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City of Johannesburg
Johannesburg Water SOC Ltd

17 Harrison Street
Johannesburg

Johannesburg Water
PO Box 61542
Marshalltown
2107

Tel +27(0) 11 688 1400
Fax +27(0) 11 688 1528

www.johannesburgwater.co.za

PARTICULAR SPECIFICATION

M20: MECHANICAL VALVES: MANUFACTURE AND SUPPLY

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PARTICULAR SPECIFICATION M20: MECHANICAL VALVES: MANUFACTURE AND SUPPLY

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M20.1 SCOPE

This Specification covers the manufacture, testing and supply of sluice, butterfly, air, gate, reflux, diaphragm, flow limiter and pressure reducing valves for use in pressure pipelines for the conveyance of raw or potable water at ambient temperatures.

M20.2 INTERPRETATIONS

M20.2.1 Abbreviations

In this Specification the following abbreviations will apply:-

ANSI	:	American National Standards Institute
ASTM	:	American Society for Testing and Materials
BS	:	British Standards Institution
SANS	:	South African National Standards
SIS	:	Swedish Institute of Standards
DIN	:	Deutsch Industry Normen
ISO	:	International Organisation for Standardization
ASME	:	American Society of Mechanical Engineers
SAECC	:	South African Electrolytic Corrosion Committee

M20.2.2 Standards

For the purposes of this Specification the latest issues of the following standard specifications will apply:-

SANS 1700	:	Fasteners
SANS 135	:	Isometric Bold Screws and Nuts (Lexagon & square/coarse thread free fit series)
SANS 136	:	Isometric Precision Hexagon Head Bolts and Screws and Hexagon Nuts (coarse thread medium fit series)
SANS 144	:	Cast Iron Single-door Reflux Valves
SANS 191	:	Cast Steel Gate Valves
SANS 192	:	Cast Steel Single-door Reflux Valves
SANS 664	:	Cast Iron Gate Valves for Waterworks and heavy Industrial Purposes
SANS 936	:	Cast Iron Spheroidal Graphite Iron Castings
SANS 1431	:	Steel
BS 3100	:	Cast Steel
BS 4504	:	Flange Drilling
BS 5155	:	Cast Iron and Carbon Steel Butterfly Valves
SIS 05 59 00	:	Pictorial Surface Preparation Standards for Painting Steel Surfaces
ISO 2441	:	Pipe Line Flanges for General use - Shapes and Dimensions of Pressure Tight Surfaces
SANS 1123	:	Steel Pipe Flanges

M20.2.3 General Requirements

This specification must be read in conjunction with the following specifications:-

G01: Particular Specification for Colour Codes

G02: Particular Specification for Corrosion Protection

M20.3 GENERAL REQUIREMENTS

Satisfactory temporary end cover shall be provided to protect threads, flanges and prepared ends of valves from damage during transportation and handling on site.

Valves shall be so transported, stored and handled as to prevent damage. Valves damaged in any way shall be removed from the site.

The Contractor shall satisfy the Engineer as to the sufficiency of the place of manufacture regarding manufacturing, testing and inspection equipment to ensure that the production of valves is strictly in accordance with this Specification.

M20.3.1 Pressure Rating

The design pressure for the valve is specified in the Tender Document either in/or the Project Specification, Drawings and Schedule of Quantities. The minimum pressure rating for valves shall be 10 Bar. Valves shall be capable of withstanding the applicable test pressure as specified in SABS 664. Test pressure shall be maintained for 5 minutes and the valve bodies shall be watertight in all aspects.

M20.3.2 Wastewater Liquids and chemicals

Various different chemicals are used to treat wastewater. These include:-

- Ferric chloride
- Chlorine
- Polymer (Polyelectrolytes)
- Ammonium bromide

Valves used for the above mentioned chemicals shall be manufactured from highly non-reactive polymer such as Polyvinylidene Fluoride (PVDF) and PVC.

Valves which encounter raw wastewater, treated wastewater and sludge shall be manufactured from corrosive resistant material.

M20.3.3 Guarantee

All valves shall be guaranteed against faulty design, materials and workmanship until the end of the maintenance period on the Main Contract. During this period the Contractor shall be required to attend to and rectify any defects, which occur due to faulty design, materials or workmanship at his own cost.

M20.3.4 Operating and Maintenance Manuals

A copy of the Operating and Maintenance Manual for each valve type and different valve manufactures shall be bound in with the Operating and Maintenance Manual for the project. The manual shall be A4 size and properly bound. Drawings larger than A3 size shall be contained in separate plastic pockets.

M20.3.4.1 Contents

- A copy of the signed factory test certificate shall be bound in with the manual, while the original shall be handed to the Engineer.
- Operating instructions
- Maintenance instructions
- Lubrication instructions
- Spare parts list
- Drawings
- Brochures

M20.3.5 Jointing Material

Jointing material shall comply with SANS 1700. Valves shall be supplied complete with bolts, nuts, washers (2 per bolt) and gaskets for joining up to adjacent mating flanges.

Bolts shall be of stainless steel in all open applications (e.g. in valve chambers, reservoirs, etc.) and galvanised when buried provided the flanges are protected with DENSO mastic and tape. The bolt shall be long enough to allow at least two screw threads to protrude from the nut when the assembly is fully tightened. A washer must be provided both under the bolt head and the nut.

M20.3.6 Contact between Dissimilar Metals

When flanges of dissimilar metals are bolted together, the internal epoxy coating shall cover the contact area of the flange without any break.

Suitable insulation material shall be used between the contact faces of dissimilar metals of which the potential difference exceeds 0,3 V. Where corrodible metal is welded to a corrosion resistant metal, the protection coating specified shall overlap onto the latter by at least 5 mm.

M20.4 FABRICATION

M20.4.1 General

(a) Marking of Valves

The design pressure in Mpa shall be hard stamped on the edge of flanges to valves, to be visible from the top of valves.

(b) By-passes

Where indicated in the Project Specification or the Schedule of Quantities, valves shall be supplied with by-passes. Such by-passes shall be bolted on to the body of the valve and not to the adjoining pipework.

(c) Hand wheels and Direction of Closure

Where valves are required to be supplied with hand wheels, the rims of such hand wheels shall be machined to a smooth finish if specified. Arrows shall be cast on the hand wheels together with the wording "TO OPEN" or "TO CLOSE" - Closing being by the clockwise rotation of the spindle unless otherwise specified.

- (d) For cap top valves an aluminium disc of at least 100 mm diameter with the same wording and arrows shall be slipped over the spindle and retained by the cap.

If specified in the Project Specification, valves shall be fitted with indicators representing

the valve status, showing fully open, fully closed and intermediate positions. Such indicators shall be corrosive proof and of robust design.

(e) Flanges

Unless otherwise indicated flanges shall conform, in all respects, to the requirements of SANS 1123 appropriate for the class of valve specified.

Should required sizes fall beyond the range of SANS 1123, flange dimensions shall confirm to the requirements as specified.

The Contractor shall obtain written confirmation of required flange drilling from the Engineer prior to the commencement of manufacture.

Sufficient clearance shall be allowed between the body of the valve and the flange to enable proper tightening of bolts. Tapped holes shall only be allowed in exceptional cases and with the Engineer's written consent.

(f) Information to be Supplied

Complete details of each valve offered must be provided at the time of tendering. This information will include at least the following:-

- Description
- Manufacturer's figure number
- Flange drilling
- Maximum working pressure (in kPa)
- Maximum unbalanced pressure (in kPa)
- Test pressure (in kPa)
- Material of components
- Gearing
- Accessories

M20.5 BUTTERFLY VALVES

Butterfly Valves shall be of the full-bore type and NOT reduced bore type with flanged ends. Valves larger than 200mm shall be fitted with gearboxes.

M20.5.1 Opening and Closing

All valves shall be capable of being opened or closed by hand under an unbalanced pressure equal to the design pressure without any difficulty. The disc shall close with a positive action with no possibility of slamming shut during any stage of the closing operation and the valve shall be capable of operating at any opening without variation of disc position or flutter of the disc.

The direction of the spindle rotation for valve closing shall be clockwise.

M20.5.2 Valve Body

Valve bodies shall be manufactured from cast iron or cast steel depending on test pressures and as specified.

The valve body shall have integral hubs for shaft bearing housings. Valves shall be provided with supporting feet and lifting rings where specified. A flow direction arrow shall either be cast into the body or shall be a brass plate screwed onto the body with brass screws.

M20.5.3 Discs

Discs shall be manufactured from cast iron or cast steel depending on test pressures and as specified. Discs shall be a single casting having a smooth streamlined design to minimize resistance to water flow.

The disc shall be off-set in the body to ensure simultaneous contact around its perimeter and shall have a positive non-slamming closing action.

M20.5.4 Seats and Seals

The profiles of the seats shall be smooth and continuous and shall provide adequate "lead in" for the resilient seal during closure of the disc to prevent excessive seating torque requirements. The seats shall be fixed to the valve body with stainless steel countersunk screws to facilitate replacement.

The seals shall be of the resilient type with non-weathering, non-sticking, long life properties. Seals shall be replaceable and shall be secured to the edge of the disc by means of a retaining ring. Sealing rings and seal retaining rings shall be manufactured from stainless steel.

The design of the seat and seal shall allow replacement thereof without removing the valve from the line.

M20.5.5 Shafts

Valve shafts shall be of high grade stainless steel. Valve shafts shall either be continuous through the disc or of a stub shaft design as described in the Project Specification and will be horizontal to the installed valve position. In the case of the sub-shaft type, each stub shaft shall extend into the disc hub for a distance of at least 1.5 times the shaft diameter.

All keys, dowel pins and taper pins used to attach the shaft to the disc shall be mechanically secured. The shaft shall be so sealed that the only two wetted parts shall be the disc and the seat.

M20.5.6 Bearings

Class 16 (1600 kPa) valves or valves with diameters of 350 mm or bigger shall be fitted with two-way adjustable bearings in order to permit precise disc-to-seat positioning at all times.

Positive bearing retention shall also be provided so that the bearing will not shift under operating conditions. The valve shall be capable of being installed and operated in any position.

The bearings shall be self-lubricating, long lasting sleeve-type bearings shall be fitted in the hubs of the valve body and at least one set of thrust bearings shall be provided.

M20.5.7 Gearboxes

Where it is necessary or where it is specified valves shall be operated via manually operated gearboxes

Gearboxes shall be self-locking and capable of holding the disc in a fixed position for any extended period of time.

Gearboxes shall be geared to be operated against the maximum unbalanced pressure with an effort not exceeding 200 N with each hand on the rim of a standard hand wheel. (Total effort = 400 N).

Gearboxes shall also be fitted with mechanical stops to prevent excessive turning and shall be

provided with replaceable shear pins. One spare shear pin shall be provided with each valve.

All gearboxes shall be equipped with position indicators, adjustable travel stops and indications of the "open" and "closed" positions.

The design of the gearbox shall readily allow for conversion to motorised drive at a later stage if required.

M20.6 AIR RELEASE VALVES

M20.6.1 Water works anti-shock and air release

Air valves shall be manufactured from cast iron or stainless steel depending on the test pressures and the project specification and of the single chamber design with cylindrical solid polymer control floats incorporating anti-shock design during high velocity air discharge.

The orifice plate, internals and body bolts shall be of stainless steel. All components of the valve shall be easily replaceable. All internals made of stainless steel that will be in contact with the fluid shall be lined or coated with a polyurethane paint to prevent cathodic action.

The design of the valve shall be such as to preclude the loss of water or the possibility of the float being blown shut by the passage of air when the accumulation of air in the pipeline is being released.

The valves shall be positive in the action to admit a free and full supply of air when the pipeline is being emptied or when the operating conditions demand.

Valves shall respond to the presence of accumulated air under normal working conditions by discharging it through a small orifice at any pressures within the specified design range.

Valves shall react immediately to pipeline drainage by full opening of the large orifice to allow unrestricted air intake. Valves shall not exhibit leaks or weeping past the large orifice seal at the maximum working pressure.

M20.6.2 Air Valves (Sewage)

Where air valves are required on sewage or industrial effluent pumping mains, they shall be specifically designed for such usage. Ordinary waterworks pattern air valves will not be acceptable.

Air valves shall be installed with an isolating valve on the inlet.

Full details of the air valves offered shall be provided at the time of tendering.

M20.6.3 Air Valves (Water Mains)

The following types of air valves as indicated on the Drawings and/or listed in the Schedule of Quantities are required.-

Type SO : Small orifice, single ball, lever type air valve which permits the escape of air from the pipe under working pressure.

Type LO : Large orifice, single ball air valve which allow air to enter the pipe when the pipe is being emptied and permit air to escape from the pipe when it is being filled.

Type DO : A combined small and large orifice air valve, the small orifice operating as the type SO and the large orifice as type LO above.

The size of the air valve shall be specified on the Drawings or in the Schedule of Quantities by the inlet diameter.

Air valves shall be suitable for the working pressure indicated on the Drawings or stated in the Schedule of Quantities.

All air valves shall be flanged and fitted with an isolating valve on the inlet pipe and a drain cock unless otherwise stated.

The air valves should be so designed that the balls are prevented from sticking.

Cover plates shall allow free discharge or intake of air, but shall prevent the ingress of foreign matter.

Valves shall be drop tight on shut-off and the design of the valve shall prevent balls from sticking.

When discharging large volumes of air at high rates the ball must not be caught up in the escaping air stream and close before all air has been released.

Tenderers shall submit full particulars of the air valves tendered on with the tender.

M20.6.4 Special Valves

All valves other than sluice and air valves shall be classified as special valves. The general requirements, pressure ratings, protective layers, flanges, markings, tests, etc. as specified in this Section will be applicable to the special valves. The particular valve will be further specified in the Project Specification.

M20.7 **GATE VALVES**

All gate valves shall comply with the requirements of SABS 664 and shall carry the SABS mark. Gate valves shall completely clear the bore of the valve in the fully open position. The direction of closing shall be clearly marked on the bonnet of the valve. Valves shall be drip-tight from zero to maximum working pressure under test conditions.

M20.7.1 Wedge Gate Valves

Valve seat and gate rings shall be manufactured from bronze to BS 1400 LG2.

Valves except flange faces shall be coated externally and internally with self-etching primer followed by one or more coats of fusion bonded epoxy material to give a total film thickness of at least 250 microns all applied in accordance with the manufacturer's specifications.

Valves where specified shall be supplied with fully enclosed, grease-packed, single-train spur gearboxes with a 3:1 or 4:1 ratio as specified.

Where required bronze gate guides and shoes shall be fitted as additional.

Integral mounted by-pass assemblies shall be fitted as additional where required.

M20.7.1.1 **Auxiliary Fittings**

Wedge gate valves of 300 mm diameter and larger shall be fitted with the following auxiliary fittings:-

- Drain Plugs

300 mm diameter valves and larger shall be supplied with gunmetal drain-plugs screwed into the lowest point of the valve and the valve body shall be suitably drilled and tapped to accept the drain-plug. The plug must be in position when the test pressure is applied.

- Ball Bearing thrust Collars

300 mm diameter valves and larger shall be fitted with ball-races on the top and bottom of the thrust collars. The ball-races shall be totally enclosed in a grease-packed cover, which shall be sealed to prevent the egress of grease. Provision must be made for lubricating the ball-races and the lubrication arrangement shall allow for re-greasing while the valve is under pressure.

M20.7.2 Knife Gate Valves

The valve body shall be cast iron with soft rubber lining. Spindle and blade are to be manufactured from stainless steel. Valve seals are to be re-packable and reversible made from Nitrile rubber with PTFE scrapers, to withstand solid particles and grit associated with wastewater and sludge.

Hand wheels shall be rising spindle types. Knife gate valves shall be installed vertically at all times.

M20.7.3 Resilient Seal Valves

Resilient Seal valves ensure tight compression sealing without wear and shall be used as isolating valves. Valve bodies shall have unobstructed, pocket-free, bores i.e. no seating protrusions or gate well, with inclined seats and gate guides to eliminate deposits in the valve body.

The spindle seal shall have at least two Nitrile Butadine rubber to DIN 3770 O-rings located in a corrosion-resistant housing and a wiper ring to prevent ingress of dirt. A back seal shall permit replacement of spindle seats under pressure, with the gate in the fully open position.

The cast iron gate shall be fully covered with a Nitrile Butadine rubber sheath fully bonded to the gate by vulcanising.

Valves shall be smooth bore and shall operate without the use of any wedging action, which may scuff or damage the rubberised gate.

Valves shall be coated with a fusion bonded epoxy coating of minimum thickness 200 microns.

M20.8 **NEEDLE VALVES**

Type NLV1 needle valves of sizes 50 NB and under shall be used for flow control of dilution water. Needle valves shall be manufactured from stainless steel and shall adhere to ASTM A 351.

The valve shall be hand operated and the ends of the body shall be screwed to BSP.

M20.9 **SPECIAL VALVES**

All valves used for special operations and conditions shall be carefully selected.

Tenderers are required to submit full details of the valves offered and the final selection shall be subjected to the approval of the Engineer. The valves offered shall not be accepted as substitutes for the standard valves specified.

M20.10 REFLUX/NON RETURN VALVES

Valves used for sewage effluent or sludge shall be self-cleansing at the base of the gate. The interior shall be smooth and free from any projections.

Valve bodies shall be of cast iron or cast steel depending on the test pressures and the project specification.

Valve doors shall be of cast steel or cast iron. Body rings, door rings and spindles shall be manufactured from stainless steel.

The following types of reflux valves as specified shall be supplied:-

- (a) Single sloping swing door for sizes up to 400 mm.
- (b) Double sloping swing door for sizes larger than 400 mm and up to 800 mm.
- (c) Multiple sloping swing doors for sizes larger than 800 mm.

Valve bodies and seals shall be free of pockets that will allow dirt accumulation.

Valve doors shall be designed to prevent fluttering and shall allow rapid but non-slamming closure on reversal of flow. The gate shall swing free in the body and in fully open position shall not obstruct the flow.

Valves shall seal effectively under all operating conditions and the design shall be such that the gate rests against the seat in the absence of flow or of differential pressure without the aid of springs or external counterweights.

Where specified in the Project Specification, valve doors shall be balanced by attaching counterweights and levers, or hydraulic dampers to the extended valve spindle.

Where valves are fitted to buried pipe lines, only hydraulic dampers shall be used.

M20.11 DIAPHRAGM VALVES

The valve is to be able to handle sludge's, rags and grit as expected in waste treatment works. The valve body must be designed to minimise turbulence and give 100% leak tight closure.

The valve must have a smooth bore and minimise wear from abrasion and allow for rodding when sludge's set in the pipeline.

The valve operating mechanism must be sealed from service and atmosphere.

The diaphragm must be manufactured from tough, resilient type natural rubber of sufficient grade to handle abrasives, acids and alkalis as expected in sewage works.

The valve body is to be cast iron with sufficient corrosion and erosion protection to last the useful life of the valve.

M20.12 BALL VALVES

M20.12.1 Type BLV1

This type is used for general purposes for sizes of 50 NB and under. The ball and stem shall be manufactured from 316 SS and the body shall be 304 SS.

The seat and the gland shall be PTFE material. The valve body shall be of the reduced bore type with ends screwed to BSP. The valve shall be lever operated.

M20.12.2 Type BLV2

BLV2 type ball valves are used for sludge lines. The valve shall be short pattern reduced bore type, fully lined with a Polypropylene or fluorocarbon resin liner.

All interior surfaces including the ball, stem and collar shall be lined to ensure that there is no contact between the metallic components and the lined media. The liners shall be securely retained by means of dovetail grooves within the bore and shall extend over the flange faces.

M20.12.3 Valve Body

The body of the valves shall be manufactured from ductile iron and all external bolts, nuts and gland followers shall be grade 316 material.

M20.13 PRESSURE REDUCING VALVE ANGLE/GLOBE PATTERN TYPE

The pressure reducing valve shall maintain a constant downstream pressure regardless of changing flow rate and/or inlet pressure.

M20.13.1 Main Valve

The valve shall be hydraulically operated, pilot-actuated, single or double chamber globe or angle patter. The valve shall consist of three major components: the body, with seat installed; the cover, with bearings installed; and the diaphragm assembly.

The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure.

Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the main valve or pilot controls.

M20.13.2 Main Valve Body

The valve body and cover shall be of cast material. Ductile iron is standard and other materials shall be available. No fabrication or welding shall be used in the manufacturing process.

The valve shall contain a resilient, synthetic rubber disc, with a rectangular cross-section contained on three and one-half sides by a disc retainer and forming a tight seal against a single removable seat inset. No O-ring type discs shall be permitted as the seating surface. The disc guide shall be of the contoured type to permit smooth transition of flow and shall hold the disc firmly in place. The disc retainer shall be of a sturdy one-piece design capable of withstanding opening and closing shocks. It must have straight edges and a radius at the top edge to prevent excessive diaphragm wear as the diaphragm flexes across its surface.

M20.13.2.1 Diaphragm

The diaphragm assembly containing a non-magnetic 304 stainless steel stem with sufficient diameter to withstand high hydraulic pressures shall be fully guided at both ends by a bearing in the valve cover an integral bearing in the valve seat. No centre guides shall be permitted. The stem shall be drilled and tapped in the cover and to receive and affix accessories as may be deemed necessary.

The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve separating operating pressure from line pressure.

The diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The centre hole for the main valve stem must be sealed by the vulcanised

process or a rubber grommet sealing the centre stem hole from the operating pressure.

The diaphragm must withstand a Mullins Burst Test of a minimum of 4000 kPa per layer of nylon fabric and shall be cycle tested 100 000 times to insure longevity. The diaphragm shall not be used as the seating surface. The diaphragm shall be fully supported in the valve body and cover by machined surfaces which support no less than one-half of the total surface area of the diaphragm in either the fully opened or fully closed position.

M20.13.2.2 Valve Cover

The main valve seat and the stem bearing in the valve cover shall be removable. The cover bearing and seat in 15 mm and smaller size valves shall be threaded into the cover and body. The valve seat in 200 mm and larger size valves shall be retained by flat head machine screws for ease of maintenance. The lower bearing of the valve stem shall be contained concentrically within the seat and shall be exposed to the flow on all sides to avoid deposits.

To insure proper alignment of the valve stem, the valve body and cover shall be machined with a locating lip. No pinned covers to the valve body shall be permitted. Cover bearing, disc retainer, and seat shall be made of the same material. All necessary repairs and/or modifications other than the replacement of the main valve body shall be possible without removing the valve from the pipeline. Packing glands and/or stuffing boxes shall not be permitted.

M20.13.2.3 Valve Manufacturer

The valve manufacturer shall warrant the valve to be free of defects in material and workmanship for a period of three year from date of shipment, provided the valve is installed and used in accordance with all applicable instructions. Electrical components shall have a one year warranty.

The valve manufacturer shall be able to supply a complete line of equipment from 32 mm through to 600 mm sizes and a complete selection of complementary equipment. The valve manufacturer shall also provide a cavitation chart which shall show flow rate, differential pressure, percentage of valve opening, Cv factor, system velocity and if there will be cavitation damage.

M20.13.3 Material Specification

Valve Size	: 50-300 mm
Main valve body and cover	: Cast Iron
Main valve trim	: Stainless steel
End detail	: SABS 1123 table 1600/3 or 2500/3 as specified
Pressure rating	: 0-50°
Coating	: Fusion bonded epoxy

Desired options:-

- X43 "y" strainer or equivalent on pilot piping
- Three ball valves on pilot piping, inlet, outlet and line to cover chamber
- 63 mm diameter pressure gauge, glycerine filled, fitted with 10 mm stainless steel ball valve on Tee-piece on inlet and outlet pilot piping.

M20.13.4 Pilot Control System

The pressure reducing pilot control shall be direct-acting, adjustable, spring-loaded, normally open, diaphragm valve designed to permit flow when controlled pressure is less than the spring setting. The pilot control is held open by the force of the compression on the spring above the diaphragm and it closes when the delivery pressure acting on the underside of the diaphragm exceeds the spring setting.

The pilot control system shall include a fixed orifice. No variable orifices shall be permitted. The pilot system shall include opening speed control on all valves 100 mm and smaller.

Three-way pilot controls will not be acceptable if the connection of TECHNOLOG "Autowat" or "Ecowat" controllers is specified.

The pilot control shall have a second downstream sensing port which can be utilised to install a pressure gauge.

A full range of spring settings shall be available in the range of 0 to 3000 kPa.

A direct factory representative shall be made available for the start-up service, inspection and necessary adjustments.

M20.13.5 Material Specification for Pilot Control

Pressure rating : 1600 kPa or 2500 kPa as specified
Trim : Stainless Steel
Tubing and Fittings : Brass compression fittings with copper tubing
Adjustment range : 200 to 2000 kPa or 100 to 500 kPa
Operating fluids : Water

M20.14 **PRESSURE REDUCING VALVE (SINGLE DIAPHRAGM LINER-OPERATED TYPE)**

M20.14.1 Function

The pressure reducing valve shall maintain a constant downstream pressure regardless of changing flow rate and/or inlet pressure.

M20.14.2 Main Valve

The valve shall be hydraulically operated, pilot activated automatic control valve for pressure reducing service. The valve shall consist of two parts: stainless steel body and an elastomeric liner. The valve shall be positioned in line and be controlled via an external pilot control valve.

M20.14.3 Material Specification

Valve Size : 50-300mm
Main valve Body : 316 Stainless steel
End Detail (50 to 100 mm) : Wafer pattern
End Detail (150 to 300mm) : SABS 1123 Table 1600/3 or 2500/3 as specified
Pressure rating : 1600 kPa or 2500 kPa as specified
Temperature range : 0 to 70°
Liner Material : Natural Rubber

Liner retainer : 316 Stainless Steel
Coating : Fusion bonded epoxy

Desired options:-

- X43 “y” strainer or equivalent on pilot piping
- Three ball valves on pilot piping, inlet, outlet and line to cover chamber
- 63 mm diameter pressure gauge, glycerine filled, fitted with 10 mm stainless steel ball valve on Tee-piece on inlet and outlet pilot piping.

M20.14.4 Pilot Control System

The pressure reducing pilot control shall be direct-acting, adjustable, spring-loaded, normally open, diaphragm valve designed to permit flow when controlled pressure is less than the spring setting. The pilot control is held open by the force of the compression on the spring above the diaphragm and it closes when the delivery pressure acting on the underside of the diaphragm exceeds the spring setting. The pilot control system shall include a fixed orifice. No variable orifices shall be permitted. The pilot system shall include opening speed control on all valves 100 mm and smaller.

Three-way pilot controls will not be acceptable if the connection of TECHNOLOG “Autowat” or “Ecowat” controllers is specified.

The pilot control shall have a second downstream sensing port which can be utilised to install a pressure gauge.

A full range of spring settings shall be available in the range of 0 to 3000 kPa.

A direct factory representative shall be made available for the start-up service, inspection and necessary adjustments.

M20.14.5 Material Specification for Pilot Control

Pressure rating : 1600 kPa or 2500 kPa as specified
Trim : Stainless Steel
Tubing and Fittings : Brass compression fittings with copper tubing
Adjustment range : 200 to 2000 kPa or 100 to 500 kPa
Operating fluids : Water
Desired Options : -

M20.15 FLOW LIMITER VALVES

M20.15.1 Screwed type limiter valves

The limiter valve shall consist of a screwed fitting with a rubber control ring orifice insert, which affects a consistent flow control within ± 10 % of the rated flow for a differential pressure across the valves over a range extending from 100 kPa to 1100 kPa.

The body of the limiter valve shall be made of uPVC plastic and shall female screwed at both ends to B.S.P.

The control rings shall be made of flexible nitrile elastomer rubber and must be able to move on a tapered seat in the body as the flow increases and be replaceable. The valve must be complete with control rings for the specified initial flow, which may be replaced in the future

(post-contract) for the final flow settings. The flow settings for the flow limiter valves are indicated in the Project Specification.

The screwed type limiter valve must be stamped with the flow in litres per minute and with an arrow to indicate the direction of flow.

A flow test must be conducted at the suppliers factory or test facilities, on one sample each of 20 mm, 25 mm and 32 mm flow limiter valve as prepared for use in the contract, over the following differential pressures:

Differential Pressure (kPa)	Tolerance limit on rated flow
50	± 50%
100	± 10%
150	± 10%
200	± 10%
300	± 101%
1000	± 10%

The measurement of flow rates must be to the satisfaction of the Engineer. If any one of the samples should fail to provide a flow rate within the tolerances specified, then all valves for installation on the contract must be tested for a selection of pressures on the contract must be tested for a selection of pressures up to the static pressures to be expected at installation sites, all to the satisfaction of the Engineer.

M20.15.2

Wafer type limiter valves

The limiter valves shall consist of a wafer pattern with a rubber control ring orifice insert, which affects a consistent flow control within ± 10% of the rated flow for a differential pressure across the valve over a range extending from the 100 kPa to 110 kPa.

The body of the limiter valve shall be made of uPVC plastic.

The control rings shall be made flexible nitrile elastomer rubber and shall be able to move on a tapered seat in body as the flow increases and be replaceable. The valve shall be complete with control rings for the specified initial flow, which may be replaced in the future (post-contract) for the final flow settings. The flow settings for the flow limiter valves are given in the Project Specification.

The limiter valve must be stamped with the flow in litres per minute and with an arrow to indicate the direction of flow.

A flow test must be conducted at the suppliers factory or test facilities, on one sample each of 50 mm and 80 mm flow limiter valve as prepared for use in the contract, over the following differential pressures:-

Differential Pressure (kPa)	Tolerance limit on rated flow
50	± 50%
100	± 10%
150	± 10%
200	± 10%
300	± 101%
1000	± 10%

The measurement of flow rates must be to the satisfaction of the Engineer. If any one of the samples should fail to provide a flow rate within the tolerances specified, then all valves for installation on the contract must be tested for a selection of pressures on the contract must be tested for a selection of pressures up to the static pressures to be expected at installation sites, all to the satisfaction of the Engineer.

M20.16 VALVE GEARBOXES

Gearboxes shall not be an integral part of the main body but shall be separate unit mounted to the body for easy removal. All gears shall be machine cut and fully enclosed and the lubrication shall be of the permanent type.

Positive stops shall be provided to prevent over opening or over closing of the units and visual indication of the point of travel at all positions in the open/close cycle shall be provided.

Torque limiting devices shall be fitted to prevent damage to gears and casings due to over tightening. Design of valves and gearboxes shall be such that leakage from the valve along the shaft cannot enter the gearbox.

M20.17 PROTECTION OF VALVES

M20.17.1.1 Internal Protection

Internal surfaces of valve bodies and discs shall be grit blasted to a Sa ½ of SIS 05 59 00 finish. Successive coats of an approved non-toxic epoxy resin paint suitable for spray application (Copon EP2300 or similar) shall then be applied to give a final dry film thickness of 300 µm. Drying times between successive layers will depend on environmental conditions and will be strictly in accordance with the requirements of the paint manufacturer.

As an alternative to the protection as specified above, the Contractor may be required to use either a solvent-less epoxy paint system or a fusion bonded epoxy powder coating. For fusion-bonded epoxy, a final dry film thickness of 250 µm is required.

Details of the protection required shall be given in the Project Specification.

M20.17.1.2 External Protection

External surfaces of valve bodies and discs shall be grit blasted to a Sa 2½ of SIS 05 59 00 finish. Successive coats of an approved non-toxic epoxy resin paint suitable for spray application (Copon EP2300 or similar) shall then be applied to give a final dry film thickness of 400 µm. Drying times between successive layers will depend on environmental conditions and will be strictly in accordance with the requirements of the paint manufacturer.

Where the specification does not call for an external surface consisting of an epoxy coating, the following shall apply:-

External surfaces of valve bodies shall be wire brushed to a Sa 3 of SIS 05 59 00 standard and painted with one layer zinc chromate primer to SANS 679 Type I (dried film thickness 50 µm). This shall be followed by two alkyd-based undercoats (each coat 25 µm thick) and one alkyd-based enamel finishing coat to SANS 630 Grade I (dried film thickness 25 µm). Final colour shall be as specified by the Engineer.

Machined flanges shall be painted with a protective coating of shellac or similar.

Refer to Particular Specification G02: Corrosion Protection

M20.18 TOLERANCES

The tolerances as specified in the appropriate SANS or BS standards shall apply to this Contract.

M20.19 COLOUR CODES

The standard final colour codes for equipment supplied under this Contract shall be in accordance with Particular Specification G01.

M20.20 TESTING AND INSPECTION

M20.20.1 Testing by Manufacturer

The Manufacturer shall carry out all tests to ensure that valve materials conform to the requirements of the relevant SANS or BS Specification. The Engineer shall not necessarily attend these tests but records must be kept and all test results and tests certificates must be provided to the Engineer.

M20.20.2 Testing by Independent Body

The Engineer may appoint an independent recognised body to conduct control tests. The Manufacturer shall provide samples required for such tests free of charge and the independent body in accordance with the relevant SANS or BS Specification shall do sampling.

The cost of such control tests shall be borne by the Employer.

M20.20.3 Inspection

Visual, operational and dimensional inspection of valves as well as inspection of protective coatings shall be carried out by the Engineer and/or the Manufacturer in the Manufacturer's workshop prior to the despatch of valves to site.

The Engineer's inspection will in no way relieve the manufacturer of any of his obligations to design, manufacture and supply valves strictly in accordance with the Specification.

M20.20.4 Hydrostatic Testing

The Engineer shall witness all hydrostatic tests and the Manufacturer shall give at least one week notification to the Engineer of the proposed dates for such tests.

Valve bodies shall be close ended tested to 2 x working pressure. Test pressures shall be maintained for at least 5 minutes and valve bodies shall be water tight in all respects.

Assembled valves shall be open-ended tested to 1.5 x working pressure for material strength and soundness. Valves shall be drop tight over the complete range of pressures from 0 to 1.5 x working pressure.

Each valve shall be supplied with a test certificate certifying that it complies in all respects with the requirements of this Specification.

M20.21 MEASUREMENT AND PAYMENT

Payment under scheduled items shall be made per complete installation as specified. Measurement and payment will distinguish between supply / delivery and installation / commissioning of the equipment.

The tendered rates or sums shall cover the cost of design, drawings, manufacture, supply, testing at the manufacturers works, delivery to site, off loading, installation, site testing, setting into operation, the supply of O & M manuals, commissioning and maintenance during the warranty period of all equipment specified and also for anything not specifically mentioned but obviously required, (e.g. all ancillaries, including all bolts, fastenings and brackets, safety guards and any work or material required for the proper installation of such equipment) to enable the equipment to be installed and/or function safely and correctly as specified. No claims whatsoever for extras will be allowed on the grounds that a necessary piece of equipment or a part thereof is not specifically mentioned.