

Part 1 General

1.1 DESCRIPTION

- .1 This section specifies the supply and installation of all process valves applicable to the process piping system.
- .2 Conform to Division 1 - General Requirements.
- .3 Valves and piping shall be tested in accordance with Section 11955 – Leakage Testing.

1.2 SUBMITTALS

- .1 Submittals shall be made in accordance with Section 01330 - Submittals Procedures.
- .2 The Contractor shall submit shop drawings and product data as follows:
 - .1 Assembly drawings and material list.
 - .2 Details of all parts and principal dimensions.
 - .3 Submit installation manuals before shipment of any equipment.
 - .4 Submit the following data complete, grouped together, and separated by divider, for each set of valves with the same combination of features and accessories:
 - .1 Dimensional outline drawing showing valve body, trim, actuator, and accessories.
 - .2 Identification of materials of construction, cross-sectional views and details; for valves, components, and accessories.
 - .3 Power and control wiring diagrams, including terminals and numbers.
 - .4 Complete motor nameplate data.
 - .5 Sizing calculations for open-close throttling and modulating.
 - .6 Valve pressure and temperature rating
 - .5 Certification of NSF61 compliance, where used for portable water service.
 - .6 Submit Operating and Maintenance Manuals as specified in Division 1. Include complete description of operation together with detailed drawings,

a complete list of replacement and repair parts, and parts manufacturer's identifying numbers.

1.3 SUPPLIERS

- .1 All valves and operators of the same type shall be provided by one manufacturer.
- .2 City will provide the contact information for the pre-purchased valve Supplier / Manufacturer.

1.4 DELIVERY AND STORAGE

- .1 Refer to Section 01645 – Material and Equipment.
- .2 Deliver valves to site using loading methods which do not damage casings or coatings.
- .3 Valves will be clearly tagged, stating size, type, coatings and mating parts.
- .4 Store on site until ready for incorporation in the work. Store using the methods and environment recommended by the manufacturer to prevent damage, undue stresses, or weathering.

Part 2 Products

2.1 GENERAL

- .1 Provide new, unused valves for the work.
- .2 Valve materials shall be free from defects or flaws, with true alignment and bores.
- .3 Unless otherwise indicated on the Contract drawings, valves shall be the same size as the pipe run in which they are to be installed.
- .4 Valve bodies shall be clearly marked in raised lettering to indicate the valve type, rating, and where applicable, the direction of flow.
- .5 Valve ends to suit adjoining piping.
- .6 Size operator to operate valve for the full range of pressures and velocities.
- .7 Size actuators for drip-tight shutoff and breakaway at full valve pressure rating, unless otherwise specified.
- .8 Specific requirements for the materials, ratings, and service conditions for each valve are listed in the valve specification sheets.

- .9 Valves shall open counter clockwise.
- .10 Factory mount operator, actuator, and accessories.
- .11 Bolts, nuts, and fasteners for valve installations: 316SS

2.2 VALVE ENDS

- .1 Valves in pipe runs less than 75 mm diameter shall be provided with female threaded ends unless indicated otherwise. Threads shall conform to ANSI 131.20.1.
- .2 Valves in pipe runs equal to or greater than 75 mm diameter shall be flanged unless indicated otherwise.
- .3 Unless indicated otherwise, for cast iron or ductile iron body valves, flanges shall be drilled to Class 125 pattern conforming to ANSI B16.1. For steel body valves, flanges shall be Class 150 pattern or Class 300 pattern, as noted in the detailed valve specification sheets, conforming to ANSI 1316.5.
- .4 Grooved joint valve ends (Victaulic) may be used where shown on the drawings or as approved by the engineer.
- .5 Slip-on joints shall be used for buried gate valves, check valves, and plug valves. The hubs shall be compatible with the pipe and jointing technique used.
- .6 Lug style wafer body valves shall have tapped holes, suitable for the bolt spacing of the pipe flanges placed on either side.
- .7 Wafer body valves shall have positioning holes, suitable for the bolt spacing of the pipe flanges placed on either side.
- .8 Valves which are bubble tight in one direction shall be installed to seal in a direction opposite to normal flow unless otherwise noted or directed by the Engineer.

2.3 MANUAL ACTUATORS

- .1 General:
 - .1 Operator force not to exceed 178 N under any operating condition, including initial breakaway. Use gear reduction operator when force exceeds 178 N.
 - .2 Operator self-locking type or equipped with self-locking device.
 - .3 Position indicator on quarter-turn valves.

- .4 Worm and gear operators one-piece design worm-gears of gear bronze material. Worm hardened alloy steel with thread ground and polished. Traveling nut type operators threaded steel reach rods with internally threaded bronze or ductile iron nut.
 - .5 Gear operators shall be totally enclosed worm gear type, equipped with a handwheel or crank and a visual indicator of the valve position. They shall be grease lubricated. Where gear operators are intended for direct bury, they shall be sealed units with long life lubricant.
- .2 Exposed Operators:
- .1 Galvanized and painted handwheels located between 0 and 2.0 metres above floor level. Hand wheels shall have the direction of opening clearly shown in raised lettering and symbols.

- .2 Hand wheel diameters shall conform to the following:

Nominal Valve Size (mm)	Minimum Hand wheel Diameter (mm)
12	50
19	50
25	60
38	75
50	85
65	105
75	200
100	250
150	300
200	350
250	400
300	450
350	450
400	550
450	600
500	600
600	600
750	600

- .3 Lever operators allowed on quarter-turn valves. Quarter turn lever operators shall be perpendicular to the pipe run when the valve is closed.

- .4 Unless different operators are scheduled or shown in the drawings, conform to the following requirements.
 - .1 Gate & Knife Gate Valves
 - .1 Less than 300 mm, handwheel
 - .2 Equal to or greater than 300 mm, totally enclosed, gear operator
 - .2 Ball Valves
 - .1 Less than 150 mm, lever operator
 - .2 Greater than or equal to 150 mm, gear operator.
- .5 Handwheel or cranks on gear type operators.
- .6 A chain-wheel operator shall be provided for valves located greater than 2.0 metres above floor level. The chain pulley shall match positively with the chain. The chains shall be rustproof. Length of chain shall be determined in field to allow chain dropping to within 1000 mm above floor. Complete with chain guide and chain hook where required to prevent chain from hanging within traffic paths.
- .7 Valve handles to take a padlock and wheels a chain and padlock.
- .3 Buried Operators:
 - .1 Buried service operators on valves larger than 63 mm shall have a 50mm AWWA operating nut. Buried operators on valves 50 mm and smaller shall have cross handle for operation by forked key. Enclose moving parts of valve and operator in housing to prevent contact with the soil.
 - .2 Design buried service operators for quarter-turn valves to withstand 610 Newton-meter of input torque at the FULLY OPEN or FULLY CLOSED positions, grease packed and gasketed to withstand a submersion in water to 69 kPa.
 - .3 Buried valves shall have extension stems, bonnets, and valve boxes. Joints for buried valves shall be mechanical joints.

2.4 VALVE STEM EXTENSIONS

- .1 Valve stem extensions shall be provided where additional clearance is required for pipe insulation or where valve operation without the extension is difficult.

- .2 Where angle valve stem extensions are employed, they shall be angle geared. Universal joints for this application are not permitted.
- .3 Stem extensions provided should be of adequate stiffness for the service. Provide, where necessary, stem guides and Universal joints. No extension assembly weight to transfer direct to valve stem or valve gear.

2.5 SPARE PARTS

- .1 Provide a list of all spare parts which would be expected to be required under normal conditions for a period of five years. At the Engineer's request, provide a price for these parts.

2.6 GATE VALVE (GV)

- .1 Resilient seated gate valve suitable for sanitary sewage.
- .2 Valves shall be full port construction, NSF61 certified and comply with AWWA C500 standard.
- .3 The body and bonnet shall be constructed from ASTM A536 ductile iron and shall have shell thickness in accordance with AWWA C500 standards.
- .4 Gate disc shall be ductile iron.
- .5 Self-cleaning metallic seats.
- .6 Non-rising bronze stem and stem nut.
- .7 Valve end connections (unless noted otherwise in Part 4: Supplemental - Valve Schedule):
 - .1 Exposed service: ASME B16.1 Class 125 flanged ends
 - .2 Buried service: Mechanical joint
- .8 Minimum 12mil DFT two-part epoxy coating installed on valve inside and outside per AWWA C550.
- .9 Operators (unless otherwise noted in Part 4: Supplemental – Valve Schedule):
 - .1 Exposed service: Handwheel
 - .2 Buried service: 50mm Operating nut
 - .3 Provide totally enclosed geared operator as per Part 4: Supplemental – Valve Schedule

.10 Manufacturers and Products:

.1 Clow ARD

2.7 ECCENTRIC PLUG VALVE (PV)

.1 Stainless steel body

.2 Ductile iron plug as per ASTM A 536.

.3 Full port. Port area shall be 100% of standard class pipe area

.4 Oil-impregnated permanently lubricated bearing with grease fittings.

.5 Grit excluder made of PTFE shall be provided to prevent the entry of grit and solids into the bearing area.

.6 Adjustable packing shall be of multiple V-ring type with a packing gland follower. Shaft seals shall permit inspection, adjustment or complete replacement of packing without disturbing any part of the valve or actuator assembly except the packing gland follower.

.7 Valve ends

.1 Exposed service: ASME B16.1 Class 125 flanged ends

.8 Plug Buna-N coated

.9 Shaft and bearing: 316 stainless steel

.10 Teflon thrust washers

.11 1200 kPa pressure rated

.12 Manual valve actuators shall be as follows:

.1 Bevel gear with operating nut and extension stem

.13 Manufacturers and Products:

.1 Dezurik Model PEF;

.2 or approved alternative

2.8 KNIFE GATE VALVE, UNI-DIRECTIONAL (KGV-UNI)

.1 Valve shall be the bonnetless knife gate valve complete with full lug body and flanged end.

- .2 Gate edge shall be machined, finished, and rounded and have a 45 degree beveled knife edge. The gate faces shall be finish ground.
- .3 PTFE Braided packing with resilient core. Packing system shall fit a rounded cast packing chamber. The packing system shall consist of multiple layers of packing. The selected packing system shall be for wet (wastewater) service. The packing gland shall match the valve body. Packing system shall provide leak-tight seal around the gate, valve superstructure and yoke designed for full peripheral access to gland bolts when valve is equipped with manual bevel gear hand wheel or power actuator.
- .4 For valves larger than 350mm with stem installed horizontally or at 45 degree, provide adjustable gate side load mechanism to carry gate load throughout full travel to prevent the excessive load on the valve packing.
- .5 The fasteners shall be stainless steel 316.
- .6 Body shall be a one piece casting of type 316 stainless steel for corrosive applications. Valve body shall incorporate cast in guides and jams and can handle full reverse pressure without damage. Valve inside port diameter shall be equal to ANSI B36.10 STD pipe inside diameter for both metal and resilient seated valves. Raised faces shall be full width per ASME B16.20 standards for spiral-wound gaskets. Valve body modifications such as bonnets, V-orifice, and purges in the chest and/or seat area shall be available.
- .7 Stem: Type 316 stainless steel
- .8 Gate:
 1. 600mm dia. and smaller: Type 316 stainless steel
 2. 750mm dia. and larger: 2205 Duplex Stainless Steel
- .9 Seat shall be resilient seated. Resilient seated valves shall have the resilient seat material molded on three sides of the stainless steel seat ring for installations where drip-tight shutoff is required.
- .10 Face-to-face dimension shall meet MSS SP-81 for knife gate valves.
- .11 Cold Working Pressure valve rating shall meet or exceed MSS SP-81. 50mm to 1200mm dia. valves shall be rated for 1035 KPa (150 psi).
- .12 Flange drilling shall be in accordance with ANSI B16.5 class 150
- .13 Manually actuated valves 350mm dia. and smaller shall have handwheel or chainwheel actuators. Manually actuated valves 400mm dia. and larger shall be supplied with bevel gear c/w with crank or chain wheel operator.

.14 The manually operated handwheel actuator yoke shall be one piece 304 cast stainless steel. The manually operated bevel gear yoke shall be a two piece 304 cast stainless steel. The yoke sleeve shall be aluminum bronze. A standard locking device shall be available. The lockout shall be rated to withstand the maximum output of the actuator.

.15 Manufacturers and Products:

.1 DeZurik Model KGC-ES Cast Knife Gate Valves

.2 or approved equal.

2.9 BALL CHECK VALVE, RAW SEWAGE PUMP DISCHARGE LINES (BCV)

.1 Ball check valve shall be non-clog, fully automatic ball check valve conforming to AWWA standard dimensions.

.2 Ball check valve shall have one moving part, the ball, which shall automatically roll out of the path of flow (vertical) providing an unobstructed opening equal to the nominal pipe size. Upon discontinuation of flow, the ball shall automatically roll back to the closed position providing a positive seal against back pressure.

.3 Mounting: suitable for vertical applications as shown on the Contract Drawings.

.4 Ball shall be sinking type.

.5 End connections: Flanged drilled in accordance with ASME 16.1 Class 125

.6 Material:

.1 Ball: Hollow aluminum filled with sand with vulcanized nitrile rubber exterior cover

.2 Body and Cover: Ductile Iron conforming to ASTM A356

.7 Finishes:

.1 Polyurethane coated exterior

.1 Coating: Polyurea/Polyurethane Hybrid Resin

.1 Cured Resin:

.1 Gel Time: 10 sec.

.2 Shore A: 90A

.3 Tensile Strength: 2400 PSI

- .4 % Elongation: 310%
- .5 Specific Gravity: 1.02
- .6 Colour: Black
- .7 Minimum coating thickness: 12mil DFT

.8 Manufacturers and Products:

- .1 HDL Model 5087 Ball Check Valve
- .2 or approved alternative.

2.10 STAINLESS BALL VALVE

- .1 Stainless Steel Ball Valve 50 mm for sewage use or air relief use
 - .1 Two piece, full port, ASTM A276 GR 316 or ASTM A351/A351M GR CF8M stainless steel body and end piece, NPT threaded ends, ASTM A276 Type 316 stainless steel ball, reinforced PTFE seats, seal and PTFE packing, blowout proof stainless steel stem, stainless steel lever operator with vinyl grip, rated 10,350kPa CWP, complies with MSS SP-110.
 - .2 Manufacturer and Product
 - .1 Conbraco Apollo 76F-100 series
 - .2 Milwaukee
 - .3 Nibco.
 - .4 Triac or approved equals

2.11 CHECK VALVE, INSERTION-TYPE (CV-INS)

- .1 Check valve to allow flow of media in one direction only. Media will flow into the inlet side of the valve and discharge from the outlet side of the check valve.
- .2 Flow back into the outlet side of the valve will be prevented by the intrinsic, basic design of the valve.
- .3 The check valve will be constructed such that it will withstand backpressure equal to a water column up to ground level while retaining a minimal head loss through the valve.
- .4 Valve to be made from polyurethane or elastomeric neoprene membrane suitable for the fluid media and the operating environment.

- .5 Valve to be normally closed. When there is no flow through the valve the valve's membrane will form a barrier preventing stormwater/foreign matter/objects from entering the sanitary piping system.
- .6 Materials of construction shall be suitable for sanitary sewer service and resistant to corrosion. Metal components and fasteners shall be 304 stainless steel.
- .7 Slip-in style Check Valves will be furnished with a set of stainless steel 304 expansion clamps located downstream of the pipe.
- .8 Valve must be designed to have a clearance fit in order to slide into the inside diameter of the host pipe. A leak-free fit between the host pipe and the check valve outer housing is required at a minimum backpressure of 2.85m water column (4 psi)
- .9 Valve shall be secured at the upstream end to either the concrete chamber wall or the host pipe. Method of securing the valve shall prevent its movement along the host pipe.
- .10 Manufacturers and Products (where specified on drawings):
 - .1 WaStop manufactured by Wapro.
 - .2 Proco ProFlex Series 790

2.12 VALVE BOX

- .1 Cast iron valve box including lids and valve extensions for valves buried underground
- .2 130mm diameter, sliding type c/w stone catcher and cover
- .3 Minimum 28 mm diameter extension spindle with 50 mm square top operating nut and bottom nut. Provide a guide plate to center the spindle to the bottom of the box.
- .4 Valve boxes cast into concrete slabs shall be flush with surface and sealed against water infiltration.
- .5 Supply one (1) operating wrench

2.13 FINISHES

- .1 All valves shall be provided with factory applied prime and finish coats for both corrosion protection and maintenance.
- .2 Minimum 12 mil dry film thickness (DFT) except where limited by valve operating tolerances.

- .3 All finished parts shall be coated with heavy grease or a mixture of white lead and tallow to prevent corrosion during shipment and installation. Bronze work shall be left bright.
- .4 Provide touch up paint matching the finished top coat.

Part 3 Execution

3.1 PREPARATION

- .1 The valve and piping arrangement indicated in the drawings is based on typical dimensions for valves of the specified type. Make the necessary modifications in the piping to allow for discrepancies between the valve dimensions shown and those supplied for the work.
- .2 Prior to the installation of the valves, field measure and check all equipment locations, pipe alignments, and structural installation. Ensure that the valve location and orientation provide suitable access to manual operators and that sufficient space and accessibility is available for pneumatic and electric actuators.
- .3 Where conflicts are identified, inform the Engineer and initiate the necessary piping modifications at no cost to the Owner.

3.2 VALVE INSTALLATION

- .1 Install valves in conjunction with the piping described in Section 11150 – Process Piping.
- .2 In horizontal pipe runs other than in locations where space does not permit, all valves shall be mounted with a vertical operating shaft with the actuator at the top. In no case shall a valve be installed pointing down.
- .3 When joining valves to pipe or fittings, do not over torque bolts to correct for misalignment.
- .4 Support valves in position using temporary supports until valves are fixed in place.
- .5 Permanently support valves to prevent transmission of loads to adjacent pipework and/or equipment. Provide flowable fill concrete bases for buried valves.
- .6 Where valves are installed in PVC pipework greater than 100 mm diameter, the valves shall be supported independently and braced against operating loads and torque to prevent transmission of stresses to the adjacent pipework.
- .7 Generally, pipe supports and hangers are not shown unless for indication purposes only.

- .8 Protect buried valves with petrolatum wrap and cathodic protection as per City Standards (S.P. No.: F4494 – Cathodic Protection of New Watermains and Fittings).

3.3 VALVE EXTENSIONS

- .1 Install valve stem extensions where necessary to provide clearance from insulation, or as indicated on the drawings.

3.4 ELECTRICAL AND INSTRUMENTATION

- .1 Electrical and instrumentation work shall be installed as specified in Division 13 and 16.

3.5 VALVE TESTING AND INSPECTION

- .1 Hydrostatically pressure test, where possible, along with piping as per Section 11955 – Leakage Testing.
- .2 Valves shall be operated under simulated and/or real process conditions to ensure they operate as intended.
- .3 Valve may be either tested while testing pipelines, or as a separate step.
- .4 Test that valves open and close smoothly under operating pressure conditions. Test that two-way valves open and close smoothly under operating pressure conditions from both directions.
- .5 Count and record number of turns to open and close valve. Account for any discrepancies with manufacturer's data.

3.6 OVERFLOW CHECK VALVE LEAKAGE TESTING

- .1 Contractor is to provide a test apparatus capable of applying a water column up to ground surface level.
- .2 Provide a minimum of five (5) working days notice of the intended testing to allow the test to be witnessed by the City and/or Site Inspector.
- .3 Hydrostatically test the inline overflow check valve for leakage in both directions using potable water.
 - .1 Test Duration: 10 minutes
 - .2 Pass Criteria: No visible leakage through or around the check valve apart from the valve's normal function. Employ the use of CCTV as needed to confirm.

- .3 Downstream Backflow Test:
 - .1 Install test apparatus on the downstream end of the overflow pipe.
 - .2 Hydrostatically test for the required duration using a water column up to ground surface level. Add water during the test as required.
 - .3 Visibly inspect the upstream end of the inline check valve to confirm that it is holding back the water column.
 - .4 Repair any leakage and repeat the test until successful.
- .4 Upstream Valve Opening Test:
 - .1 Install test apparatus on the upstream end of the overflow pipe.
 - .2 Slowly fill the apparatus with water. Note the level at which the valve opens and releases the test water.
 - .3 Repeat this test three times and account for any discrepancy between the tests and the manufacturer's literature.
 - .4 Submit opening test levels to the Contract Administrator.

Part 4 Supplemental – Valve Schedule

Valve Tag	Type	Location	Nominal Diameter (mm)	Valve End Connections	Actuator
TBC	BCV	Valve Chamber Pump 1 Discharge Check	75	Flanged	Bevel Gearbox Extension
TBC	BCV	Valve Chamber Pump 2 Discharge Check	75	Flanged	Bevel Gearbox Extension
TBC	PV	Valve Chamber - 75 FM Isolation	75	Flanged	Bevel Gearbox Extension
TBC	KGV	Valve Chamber - 100 FM Isolation	100	Flanged	Stem extension
TBC	KGV	Valve Chamber - 100 FM Drain	100	Flanged	Stem extension
TBC	PV	Valve Chamber – Pump 1 75 FM Isolation	75	Flanged	Bevel Gearbox Extension
TBC	PV	Valve Chamber - Pump 2 75 FM Isolation	75	Flanged	Bevel Gearbox Extension

Valve Tag	Type	Location	Nominal Diameter (mm)	Valve End Connections	Actuator
<i>TBC</i>	CV-INS	Wet Well - Overflow Check	400	Insertion-Type	N/A

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This section covers heavy duty, fabricated, stainless steel, wedge-style isolation gates, operators, wall thimbles, and associated appurtenances.
 - .1 Gates shall be wall mounted, and of heavy-duty construction with minimum material thickness of 10mm.
 - .2 Gates shall be true sluice gates with a seating and de-seating system including gate guides and wedges to ensure that the gate engages the seat only when seating.
- .2 The equipment provided under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions and recommendations of the equipment manufacturer unless exceptions are noted by the Engineer.
- .3 Gates and operators shall be supplied with all the necessary parts and accessories indicated on the drawings, specified, or otherwise required for a complete, properly operating installation and shall be the latest standard product of a manufacturer regularly engaged in the production of fabricated gates.
- .4 Specific information relative to the various slide gates including identification (tag) numbers, design head conditions, gate sizes, mounting requirements, methods of operation, style of gate, and other information is tabulated within **Section 3.8 - Gate Schedule**.
- .5 All gates shall be complete including the gate, guides, frames, brackets, wall thimbles with mounting bolts (as indicated), stems and stem guides, manual actuators, and all other necessary appurtenances.
- .6 Materials shall be the manufacturer's standard except as hereinafter modified or required.
- .7 The isolation gate manufacturer and the Contractor are entirely responsible for testing the gate and all accessories in the context of the information listed in the gate schedule and drawings.

1.2 RELATED SECTIONS

- .1 Section 01330 – Submittal Procedures
- .2 Section 01750 – Operation and Maintenance Manuals
- .3 Section 01780 – Closeout Submittals

.4 Section 01800 – Testing and Commissioning

.5 Section 01820 – Demonstration and Training

1.3 REFERENCES

.1 American Society for Testing and Materials International (ASTM).

.1 ASTM A240/A240M-06c, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

.2 ASTM A276-04, Standard Specification for Stainless Steel Bars and Shapes

.3 ASTM D2000-06a, Standard Classification System for Rubber Products in Automotive Applications

.4 ASTM F593-02, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs

.5 ASTM F594-02, Standard Specification for Stainless Steel Nuts

.2 American Water Works Association

.1 C-560; Cast-Iron Slide Gates

.2 C-561; Fabricated Stainless Steel Slide Gates

.3 Ontario Building Code, 2012

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01330 - Submittal Procedures.

.2 Product Data to be submitted by the manufacturer and the Contractor:

.1 Drawings showing the principal dimensions, general construction, and materials used in the gate and lift mechanism.

.2 Maintenance data for incorporation into manual specified in Section 01780.

1.5 QUALITY ASSURANCE

.1 The manufacturer shall have experience in the production of substantially similar equipment and shall show evidence of satisfactory operation in at least five (5) installations.

- .2 The manufacturer's shop welds, welding procedures and welders shall be qualified and certified in accordance with the requirements of the latest edition of ASME's Boiler and Pressure Vessel Code, Section IX.
- .3 Installation and adjustment of gates and appurtenances to be completed in accordance with the recommendations of the manufacturer. The manufacturer shall certify the gates' installation and provide certificate to the Contract Administrator.
- .4 The manufacturer shall be ISO 9001 Certified.

1.6 WARRANTIES

- .1 A minimum warranty of two (2) years from Substantial Performance must be provided for all gates, and appurtenances. It must cover all parts and labour, as well as any regular maintenance not specified in the technical manual delivered with the equipment.

Part 2 Performance

2.1 LEAKAGE

- .1 All gates shall be substantially watertight under the design head conditions. When fully closed, and under the design seating head, gates shall have zero leakage.

2.2 DESIGN HEAD

- .1 Gates shall be designed to withstand the design head list in **Section 3.8 - Gate Schedule**.

2.3 SEAL PERFORMANCE TEST

- .1 Gates' sealing system shall have been tested through a manufacturer's cycle test in an abrasive environment and showing that the leakage requirements are still obtained after 25,000 cycles with a minimum deterioration.

2.4 ANCHORAGE AND SUPPORT

- .1 Design equipment, anchorage, and support systems for vertical and lateral loading in accordance with the Ontario Building Code.

Part 3 Products

3.1 ISOLATION GATE FRAME

- .1 The gate frame shall be constructed of structural members or formed plate welded to form a rigid one-piece frame. The frame shall be of the flange back design suitable for mounting on a concrete wall.
- .2 The frame configuration shall be of the flush-bottom type and shall allow the replacement of the top and side seals without removing the gate frame from the concrete or wall thimble.
- .3 The frame shall be designed for the design head indicated with a minimum safety factor of five (5) with regard to tensile, compressive, and shear strength as noted in AWWA-C560.
- .4 Wall surface mounted frames to include EPDM wall gasket or non-shrink grout between frame and concrete surface.

3.2 ISOLATION GATE SLIDE

- .1 The slide shall consist of a one-piece, minimum 10mm, thick flat plate reinforced with formed stainless steel (316L) plates or structural members welded to the gate slide to limit its deflection to 1/720 of the gate's span under the design head. Bolted reinforcements will not be permitted.
- .2 The slide shall be designed for the design head indicated with a minimum safety factor of five (5) with regard to tensile, compressive, and shear strength as noted in AWWA-C560.

3.3 ISOLATION GATE GUIDES AND SEALS

- .1 The guide shall be designed for maximum rigidity and extend in one continuous piece from gate invert to such height as to retain and support at least two thirds (2/3) of the vertical height of the gate in the fully open position, and to form posts for support of gate operators on self-contained gates.
- .2 The gate seal shall consist of mechanically retained resilient rubber seal that will provide tight shutoff. The resilient seal shall be replaceable and shall be securely fastened to the gate frame to prevent pull out due to high velocities during gate closing.
- .3 The bottom seal shall be made of resilient neoprene set into the bottom member of the frame and shall form a flush bottom.
- .4 The guides shall be designed for the design head indicated with a minimum safety factor of five (5) with regard to tensile, compressive, and shear strength as noted in AWWA-C560.

3.4 WEDGING DEVICES

- .1 Flush-bottom closure gates shall be provided with fixed top and bottom wedges.
- .2 The gate sealing system shall include fixed factory installed wedges to provide proper seat interference and assure tight shutoff with zero leakage. Sufficient number of wedges shall be provided at top, bottom, and sides of the gates to eliminate any deflection of the gate when seated.

3.5 OPERATORS AND STEM

- .1 The operating stem shall be of solid stainless steel (see **Section 3.6 - Material** for details).
- .2 Design stem to transmit in compression at least two (2) times the rated output of the operating manual mechanism with a 178 N effort on the crank or handwheel.
- .3 The stem shall have a slenderness ratio (L/R) less than 200. The L/R ratio is defined as the distance between guides divided by $\frac{1}{4}$ of the stem radius (radius within threads).
 - .1 The threaded portion of the stem shall have machined cut threads of the Acme type.
 - .2 Stem shall not smaller than 25mm dia.
- .4 For stems in more than one piece, the different sections shall be joined together by solid couplings. The couplings shall be grooved and keyed and shall be of greater strength than the stem.
- .5 No slack or looseness shall exist between the stem sections or between the stem and the gate door. Even in reverse action, every 1mm movement of the next highest stem section shall move the gate door by the same amplitude.
- .6 Provide Type 316 stainless steel bushed stem guides, adjustable in two directions, and spaced in accordance with the manufacturer's recommendations so that the L/R ratio does not exceed 200.
- .7 Manual Operator – Bevel Geared Crank-operated:
 - .1 Crank-operated, with weatherproof housings with solid bronze lift nut.
 - .2 Mount on high strength SS pedestal or base.
 - .3 Maximum manual crank effort to operate gate shall not exceed 178 N.
 - .4 Lift Nut: Internally threaded with Acme threads.

- .5 Gears to be bevel or spur gear style. Orient to suit location of gate. Refer to Contract Drawings.
- .6 Suitable for portable electric drill operation. Furnish one adapting chuck to fit slide gate operators and to fit electric drill operators.
- .7 Wall Brackets for floor mounted stands: Fabricated from Type 316L stainless steel.
- .8 Operator, gears, and orientation shall be suitable for (minus) -40°C temperature.
- .9 Gate shall be equipped with a locking mechanism (passive or active), allowing it to remain opened for maintenance.

3.6 MATERIAL

PART	MATERIALS
Frame, yoke, stem guides, gate, stem extension, rails	Stainless steel ASTM A-276 Type 316L
De-seating rail	Stainless steel ASTM A-276 Type 316L
Top and side seals	Neoprene ASTM D2000, 1CE615 Grade H-40S, EPDM ASTM 1056
Bottom seal	Neoprene ASTM D2000 Grade 1BE265 or UHMW
Threaded stem	Stainless steel ASTM A-276 type 303MX, Type 316L
Fasteners and Anchors	ASTM F593 and F594 GR2 for Type 316L
Gasket (between frame and wall thimble)	Neoprene ASTM D2000 M2 BC 503, Polycarbonate ASTM D-3935
Lift nut	Bronze, Manganese bronze ASTM B584 UNS-C86500

3.7 ACCEPTABLE MANUFACTURERS

- .1 B.N.W. Valve Manufacturers Ltd., Series 77.

3.8 SLUICE GATE SCHEDULE

SG-01	
Location	<i>Sanitary Inlet – Outlet to Wet Well</i>
Quantity Required	1
Rising Stem (Y/N)	N

SG-01	
Location	<i>Sanitary Inlet – Outlet to Wet Well</i>
Gate Opening Direction	Up
Size of Wall Opening (Diameter, mm)	250
Type of Water Head	Unseating
Water Head (m)	2.95
Opening Invert Elevation (± m)	61.65
Operating Floor Elevation (m)	N/A
Gate Mounting	Direct to concrete in front of existing 250mm dia. Pipe inside a round concrete wet well. Contractor to confirm the inside/outside dia. Of the existing pipe prior to submitting shop drawings. Design the gate frame and provide extra wide flanges to suit the curvature of the wet well
Operator Type	Bevel Gear with 50mm operating nut and flush floor box, and extended stem

Part 4 Execution

4.1 INSTALLATION

- .1 Gates and appurtenances shall be handled and installed in accordance with the manufacturer's recommendations.
- .2 Gates shall be clean and free of construction debris.
- .3 Lubricate stems and stem threads before operating.

4.2 VERIFICATION

- .1 A Manufacturer's Representative for the equipment specified herein shall be on-site for the following task and the minimum number of person-days (defined as one person for eight hours within the regular Contractor working hours). Travel time to site is excluded.
 - .1 Two (2) person-days for installation assistance, inspection, and certification of installation.
 - .2 One (1) person-day for functional and performance testing and certification.

- .2 Installation and testing shall progress with Forms 101 and 102 being completed for each gate as per Section 01645.

- .3 Field Tests
 - .1 Following the completion of each gate installation, the gates shall be operated through at least two (2) complete open/close cycles in each of the available control modes (i.e., local manual, etc.).

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section specifies the replacement of the existing pump with two (2) new submersible raw sewage pumps, including motors and all appurtenances as indicated on the contract drawings and specified herein.

1.2 REFERENCE CODES AND STANDARDS

- .1 Products provided under this specification must comply with all regulations and codes in effect in Ontario.
- .2 Electrical work shall be in accordance with the Canadian Electrical Code and with applicable standards of the Electrical and Electronic Manufacturers Association of Canada (EEMAC) and the Canadian Standards Association (CSA).
- .3 Hydraulic Efficiency and Pump Impeller tolerances shall conform to the Standards of the Hydraulic Institute.
- .4 Canadian Standards Association (CSA).
 - .1 CAN/CSA C22.2 No. 108-01, Liquid Pumps
- .5 American Society for Testing Materials (ASTM).
 - .1 A48/A48M-03 Standard Specification for Gray Iron Castings
 - .2 A278/A278M-01(2006), Standard Specification for Gray Iron Castings for Pressure-Containing Parts for Temperatures Up to 650°F (350°C)
 - .3 ASTM F593-02, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
 - .4 ASTM F594-02, Standard Specification for Stainless Steel Nuts
- .6 American National Standards Institute (ANSI)

1.3 RELATED SECTIONS

- .1 Section 01330 – Submittal Procedures
- .2 Section 01645 – Material and Equipment
- .3 Section 01800 – Equipment Testing
- .4 Section 01810 – Commissioning

- .5 Section 01820 – Demonstration and Training
- .6 Division 13 – Special Construction
- .7 Division 16 - Electrical

1.4 SUBMITTALS

- .1 Submittals shall be in accordance with Section 01330 – Submittal Procedures
- .2 Shop Drawings:
 - .1 Pump Type, manufacturer and general description,
 - .2 Submittals shall include:
 - .1 Type, manufacturer and general description,
 - .2 General outline drawings showing clearly all general and essential dimensions.
 - .3 Descriptions and specifications of various components including:
 - .1 Pump impeller
 - .2 Pump casing
 - .3 Wearing rings
 - .4 Discharge fittings
 - .5 Valves
 - .6 Service cart, rails & Lifting equipment
 - .7 Accessories
 - .3 Complete catalog information, descriptive literature, specifications, and identification of materials of construction for various components.
 - .4 Pump performance curves showing curve number, impeller diameter, rated speed, pump capacities at various heads, pump brake (shaft) power, motor input power, NPSH required, pump efficiency, and overall efficiency vs. flow, from shutoff to run-out. Indicate separately head, pump brake power, motor input power, NPSH required, hydraulic efficiency, overall efficiency, and minimum submergence required at specified rated capacity. Clearly

- indicate manufacturer's recommended Allowable Operating Region on performance curves.
- .5 For variable speed motors provide variable speed pump performance curves for every 5 Hz over the operational range.
 - .6 Data as follows:
 - .1 Power requirements, voltage, motor power output
 - .7 Maximum allowable solid passage size: 50mm
 - .8 Total mass of pump and motor
 - .9 Anchor bolt setting plans. Anchorage design shall meet the requirements of the latest Ontario Building Code, Division B, Part 4 for post-disaster building structures, Elements of Structures, Non-Structural Components and Equipment.
 - .10 Details of power and sensor cables, and cable entry system.
 - .11 Details of motor cooling system, including any required external utility requirements.
 - .12 Details of all instrumentation.
 - .13 Power and control wiring diagrams, including terminal numbers.
 - .14 Factory finish system.
 - .15 Motor data as required by Division 16.
 - .3 Quality Control Submittals:
 - .1 Factory Functional and Performance Test Reports.
 - .2 Field Functional and Performance Test Reports.
 - .3 Special shipping, storage and protection, and handling instructions.
 - .4 Manufacturer's printed installation instructions.
 - .5 List of recommended spare parts to maintain equipment in service for period of 5 years. Include list of special tools required for checking, testing, parts replacement, and maintenance with current price information.

- .6 List of special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.
- .4 Submit operation and maintenance data for incorporation into manual specified in Section 01750 – Operation and Maintenance Manuals.
 - .1 The Contractor shall furnish operating & maintenance manuals for the equipment herein described covering each item of equipment, apparatus and device furnished or fabricated and installed and shall include the following:
 - .1 General catalogue data and/or marketing literature.
 - .2 Installation instructions.
 - .3 Operating characteristics
 - .4 Operating instructions with troubleshooting section.
 - .5 Maintenance instructions.
 - .6 Spare parts list
 - .7 Approval documents

1.5 PERMITS

- .1 The Contractor shall obtain permits and coordinate power supply with the power company.
- .2 The Contractor shall obtain permits and coordinate inspections of the Electrical Protection Branch and Ontario Electricity Safety Authority.

1.6 QUALITY ASSURANCE

- .1 Experience Requirements
 - .1 The Contractor shall engage the services of a firm or firms who have successfully, completed at least five (5) similar size installations during the past three (3) years.
- .2 Installation Checkout and Inspection
 - .1 The pump system shall be inspected prior to conducting the field test. The inspection includes certification from the manufacturer and ancillary equipment suppliers that the equipment has been properly installed and that subsequent operation will not void any warranties or damage the

equipment. The signed inspection form shall be completed prior to commencing the field testing.

.3 Field Testing

- .1 Upon completion of the installation, each piece of equipment and the system shall be field tested for satisfactory operation without excessive noise, vibration, overheating, etc. Compliance shall be based on specification requirements and written manufacturer requirements and all applicable codes and standards. All equipment shall be adjusted and checked during the field test for misalignment, clearances, supports, and adherence to safety standards.

1.7 FACTORY ACCEPTANCE TEST (FAT)

- .1 Each pump shall be given a Factory Acceptance Test at the location where the pump is manufactured and/or assembled in accordance with Hydraulic Institute Standard 11.6. Copies of the performance test shall be submitted to the Engineer for approval prior to pump delivery.
- .2 Acceptance criteria: meet the performance test acceptance grade 1U as established in ANSI/Hydraulic Institute Standard 11.6. The Owner reserves the right to reject the equipment if the pump does not meet the specified performance requirements and the acceptance criteria in the factory performance test.
- .3 The FAT will evaluate workmanship and verify construction and components against this specification and Shop Drawings submitted to and reviewed by the Engineer.
- .4 Refer to Section 2.6 for other detailed requirements about the factory testing.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 Deliver products to the site, and handle and store them to avoid damage to any components.
- .2 Provide dry storage areas and follow the manufacturer's recommendations for storage and handling. Rotate moving parts monthly during storage.

1.9 WARRANTIES

- .1 Pumps and accessories shall be guaranteed against design, manufacturing and installation workmanship defects for a period of fifteen thousand (15,000) hours of operation up to two (2) years from the date of substantial performance of the Project.

Part 2 Products

2.1 PUMPS & OPERATING CONDITIONS

- .1 Proposed pump information:
 - .1 Number of pumps: 2
 - .2 Xylem Flygt Submersible: Model NP 3069 SH3 Adaptive 276, 3 Phase, 60Hz, 2.7hp, 600V, 2.9A, impeller code 276, 100mm inlet diameter, 50mm discharge, motor N3069.060 13-08-2BB-W2.7hp
 - .3 Configured in duty/standby arrangement
 - .4 Per pump: Duty point **6.8 L/s** at **8.4m** of total head
 - .5 Pumping media: municipal wastewater (0-1% total solids), 5-30 degree C
 - .6 Soft starter driven
 - .7 Include stainless steel 316 mounting and guide slide and rail bracket system
 - .8 Explosion proof motor and suitable for Class 1 Zone 1 Hazardous Environment

2.2 ACCESSORIES

- .1 Anchor bolts, fastener and hardware:
 - .1 Adhesive anchor type, Model HIT-HY200 by Hilti Canada
 - .2 316 stainless steel anchor bolts, fasteners hardware complete with anti-galling compound, sized by equipment manufacturer per the Ontario Building Code for post-disaster building.
- .2 Lifting Lugs: For equipment weighing over 45 kg.
- .3 Provide one (1) of each of the following to be shared between the pumps as needed:
 - .1 Service lifting device for horizontal lifting of the motor and pump
 - .1 Shall consist of stainless steel 316 motor lifting chain, motor lifting strap, pump lifting angle and straps, and all associated hardware and fasteners
 - .2 The lifting device / cradle shall enable safe and easy removal of the pump and motor from the station for major

repairs without the need for lifting slings. This service shall not require more than 1 person to rig.

2.3 PAINT

- .1 Manufacturer's epoxy system with a minimum of 150 microns (6 mil) DFT for continuous submergence in corrosive water. Epoxy system shall have at least 80% solids by volume

2.4 CABLES

- .1 New cables power cables in accordance with Div. 16.
- .2 Power cables shall be sized to match the pump supplied, and the location and shall be fully waterproof cable and connections.
- .3 Pump power and control cables shall be suitable for submersible pump application and cable sizing shall conform to CSA standards and OESC specifications for pump motors. Cable shall carry a CSA approval and be of sufficient length to reach junction boxes or control panels as shown on the contract drawings without strain or splicing.

2.5 CONTROL AND INSTRUMENTATION

- .1 New control and instrumentation per Div. 13 and Div. 16.

2.6 FACTORY SHOP TESTING

- .1 Performance and Certified Test Curves for Pumps
 - .1 The pump performance shall conform to ANSI/HI 11.6. The tests are intended to ascertain the performance of the pump and to compare this with the manufacturer's guarantee. The performance test of the pumps shall be carried out to determine the performance of the pump with respect to the discharge rate of flow, total head, power absorbed, etc. For a combined motor-pump unit (for example, submersible pump; or separate pump and motor with overall efficiency guaranteed), the guarantee covers the efficiency of the entire unit.
 - .2 The pump shall be tested for proper operation at rated power supply values and for electrical and mechanical integrity prior to shipment according to ANSI/HI 11.6.
 - .3 Each pump shall be given a certified performance test under the simulated design conditions, to establish head, capacity and efficiency along the pump curve. Tests shall be conducted in accordance with Hydraulic Institute Standard ANSI/HI 11.6 and testing results shall meet acceptance

criteria Grade 1U as specified in ANSI/HI 11.6. Certified test curves shall be furnished to the Engineer.

- .4 The pump supplier must supply the following test results:
 - .1 Performance test curve, proving that the pump meets the operating conditions in accordance with ANSI/HI Standard 11.6. Pump performance test shall cover the full operating range of the pump at the full speed. Test each pump at the operating conditions specified and take not less than seven (7) evenly spaced operating points between shut-off and run out. One of the test points must be at the conditions specified. Report the following parameters at least for each test point:
 - .1 Flow
 - .2 Pump Total Head
 - .3 RPM
 - .4 Brake Horsepower
 - .5 Hydraulic and wire-to-water efficiencies
 - .6 Driving motor voltage and current amperage measured for each phase.
 - .2 Current and power consumed during the test;
 - .3 Megger Test - verification of the electrical resistance to ground;
 - .5 Hydrostatic Test of the pump volute and the complete pump unit to the pressure of 1.5 times the pump shutoff head which shall be maintained for at least 3 minutes.
 - .6 Vibration Test:
 - .1 Impeller shall be statically and dynamically balanced by the pump manufacturer.
 - .2 Vibration shall not exceed 80 percent of limits specified in ANSI/HI Standard 9.6.4.
- .2 Motor Tests
 - .1 Each motor shall be given the following non-witness tests at the factory and results shall be plotted to show full and part load motor characteristic in accordance with I.E.E.E. Standards.

- .1 Winding Resistance
 - .2 Running High Current
 - .3 Locked Rotor Current
 - .4 High Potential
 - .5 Efficiencies and Power Factors at 1/2, 3/4, and Full Loads
 - .6 Temperature rise with full load test run
- .3 Test Results
- .1 Submit four certified copies of the test reports for the above prior to shipping.

Part 3 Execution

3.1 EXAMINATION

- .1 Contractor shall off-load equipment at installation site using equipment of sufficient size and design to prevent injury or damage. Immediately after off-loading, contractor shall inspect complete pump and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in written claim with shipper prior to accepting delivery. Validate all pump serial numbers and parts lists with shipping documentation. Notify the manufacturer's representative of any unacceptable conditions noted with shipper.

3.2 INSTALLATION

- .1 Follow the manufacturer's recommended installation details and procedures supplemented by details on the drawings.
- .2 Install in a neat, workman like manner so that connections and disconnections can be easily made with parts accessible for inspections, maintenance and repairs.
- .3 Install at correct elevations, true, square, plumb and level and provide all shims required.
- .4 Apply protection so that all anchor bolts, shims and miscellaneous metals are fully corrosion protected.
- .5 Supply/install new anchors and bolts for pump base in accordance with manufacturers recommendations.

3.3 CLEAN UP

- .1 Clean up and remove all waste prior to start-up and touch up all surfaces as required so that all finishes are in an unmarred condition.

3.4 CERTIFICATION START UP AND COMMISSIONING

- .1 Check the final installation and the operation of each component. Check the interconnection of wiring for alarms and controls.
- .2 Coordinate an inspection and supervision of start up by the equipment supplier and provide to the Engineer a written certification as per Section 01645 by the supplier that the equipment is installed and operating in accordance with the manufacturer's standards.
- .3 Upon receipt of instructions to proceed, commence commissioning in accordance with Division 1 and verify that the equipment conforms to these specifications.

3.5 FIELD TESTING

- .1 Each pump shall be subjected to a mechanical field test by a qualified technical representative of the pump manufacturer and field testing on each pump shall include the following as a minimum:
 - .1 Alignment: Test complete assemblies for correct rotation, proper alignment and connection, and quiet operation.
 - .2 Operating Temperatures: Monitor bearing areas on pump and motor for abnormally high temperatures.
 - .3 Flow Output: Measured by the instrumentation and storage volumes.
 - .4 Vibration Test:

Test with complete unit (including rotating assembly, couplings, and motor) installed and discharging to the connected piping systems at rates between low discharge head and high discharge head conditions specified, and with actual building structures and foundation provided shall not develop at any frequency or in any plane, peak-to-peak vibration amplitudes exceeding 80 percent of the latest Hydraulic Institute Standards (ANSI/HI Standard 11.6).

If the pump units exhibit vibration in excess of limits specified, adjust or modify as necessary. Units that cannot be adjusted or modified to conform as specified shall be replaced.
 - .5 Performance Test
 - .1 Test for a continuous 3-hour period without malfunction

- .2 Minimum Testing Record:
 - 1. Total static head and total discharge head.
 - 2. Flow measured by permanent instrumentation, temporary instrumentation, and/or storage volumes.
 - 3. Pump discharge pressure measured by instrumentation.
 - 4. Calculated velocity head at the discharge flange.
 - 5. Driving motor voltage and amperage measured for each phase.
- .6 Power
- .7 Efficiency
- .8 Minimum Testing Record:
 - .1 Total static head and total discharge head.
 - .2 Flow measured by permanent instrumentation, temporary instrumentation, and/or storage volumes.
 - .3 Pump discharge pressure measured by instrumentations.
 - .4 Calculated velocity head at the discharge flange.
 - .5 Driving motor voltage and amperage measured for each phase.
- .2 The manufacturer's representative shall arrange for any adjustments prior to commencement of operation. A complete report of this inspection shall be submitted (in duplicate) directly to the Engineer.
- .3 Commission Pumps in accordance with Section 01800 and 01810.

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK

- .1 The section specifies the requirements for a passive odour control valve treating the vents of the chamber.

1.2 RELATED SECTIONS

- .1 Section 01330 – Submittal Procedures.
- .2 Section 11150 – Process Piping
- .3 Section 11160 – Process Valves & Operators

1.3 SUBMITTALS

- .1 Submittals shall be in accordance with Division 01.
- .2 Submit engineered shop drawings and documentation showing the unit's construction, components, and mounting. Include operations and maintenance materials, and certification from the manufacturer that the product is suitable for use on this project in this climate. **Submit RAL color number for final approval during the shop drawing review stage.**

1.4 DELIVERY, STORAGE AND HANDLING:

- .1 Deliver, store and handle all materials in a manner, which protects them from damage and in accordance with the manufacturer's recommendations

Part 2 Products

2.1 ODOUR CONTROL VALVES

- .1 Shall contain dry-scrubbing removable media in a cartridge or container system designed for removal of H₂S gas. Media must be non-hazardous before and after it is spent.
- .2 Removable dry-scrubbing media canisters must be readily obtained or shipped to the Ottawa area in a timely manner,
- .3 Corrosion resistant construction (body and components) made from aluminum, FRP, stainless steel, or similar.
- .4 Ventilation ports for easy venting.
- .5 Tamper proof lockable hooks and security latches.

- .6 Designed for use outdoors in environments with similar climate to the Ottawa area.
- .7 Suitable for use on sewage infrastructure for venting and air-intake applications.
- .8 **Paint enclosures custom exterior green, or a colour to be confirmed by the Contract Administrator during the shop drawing review stage.**
- .9 **Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.**
- .10 **Clean and prime exposed non-galvanized components to prevent rusting.**
- .11 Model & Manufacturer:
 - .1 Model 2050-50 Wager Company with Wager media and mist eliminator.
 - .2 Or approved equal.

Part 3 Execution

3.1 INSTALLATION

- .1 Mount valves true and plumb on a 100mm diameter, flanged, stainless steel pipe or as shown on the Contract Drawings.
- .2 Connecting flange of the valve to be min 600mm above the mounting surface.
- .3 Locate valves to allow for adequate maintenance access to the valve and adjacent equipment.
- .4 Supply and install minimum of 200lbs of dry-scrubbing media supplied by Wager Company suitable for removal of H₂S gas.

END OF SECTION