### 3.2 Hoses

- .1 Hang hose such that when fully retracted, no hose rests on the ground.

### 3.3 Swivels

- .1 Install swivels on the inlet connections of dispensing nozzles.

### 3.4 Breakaway Fittings

- .1 Install the breakaway fitting in-line with the hose and downstream of the hosebun.
- .2 Demonstrate separation and reconnection of 25mm and 19mm breakaway fittings.

## **FUEL DISPENSING SYSTEMS**

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### **3.5 Nozzles**

- .1 Test the operation of the automatic shut-off features in all potential use situations.

### **3.6 Hose Retractors**

- .1 Adjust hose retractors to repeatedly retract the hose from the fully extended position when the hose is full of fluid. Adjust or increase the counterweight as required.

### **3.7 Strain Relief**

- .1 Install the strain relief to prevent kinking or damage to the hose jacket due to strain or slipping.

### **3.8 Antisiphon Valves**

- .1 Install and test prior to final commissioning of the system. The anti-siphon valve shall not chatter or remain closed when the dispensing pumps are operating.

### **3.9 Tank Visual Level Gauges**

- .1 Install drop tubes such that the tube is plumb and vertical so that the float does not drag on the drop tube wall.
- .2 Calibrate the gauge so it reads the average fuel depth in the primary vessel as if it were located at the mid-point of the primary tank length.

### **3.10 Spill Kit**

- .1 Deploy the spill kit as shown on the drawings. Fasten the lower tub to the curb of the concrete pad with a minimum of 2 m of 3 mm galvanized steel passing link chain and secure with a padlock to allow authorized removal.

### **3.11 Testing**

- .1 Field test all pumps in the presence of the Contract Administrator and the manufacturer's representative, in Winnipeg, prior to shipping to site.
- .2 Correct vibration or cavitation and retest pumps to confirm correction.
- .3 Provide instruments and undo flanges when requested by the Contract Administrator Representative to check alignment and pipe connections.

**END OF SECTION**

**ABOVEGROUND FUEL SYSTEM DECOMMISSIONING**

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**1. GENERAL**

**1.1 Scope**

- .1 The following statement generally describes the scope of work to be performed by licenced petroleum technician(s) covered by this Section:
  - .1 Decommissioning of:
    - .1 Storage Tanks, Day Tanks, and related devices.
    - .2 Piping Systems.
    - .3 Pumps and related devices.
  - .2 Loading at site, offloading and disposal at an approved location.
  - .3 All permits, inspections, and documentations.

**1.2 Related Requirements**

- .1 Division 1 – General Requirements.

**1.3 References**

- .1 CCME PN 1326, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.
- .2 Manitoba Regulation 188/2001 – the Dangerous Goods Handling and Transportation Act.
- .3 Manitoba Guideline for the Dismantling and Removal of Petroleum Storage Tanks – February 2007.
- .4 Canadian Environmental Protection Act.
- .5 National Fire Code of Canada 2010, as amended by the Manitoba Fire Code.
- .6 Dangerous Goods Handling and Transportation Act – Storage and Handling of Petroleum Products and Allied Products Regulation.
- .7 WHIMS Workplace Hazardous Material Information System.

**1.4 Submittals**

- .1 Proposed decommissioning plan shall be provided to the Contract Administration at least 21 calendar days prior to scheduled start of decommissioning. Include:
  - .1 General description of activities.
  - .2 Spill containment and mitigation plan.
  - .3 Disposal method and location.

**ABOVEGROUND FUEL SYSTEM DECOMMISSIONING**

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- .4 List of all Authorities Having Jurisdiction and contacts.
- .5 Sample permits and documents to be completed.

**1.5 Waste Management and Disposal**

- .1 Remove from site and dispose of all materials at appropriate registered facilities.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

**2. PRODUCTS (NOT USED)**

**3. EXECUTION**

**3.1 Works by licensed and certified petroleum technicians.**

**3.2 Demolition:**

- .1 Upon receiving Substantial Performance for the new installation, and in accordance with the approved schedule of work.
- .2 Transfer of remaining fuel to new storage tanks as follows:
  - .1 Transfer fuel through strainer and filtration system. Use of new unloading system is permitted if suitable for this operation.
  - .2 Bottom contents, approximately 5%, of existing fuel, in any tank is to be stored in separate containers provided by the Contractor, for disposal of by the Contractor in an approved method.
- .3 Disconnect and remove existing fuel oil and gasoline piping and pump systems, power, and controls, as indicated on the Drawings.
- .4 Turnover items identified by the Contract Administrator to the City.
- .5 Prepare tanks and all surplus system components for shipping, load and secure onto GWWD rail car(s). Shipment from site to the location indicated in the supplemental conditions will be by the City.
- .6 Receive and unload items at the termination point upon arrival.
- .7 Transport and provide final disposal of all tanks and system components.
- .8 Complete all regulatory documentation.
- .9 Provide certification of disposal to Contract Administrator.

**END OF SECTION**

## FUEL UNLOADING AND TRANSFER SYSTEMS

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### 1. GENERAL

#### 1.1 Scope

- .1 The following statement generally describes the scope of work included in this Section:
  - .1 Supply, installation, testing, of all components for fuel unloading and transferring systems as required by: codes, standards, the authority having jurisdiction, the work as shown on the Contract Documents and as specified herein.
  - .2 Assembly and installation of all diesel unloading and transfer system components and protective enclosure on 25,000 litre tank extended skid, prior to shipping to site.
  - .3 Assembly and installation of all diesel unloading and gasoline unloading system components in standalone skid and protective enclosure for connection to combined diesel/gasoline tank prior to shipping to site.
  - .4 Existing systems to remain operational until new systems achieve Substantial Performance.
  - .5 For locations indicated by the National Fire Code of Canada, part 4.5.7.1, valves shall conform to ULC/ORD-C842 – Guide for the Investigation of Valves for Flammable and Combustible Liquids.
  - .6 Refer other sections for dispensing systems, steel piping work, controls, enclosures.

#### 1.2 Related Work

- .1 Division 1 – General Requirements.
- .2 Section 05 50 00 – Miscellaneous Metals.
- .3 Section 09 87 00 – Coating Systems for Steel Pipes and Miscellaneous Metals.
- .4 Section 23 05 17 – Pipe Welding.
- .5 Section 23 05 53.01 – Mechanical Identification.
- .6 Division 25 – Controls.
- .7 Division 26 – Electrical.
- .8 Division 33 – Tanks.

#### 1.3 References

- .1 ASTM International
  - .1 ASTM A193/A193M-12b, “Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure and Other Special Purpose Applications.”

## FUEL UNLOADING AND TRANSFER SYSTEMS

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- .2 ASTM A194/A194M-13, "Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service or Both."
- .3 ASTM A351/A351M-13a, "Standard Specification for Castings, Austenitic, for Pressure-Containing Parts."
- .4 ASTM A479 / A479M - 13b, "Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels."
- .2 ANSI/ASME B40.1-2013, "Pressure Gauges and Gauge Attachments".
- .3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).
  - .1 SP-25-2013, Standard marking System for Valves, Fittings, Flanges and Unions.
  - .2 SP-61-2013, Pressure Testing of Steel Valves.
- .4 ULC/ORD-C842-84, Guide for the Investigation of Valves for Flammable and Combustible Liquids.
- .5 National Research Council/Institute for Research in Construction.
  - .1 NRCC 53303, National Fire Code of Canada (NFC)-2010.
- .6 CPPI 1990, Canadian Petroleum Products Institute Colour-Symbol System to Mark Equipment and Vehicles for Product Identification.

### 1.4 Action and Informational Submittals

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
- .2 Shop Drawings:
  - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Submittals to include:
  - .1 Valves.
  - .2 Accessories.
- .4 Indicate for each item as applicable:
  - .1 Manufacturer, model number, line contents, maximum pressure and temperature rating.
  - .2 Nominal size and dimensions including details of construction and assembly.

## **FUEL UNLOADING AND TRANSFER SYSTEMS**

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### **1.5 Closeout Submittals**

- .1 Submit maintenance data including monitoring requirements for incorporation into manuals specified in Section 01 78 00 - Closeout Submittals.

### **1.6 Delivery, Storage, and Handling**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.

### **1.7 Waste Management and Disposal:**

- .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.

## **2. PRODUCTS**

### **2.1 Operating Environment**

- .1 All products shall be rated for:
  - .1 Use with gasoline, to 10% ethanol blend.
  - .2 Diesel fuel including low-sulfur diesel.
  - .3 **Ambient and operating liquid temperatures between -40°C and +40°C, unless otherwise noted.**

### **2.2 Hose End Connectors – Dry Type Quick Couplers**

- .1 Dry disconnect quick disconnect devices.
- .2 Cam-arm / groove type connection lock.
- .3 Automatic closure of both mating devices (coupler and adapter) during disconnection.
- .4 Poppetted seal cylinder with snap-on changeable nose seal.
- .5 Locking actuator handle.
- .6 Acceptable material: OPW Kamvalok 1600 / 1700 series, or approved equivalent in accordance with B7.

### **2.3 Hoses – Fuel Unloading**

- .1 Petroleum / diesel / gasoline / gasoline-10% ethanol.
- .2 -40°C to +40°C minimum operating temperature range.
- .3 Synthetic rubber tube, RMA Class A – High Oil Resistant.

## **FUEL UNLOADING AND TRANSFER SYSTEMS**

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- .4 Cover: RMA Class A – High Oil Resistant.
- .5 Spiral reinforcing for suction application.
- .6 Bend Radius: 100mm or less for 50mm i.d. hose.
- .7 Hose manufacturer recommended end threaded fittings, installed as recommended.
- .8 ULC approved hose and components.
- .9 Suction rated to 700 mm (29 inches) of Mercury column.
- .10 50 mm by 16 m long.
- .11 Acceptable material: Goodyear LW Arctic Tank Truck or approved equivalent in accordance with B7.

### **2.4 Reel – Unloading Hose**

- .1 Active “Live” type reel.
- .2 Painted steel fabrication.
- .3 Non-swivel frame.
- .4 Manual bevel geared rewind hose, complete with removable crank handle assembly.
- .5 Crank position as shown on drawings.
- .6 Working pressure: 700 mm HG vacuum to 350 kPA (50 PSIG) pressure.
- .7 Capacity:
  - .1 16 m of 50 mm diameter hose.
- .8 One reel for diesel fuel unloading.
- .9 One reel for gasoline unloading.
- .10 Acceptable Material: Hannay Model 232 or approved equivalent in accordance with B7.

### **2.5 Reel – Static Grounding Cable**

- .1 Active “Live” type reel.
- .2 Painted steel fabrication.
- .3 Non-swivel frame.
- .4 Sealed spring assembly, with non-sparking ratchet assembly.
- .5 Complete with:

## FUEL UNLOADING AND TRANSFER SYSTEMS

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- .1 Vinyl coated grounding cable – 2mm (3/16”) cable diameter x 23 m long.
- .2 100 amp rated alligator end clamp.
- .3 Grounding strap.
- .6 Acceptable Material: Hannay Model HGR50 or approved equivalent in accordance with B7.

### 2.6 Strainers

- .1 Basket type with bolted top cover.
- .2 Cast steel body.
- .3 Stainless steel basket, 40 mesh.
- .4 Suitable for 700mm HG vacuum to 1035 kPa (150 psig).
- .5 Inlet / outlet to match connecting pipe size.
- .6 Acceptable Material: Sureflow BTC150 or approved equivalent in accordance with B7.

### 2.7 Flexible Pipe Connection

- .1 Application: to suit motion in 3 planes concurrently, in pressure or vacuum services:
- .2 Minimum acceptable movement capacity:
  - .1 Lateral: 38 mm.
  - .2 Angular: 15°.
- .3 Minimum length in accordance with manufacturer’s recommendations to suit offset.
- .4 Inner hose: stainless steel: T321 or 322, ribbed/ corrugated.
- .5 Braided wire mesh stainless steel outer jacket, T304 or T316.
- .6 End connections: stainless steel, threaded (one end swivel), and to match specified piping terminations.
- .7 CSA approved for use with Diesel fuel, including low sulfure, and automotive gasoline to 10% ethanol blend.
- .8 Operating conditions:
  - .1 Working pressure: 870 kPa.
  - .2 Working temperature: -40°C to +40°C.
  - .3 To match system requirements.

## FUEL UNLOADING AND TRANSFER SYSTEMS

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- .9 Acceptable Product: OPW FC series, or approved equal in accordance with B7.

### 2.8 Pressure Gauges

- .1 100 mm dia. or larger dial, liquid filled, accuracy 1% of full range, 6 mm dia. fittings, elastomeric blow out disc at top of case, solid front, stainless steel bourdon tube, welded construction, micrometer needle.
- .2 Provide:
  - .1 Sintered metal snubber.

### 2.9 Unloading and Day Tank Fill Pump Packages P-P501, P-P502, P-P503, P-P504

#### General

- .1 Pump package to be preassembled and located within weather proof enclosure (cabinet), as indicated on the drawings, for review, testing, and City acceptance in Winnipeg, prior to shipment to site.
- .2 Pumps:
  - .1 As identified on the drawings.
  - .2 Direct drive, base mount pump.
  - .3 Positive displacement rotary type.
  - .4 Self-priming and run dry capability.
  - .5 Integral pump pressure relief valve.
  - .6 Seal: Mechanical, self-lubricated, fluorocarbon elastomers, rotating faces, hardened steel on carbon; stationary faces, approved for design temperature Diesel fuel use.
  - .7 Capacity and accessories as shown in the pump schedule on the drawings.
- .3 Pump package to include:
  - .1 Suction strainer(s) with isolation valves.
  - .2 Suction and discharge ball-type isolation valves.
  - .3 Suction and discharge 100mmØ pressure gauge with ULc listed ball-type isolation valves.
  - .4 Discharge check valve and pressure relief valve. Pressure setting for the relief valves to be a maximum of 690 kPa.
  - .5 Piped relief valve header for return to tank.
  - .6 Discharge line check valves.

## **FUEL UNLOADING AND TRANSFER SYSTEMS**

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- .7 Common discharge fuel flow switch.
- .8 Thermal pressure relief valves as indicated on the drawings.
- .9 Base mount drive motor and flexible self-aligning coupling and guards.
- .10 As indicated on the drawings.
- .4 Pump Controllers
  - .1 All three phase pumps' controls will be provided from central PLC through dedicated motor starters.
  - .2 Refer to Division 25 for three phase pump controls and sequences.

### **2.10 Diesel Unloading Pumps P-P501, P-P502**

- .1 Ductile cast iron or steel base mounted pump.
- .2 Horizontal shaft configuration.
- .3 Self-priming and air release.
- .4 Base: Fabricated steel.
- .5 Replaceable casing liner and end discs.
- .6 Self-adjusting sliding vane.
- .7 Acceptable Material: as specified on the drawings, or approved equivalent in accordance with B7.

### **2.11 Diesel Day Tank Transfer Pumps P-P503, P-P504**

- .1 Ductile cast iron or steel base mounted pump.
- .2 Horizontal shaft configuration.
- .3 Self-priming and air release.
- .4 Base: Fabricated steel.
- .5 Replaceable casing liner and end discs.
- .6 Self-adjusting sliding vane.
- .7 Acceptable Material: as specified on the drawings, or approved equivalent in accordance with B7.

### **2.12 Diesel Fuel Unloading Only Pump P-A501**

- .1 As for above pumps.

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**FUEL UNLOADING AND TRANSFER SYSTEMS**

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- .2 Acceptable Material: as specified on the drawings, or approved equivalent in accordance with B7.

**2.13 Gasoline Unloading Only Pump P-A502**

- .1 As for above pumps.
- .2 Rated for gasoline service.
- .3 Acceptable Material: as specified on the drawings, or approved equivalent in accordance with B7.

**2.14 Electric Motors**

- .1 High efficiency type motors for motors above 0.75 kW.
- .2 TEFC housings.
- .3 Voltage, frequency and phase as shown on the Drawings.
- .4 Motor shall be rated for area classification where installed.
- .5 Minimum 1.15 service factor.
- .6 Starting current shall not exceed 6 times the full load current.
- .7 Starting breakdown torque shall comply with EEMAC Standards.
- .8 Dripless anti-friction type bearings.

**2.15 Ball Valves**

- .1 NPS 50 and over flanged:
  - .1 Quarter turn lever handle actuated manual ball valve.
  - .2 Two piece steel body, bolted construction.
  - .3 Full Port, Class 150, raised face flange.
  - .4 Minimum rating: 600 WOG.
  - .5 Seal Class 6 shut-off.
  - .6 Stainless Steel ball and trim.
  - .7 Malleable iron handle with stainless steel stop plates, lockable.
  - .8 ASME B16.5 face to face Dimensions.
  - .9 Acceptable Material: MA Steward F-150-LC-R-SS-N or approved equivalent in accordance with B7.

## FUEL UNLOADING AND TRANSFER SYSTEMS

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- .2 NPS under 50, screwed:
  - .1 Quarter turn lever handle actuated manual ball valve.
  - .2 Two piece body.
  - .3 Full Port.
  - .4 Minimum rating: 600 WOG.
  - .5 Seal Class 6 shut-off.
  - .6 Stainless Steel ball, stem and all internal trim.
  - .7 PTFE stem and ball seals.
  - .8 Malleable iron lever handle with Cadmium plated steel nut.
  - .9 Graphite body seal for top entry joint.
  - .10 Acceptable Material: MA Steward LSSR-2 series or approved equivalent in accordance with B7.

### 2.16 Check Valves

- .1 Check valves shall be class 800 cast or forged steel swing check valves conforming to API 600 / 602.
- .2 Valves are to have normal ports and bolted bonnet with graphite gasket construction.
- .3 NPS 50 and over:
  - .1 Class 150, raised face.
  - .2 Stainless steel disc plates, pin.
  - .3 Acceptable Material: Bonney Forge or approved equivalent in accordance with B7.
- .4 NPS under 50, screwed:
  - .1 Threaded and full port, bolted bonnet swing check valves.
  - .2 Stainless steel disc and trim.
  - .3 Integral CoCr seat, or approved equivalent in accordance with B7.
  - .4 Graphite with stainless steel gasket.
  - .5 Acceptable Material: Velan or approved equivalent in accordance with B7.

## FUEL UNLOADING AND TRANSFER SYSTEMS

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### 2.17 Fire Safety Valve – Emergency Shut-Off

- .1 NPT under 50, screwed.
- .2 Quarter turn operation.
- .3 Fire Safe to API 607, Seal Class 6 shut off.
- .4 Carbon steel or stainless steel, with stainless steel trim, and PTFE seats.
- .5 Spring close handle, maintained open by replaceable fusible link set to close valve at 74C (165F).
- .6 Minimum rated working pressure: 1050 kPA (150 psig).
- .7 Temperature range: -10°C to 40°C liquid temperature.
- .8 FM approved for emergency shut off service.
- .9 Acceptable Material: Metsco-Jamesbury Firesafe Figure 1075 or approved equivalent in accordance with B7.

### 2.18 Pressure Relief Valves

- .1 Pressure Safety Valves (PSV)
  - .1 Class 150 raised flange for 50mm or greater, NPT to suit under 50mm connections.
  - .2 Steel body, bonnet and cap.
  - .3 316 stainless steel nozzle, disc, and spring.
  - .4 -40°C to 40°C operating temperature.
  - .5 Metal seated.
  - .6 Set pressure of 690 kPa with capacity to suit pumping capacity at 10% overpressure.
  - .7 API standards compliant.
    - .1 Acceptable Material: Farris Engineering – Curtiss Wright, 2600 and 2700 series, or approved equivalent in accordance with B7.
- .2 Thermal Relief Valves (TRV)
  - .1 NPT connections.
  - .2 Stainless Steel body, bonnet and cap.
  - .3 316 stainless steel nozzle, disc, and spring.
  - .4 -40°C to 40°C operating temperature.

## FUEL UNLOADING AND TRANSFER SYSTEMS

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- .5 Metal seated.
- .6 Set pressure of 690 kPa with capacity to suit pumping capacity at 10% overpressure.
- .7 API standards compliant.
- .1 Acceptable Material: Farris Engineering – Curtiss Wright 2600 series, or approved equivalent in accordance with B7.

### 2.19 Solenoid Operated Fuel Valve

- .1 Valve
  - .1 NPS under 50: Threaded Connections.
  - .2 Two piece SS316 ball and trim.
  - .3 Full or reduced port.
  - .4 Blow-out proof stem.
  - .5 150 WOG rated for diesel fuel service.
  - .6 Liquid temperature approx. -40°C to 40°C.
  - .7 Ambient temperature: 10°C to 40°C.
  - .8 Suitable for electric actuator service.
  - .9 Acceptable material: MA Stewart MAS G-2ED or approved equivalent in accordance with B7.
- .2 Operator:
  - .1 Aluminum case.
  - .2 Quarter turn on/off, with manual override.
  - .3 -40°C to 40°C operating range.
  - .4 Maximum 90 degree run time: 15 seconds.
  - .5 Torque to suit 3-way valve operating requirements.
  - .6 Voltage: 24 Volt.
  - .7 Nema 4 housing – upgrade as required to suit hazardous location applications.
  - .8 Complete with all mounting and connections for selected valve.
  - .9 Acceptable Material: Promation P1 series or approved equivalent in accordance with B7.

## FUEL UNLOADING AND TRANSFER SYSTEMS

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### 2.20 Anti-siphon Valves

- .1 Anti-siphon valve is to be a threaded ductile iron body angle valve with:
  - .1 Aluminum or Iron body.
  - .2 Stainless steel spring.
  - .3 Stainless steel or aluminum internals.
  - .4 Seals: soft, rated for liquid: Viton, Nitrile, or equivalent.
  - .5 Internal thermal pressure relief back to tank.
  - .6 Calibrated spring for anti-siphon protection suitable for the installation.
- .2 Acceptable material: Morrison Bros 910 series or approved equivalent in accordance with B7.

### 2.21 Weather Proof Enclosures

- .1 Refer Division 05 and the Drawings.

## 3. EXECUTION

### 3.1 General

- .1 Install all components as recommended by manufacturer, as indicated on the drawings, and consistent with general industrial trade practice.
- .2 Install at least one union immediately adjacent to any threaded valve that cannot be disassembled in place for repairs.
- .3 Install valves with stems upright or horizontal.
- .4 Check for proper operation of valve actuators prior to and after installation.
- .5 Thoroughly clean and touch-up any damaged coatings.

### 3.2 Pressure Gauges

- .1 Install in following locations:
  - .1 On suction and discharge of all pumps.

### 3.3 Installation of emergency shut-off valve(s):

- .1 Provide quick opening and closing emergency shut-off valve(s) in fuel oil piping where shown. Ensure that the valves are easily accessible and provide a red-white "EMERGENCY FUEL OIL SHUT-OFF" sign at each valve location.

## FUEL UNLOADING AND TRANSFER SYSTEMS

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### 3.4 Pumps

- .1 Place level, shim unit and align base in accordance with manufacturer's recommended tolerance.
- .2 Ensure that pump body does not support piping or equipment. Provide supports for this purpose.
- .3 Check rotation prior to start-up.
- .4 Shim and level pump bases after installation and prior alignment of pumps.
- .5 Thoroughly clean and touch up shop painting.
- .6 Testing
  - .1 Field test all pumps in the presence of the Contract Administrator and the manufacturer's representative, in Winnipeg, prior to shipping to site.
  - .2 Correct vibration or cavitation and retest pumps to confirm correction.
  - .3 Provide instruments and undo flanges when requested by the Contract Administrator to check alignment and pipe connections.

### 3.5 Identification

- .1 Identify valves and components in accordance with CPP1 1990, and City of Winnipeg standards.

### 3.6 Leakage Testing

- .1 Hydrostatically test completed system to 1-1/2 times the maximum working pressure at the highest point of the system or 350 kPa (50 psig) whichever is higher, in accordance with the CSA B139-09, the National Fire Code of Canada and ANSI/ASME B31.3. Do not exceed any component's working pressure rating.
- .2 All piping shall maintain test pressure without loss for four hour period.
- .3 Tanks shall be limited to 7 kPa (1 psig) imposed pressure.
- .4 Isolate tanks and equipment not designed for test pressures from piping for pressure tests.
- .5 Flush line with fuel for a 10 minute period once testing completed. Fuel for flushing will be supplied by the City.
- .6 At completion of flushing, filter fuel and transfer into AST as directed by City Representative.
- .7 Nozzles installed in pipeline for pressure testing procedures shall be seal welded, once test results are approved by Contract Administrator.

**END OF SECTION**

## PIPE AND FITTINGS

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### 1. GENERAL

#### 1.1 Scope

- .1 The following statement generally describes the scope of work included in this Section:
  - .1 Provision of all piping and fittings as required by: codes, standards, the authority having jurisdiction, as shown on the Contract Documents and as specified herein for:
    - .1 All piping required for the fully operational system.

#### 1.2 Related Work

- .1 Section 23 05 17 – Pipe Welding.
- .2 Section 23 05 29 – Pipe Hangers, Supports, Anchors and Seals.
- .3 Section 33 56 13 – Above Ground Fuel Storage and Supply Tanks.

#### 1.3 References

- .1 ASTM International
  - .1 ASTM A194/A194M-13 “Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature, or both.”
  - .2 ASTM A320/A320M-11a, “Standard Specification for Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service.”
- .2 American National Standards Institute (ANSI)
  - .1 ANSI/ASME-B16.5-2013, Pipe Flanges and Flanged Fittings: NPS ½ through NPS 24 Metric/Inch Standard.
  - .2 ANSI/ASME-B16.9-2012, Factory-Made Wrought Buttwelding Fittings.
  - .3 ANSI/ASME-B16.11-2011, Forged Fittings, Socket-welding and Threaded.
  - .4 ANSI/ASME B31.3-2010 “Process Piping”.
- .3 American Petroleum Institute (API)
  - .1 API 1104, Welding Pipelines and Related Facility.
  - .2 API RP 1107, Recommended Pipeline Maintenance Welding Practises.
- .4 National Research Council/Institute for Research in Construction.
  - .1 NRCC 53303, National Fire Code of Canada (NFC)-2010.

## PIPE AND FITTINGS

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- .5 CPPI 1990, Canadian Petroleum Products Institute Colour-Symbol System to Mark Equipment and Vehicles for Product Identification.
- .6 Canadian Standards Association (CSA)
  - .1 CSA B51-09, "Boiler, Pressure Vessel, and Pressure Piping Code."
- .7 CAN/ULC-S642-07, "Standard for Compounds and Tapes for Threaded Pipe Joints".

### 1.4 Welder's Qualifications

- .1 Refer to Section 23 05 17 – Pipe Welding.

### 1.5 Welding inspector

- .1 Refer to Section 23 05 17 – Pipe Welding.
- .2 Cooperate with inspector at all times during weld tests.
- .3 Inspection will be in accordance with ANSI/ASME B31.3-2010 and CSA B51.
- .4 Inspection will include visual examination of 100% of welds and magnetic particle examinations of 10% of welds.
- .5 Provide Contract Administrator with one week notice of pipe welding procedures.
- .6 Pipe welds shall not be covered or concealed until inspector has examined welds.

### 1.6 Scheduling of Work

- .1 Schedule work to minimize interruptions to other trades working on site.
- .2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

### 1.7 Pipeline Operating Conditions

- .1 Pipeline specifications are affected by services temperature and location.
- .2 The service temperature range for this location is: -40°C to +40°C.
  - .1 Pipeline materials must have 510°C melting temperature or higher except for threaded sealants.

### 1.8 Action and Informational Submittals

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

## PIPE AND FITTINGS

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- .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Shop Drawings:
    - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
      - .1 Shop drawings: submit drawings stamped and signed by Professional Engineer registered or licensed in Manitoba.
  - .3 Submittals to include:
    - .1 Pipes.
    - .2 Flanges.
    - .3 Fittings.
    - .4 Gaskets and bolts.
    - .5 Accessories.
  - .4 Indicate for each item as applicable:
    - .1 Manufacturer, model number, line contents, pressure and temperature rating.
    - .2 Nominal size and dimensions including details of construction and assembly.
- 1.9 Closeout Submittals**
- .1 Submit maintenance data including monitoring requirements for incorporation into manuals specified in Section 01 78 00 - Closeout Submittals.
- 1.10 Delivery, Storage, and Handling**
- .1 Packing, shipping, handling and unloading:
    - .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.
- 1.11 Waste Management and Disposal**
- .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.
- 2. PRODUCTS**
- 2.1 Piping**
- .1 For identification of pipeline operating conditions, refer to Item 1.7 above.

## PIPE AND FITTINGS

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- .2 Temperatures to -40°C:
- .3 Pipe: Carbon steel, ASTM A53/A53M.
  - .1 Over NPS 50: Schedule 40 bevel ends.
  - .2 NPS 50 and under: Schedule 80 plain ends.

### 2.2 Joints

- .1 Screwed fittings shall be used only for valves NPS 50 and under or where connecting to equipment and instrumentation:
  - .1 Class 150 cast or forged carbon steel fittings, National Pipe Thread (NPT).
  - .2 PTFE tape or thread sealant meeting CAN/ULC-S642.
- .2 Welded joints:
  - .1 Electrodes: CSA W48 Series.
  - .2 Pipe ends:
    - .1 Above 50 mm bevelled.
    - .2 50 mm or less: socket welded.

### 2.3 Fittings

- .1 50 mm and smaller:
  - .1 Class 3000 forged steel fittings to ANSI/ASME B16.11 Forged Fittings Socket-Welding and Threaded.
- .2 Larger than 50 mm:
  - .1 Butt-weld pipe fittings 65MMØ and larger are to be wrought steel castings conforming to ASTM A234-WPG and ANSI/ASME - B16.9-1986, "Factory-Made Wrought Steel Buttwelding Fittings", schedule 80 wall thickness.
- .3 Flanges:
  - .1 Forged carbon steel to ANSI/ASME B16.5 Pipe Flanges and Flanged Fittings ASTM Class 150.
  - .2 50 mm diameter and smaller: socket weld. Raised face.
  - .3 Larger than 50 mm diameter: ANSI slip-on or weld neck, raised face.
- .4 Flange gaskets:
  - .1 Non-asbestos.

## PIPE AND FITTINGS

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- .2 Aramid fibre with NBR binder.
- .3 Operating Temperature Ratings: Min: -40°C, Max. 100°C.
- .4 150# ANSI, API 6001.
- .5 Working pressure: 3.4 MPA or better.
- .6 Configuration to suit flange configuration.
- .7 Acceptable material: Garlock Blue-gard style 3000.

### 2.4 Nuts and Bolts

- .1 Imperial size bolts with hexagon heads and hexagon nuts.
- .2 Bolting Materials: Carbon steel.
  - .1 To ASTM A193/A193M Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications, Grade B7.
  - .2 Galvanized carbon steel nuts: ASTM A194/A194M, Grade 7M.
  - .3 Projected bolt end at least 3 mm beyond nut face, but not more than one bolt diameter.
- .3 U-bolts, washers and miscellaneous iron and steel parts used in pipe hangers and supports shall be cadmium plated or galvanized, unless otherwise noted.
- .4 All buried or submerged bolts, nuts and washers shall be stainless steel.

## 3. EXECUTION

### 3.1 Welding

- .1 In accordance with Provincial requirements, or in absence of same, to API 1104.
- .2 Refer also to Section 23 05 17 – Pipe Welding.
- .3 Identify each weld with welder's identification on weld map, and provide weld map to Contract Administrator.
- .4 Do not conceal welds until approved by the Contract Administrator and Weld Inspector.
- .5 Replace or repair and reinspect all defects as required by specified codes at the Contractor's expense.

### 3.2 Piping

- .1 Install fuel piping system in accordance with the National Fire Code of Canada and CAN/CSA B139 Installation Code For Oil-Burning Equipment.

## PIPE AND FITTINGS

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- .2 Connect to equipment in accordance with manufacturer's instruction unless otherwise indicated.
- .3 Clean welding spatter, slag, scale and dirt from pipes, inside and out.
- .4 Fully passivate all welds to prevent the formation of corrosion.

### 3.3 Identification

- .1 Identify piping and fittings in accordance with CPPI 1990 and Section 23 05 53.01 – Mechanical Identification.

### 3.4 Coatings

- .1 Protect all steel components that have internal linings to prevent damage of lining. Repair to meet original specification if damaged prior to final assembly.
- .2 Touch up coatings as per Section 09 87 00 - Coating Systems for Steel Pipes and Miscellaneous Metals.

### 3.5 Leakage Testing

- .1 Hydrostatically test completed system to 1-1/2 times the maximum working pressure at the highest point of the system or 350 kPa (50 psig) whichever is higher, in accordance with the CSA B139-09, the National Fire Code of Canada and ANSI/ASME B31.3. Do not exceed any component's working pressure rating.
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- .6 At completion of flushing, filter fuel and transfer into AST as directed by City Representative.
- .7 Nozzles installed in pipeline for pressure testing procedures shall be seal welded, once test results are reviewed by Contract Administrator.

**END OF SECTION**