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September 2024

**PARTICULAR SPECIFICATION DSP-1-1**

**DRAKENSTEIN PUMP STATION DISCHARGE PIPEWORK**

**MODIFICATION TO PIPES AND VALVES**

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**PARTICULAR SPECIFICATION DSP-1-1**  
**DRAKENSTEIN PUMP STATION DISCHARGE PIPEWORK**  
**MODIFICATION TO PIPES AND VALVES**

**DSP 1      SCOPE**

**DSP 1.1      Background**

The Drakenstein Pump Station, located at coordinates -33.8447 S, 18.9944 E, within the Drakenstein Correctional Facility near Paarl in the Western Cape, serves an essential function in the Berg River Water Supply Scheme. During the rainy winter season, the pump station transfers water from the Berg River to the Berg River Dam. The Pump Station consists of four vertical spindle pump sets designed to collectively pump up to 4 m<sup>3</sup>/s in parallel, with three pumps running and one pump on standby. The existing discharge pipework on each of the four lines consists of a DN 800 to DN 900 expander pipe, a DN 900 nozzle-check valve, a spool piece with a flange adaptor and a DN 900 butterfly valve.

**DSP 1.2      Services Required**

The scope of work shall include the as-built drawings, supply of all materials, manufacture, shop assembly and testing, corrosion protection, delivery to the manufacturers workshop, delivery to site, loading and off-loading of equipment, storage and installation at the site, remedial corrosion protection on Site, putting to work, testing (both at the manufacturer's works and on-site), commissioning and handover, and provision of the operation and maintenance manuals as required for the following equipment:

**DSP 1.2.1      ITEM A: Valves**

**Repurposed Spherical Valves and Modifications**

The four existing DN 900, PN 25 electrically operated butterfly valves in Drakenstein Pump Station shall be removed and replaced with four DN 900, PN 40 hydraulically operated spherical valves, complete with their existing hydraulic power packs and new hydraulic cylinders, that are repurposed from Kliphoek Pump Station in the Usutu River Government Water Scheme.

New hydraulic pipes leading from the power packs to the new hydraulic cylinders shall be supplied and installed for each of the four (4) spherical valves.

The existing mounting bracket, counterweight lever arm and baseplates of the spherical valves shall be modified in accordance with Sketch A and Sketch B in Appendix B of this Particular Specification and Drg. Reg. No. 181618/24 ME respectively to accommodate the requirements specified in this Particular Specification.

The installation of the new spherical valves shall be completed in the pump station at RL 141,200. A 25-ton EOT crane is available to handle equipment. See the installation drawing of the new spherical valves on Drg. Reg. Nos 181618/24 ME with the existing layout on Drg. Reg. Nos 163767/12 ME.

The function of each of the new spherical valves is to regulate and control the flow of water during pump startup when pressures on both sides of the spherical valves need to equalise before the valves can fully open.

All components required for the spherical valve installation, including the valve supports, bolts, studs, gaskets, remedial corrosion protection and all components required for the valve installation form part of this Particular Specification. The Contractor shall be responsible for providing fully operational, tight shut-off valves. It is not envisioned to redo the corrosion protection of the existing spherical valves, only remedial corrosion protection.

The scope of work shall also include the installation of position indication sensors on the spherical valves, as well as the integration of the valves and hydraulic power packs with the existing SCADA system.

**New Ball Valves**

Four new DN 25 (1"), PN 25 stainless steel ball valves with BSPT female thread on both sides shall be supplied and installed on the straight pipes located downstream of the existing nozzle-check valve and upstream of the new spherical valves.

Each ball valve's function is to isolate the pressure measuring off-take provided on each of the new straight pipes. The off-takes are provided for future use to allow for pressure measurements and need to be isolated until such time when pressure measurements are required.

All components required for the ball valve installation, including the DN 25 (1") high pressure stainless steel hexagon nipples, as shown in Drg. Reg. No. 181618/24 ME, form part of this particular specification.

**DSP 1.2.2      ITEM B: Pipework**

**Pipe Modifications**

The four (4) existing DN 800 to DN 900 expander pipes require modification to accommodate the face-to-face distance of the new spherical valves that will replace the existing butterfly valves.

The modifications to the expander pipes shall be completed in the pump station at RL 141,200. A 25-ton EOT crane is available to handle equipment.

The existing expander pipe shall be removed as indicated on Drg. Reg. No. 181618/24 ME and the new expander (Item 1 – Drg. Reg. No. 181618/24 ME) pipe shall be welded on site as shown in Drawing Reg. Nos 181618/24 ME to 181621/24 ME. The new expander pipe piece shall be corrosion protected in accordance with Section DSP 6 of this Particular Specification and Standard Specification DWS 9900. After Site welding, the entire pipe assembly, including the existing pipe section and newly added part, shall be corrosion protected and to the correct colour in accordance with DWS 9900 and Section DSP 6 of this Particular Specification.

### **Straight Pipes**

Four (4) new DN 900 straight pipes shall be installed immediately upstream of the new DN 900 spherical valves. This request is comprehensive of the manufacture, supply, corrosion protection, delivery to site, loading and off-loading, testing and installation of all four straight pipes in accordance with Drg. Reg. Nos 181618/24 ME to 181621/24 ME.

Each straight pipe's function is to connect the existing nozzle-check valve to the new spherical valve utilising the new flange adaptor. The straight pipe shall also ensure that the new spherical valves are horizontally aligned with the new valve supports.

All bolts, nuts, studs, washers, packing for mounting of valves and all components required for the installation of the pipework shall form part of the scope of works.

### **Spool Pieces**

Four (4) new DN 900 Spool pieces shall be installed immediately downstream of the new DN 900 spherical valves. This request is comprehensive of the manufacture, supply, corrosion protection, delivery to the Site, loading and off-loading, testing and installation of all four spool pieces, in accordance with Drg. Reg. Nos 181618/24 ME to 181621/24 ME.

Each spool piece's purpose is to accommodate the PN 40 flange drilling of the spherical valves and connect the valves to the existing DN 900 cast-in pipes which have PN 25 flange drillings.

All bolts, nuts, studs, washers and all components required for pipework installation form part of this Contract.

### **DSP 1.2.3 General**

It is imperative that the Contractor familiarise himself with the Site layout, confirm as-built dimensions and the available resources on the site to accomplish feasible methodology to perform the scope of work.

If any mechanical or electrical resources (equipment) on Site, that are deemed necessary for performing the scope of work or any existing Site conditions, are found by the Contractor to be lacking in performance or serviceability, the Contractor shall bring it to the attention of the Engineer, in writing, during the quotation process.

All stainless-steel threads shall be coated in molybdenum disulfide in accordance with DWS 9900.

This request shall include transport of all activities regarding materials and labour to perform scope of work. This request shall also be inclusive of connecting the new control equipment to the existing SCADA system.

In handing over the Site to the Contractor, the Contractor shall put in place lockout procedure(s) on Site access and equipment operation in agreement with relevant Departmental personnel. A contingency plan shall be in place while performing the task at hand and shall include the following:

- The Contractor shall maintain Site security, preventing unauthorised personnel or persons entering.
- The Contractor shall be responsible for health and safety on Site.

**Inspections:** The DWS Representative(s) may enter into the Workshop and demarcated areas on site to carry out inspections as they find necessary from time to time. Mr. A. van Schalkwyk (012 336 3623) and Mr. M. Marakalla (012 336 6571) shall be notified two weeks in advance of attending scheduled inspections.

All fasteners on the existing pipework and valve flanges shall be replaced with new hot dip galvanised fasteners in accordance with DWS 9900 as indicated in Drg. Reg. Nos 181618/24 ME to 181621/24 ME.

All nuts, bolts, washers, packing for mounting the valves and pipes and all components required for the installation into the pipe system are included in this particular specification. Where valves are refurbished, one complete set of new fasteners shall be supplied for each flange of such valve.

Once all work is completed, the Contractor shall ensure that the pump station is returned to its full operational capacity.

The most probable pumping period for Drakenstein Pump Station is between April and September each year however, the pump station may require full pumping capacity throughout the year. Therefore, the Contractor shall ensure that three (3) pumping lines are at full pumping capacity at all times.

The Contractor's offer shall be in accordance with the following Drawings:

MODIFICATIONS TO DN 900 DISCHARGE PIPEWORK:	181618/24 ME to 181621/24 ME
HYDRAULIC POWER PACK AND PIPES:	181622/24 ME
MODIFICATIONS OF VALVE LEVER ARM:	APPENDIX B - SKETCH A
MODIFICATIONS OF VALVE BASEPLATE:	APPENDIX B - SKETCH B
DN 900, PN 40 SPHERICAL VALVE:	GA 9029 – SHEET 1 OF 2
DN 900, PN 40 SPHERICAL VALVE - INSTALLATION:	GA 9029 – SHEET 2 OF 2

All accessories to be supplied under this Contract shall be prepared by the Contractor for approval by the Engineer.

In summary this specification shall cover:

- (a) Manufacture and installation of the new DN 800 to DN 900 Expander Pipe (4-off) on each of the discharge lines.
- (b) Manufacture and installation of the new DN 900 Straight Pipes (4-off), including new DN 900 Flange Adaptors (4-off) on each of the discharge lines.
- (c) Manufacture and installation of the new DN 900 Spool Pieces (4-off) on each of the discharge lines.
- (d) Manufacture and installation of the new DN 25 (1") ball valves (4-off) on each of the discharge lines.
- (e) Manufacture and installation of the DN 900 Spherical Valve Supports (8 total) of the new spherical valves.
- (f) Modification and installation of the existing DN 900, PN 40 hydraulically operated Spherical Valves (4-off) on each of the discharge lines.
- (g) Modification of existing hydraulic equipment to allow for the adjustment of the valve opening and closing speed.
- (h) Full workshop testing of each spherical valve with its new hydraulic cylinder and existing associated power pack to ascertain the desired functionality.
- (i) Removal, packing, handling (loading and unloading) and transport of the spherical valves, lever arms, counterweights, hydraulic actuators and hydraulic power packs.
- (j) As-built drawings of the modifications to the counterweight lever arm, baseplates and shaft keyways.
- (k) Installation of the hydraulic power packs complete with new stainless-steel 316 L hydraulic pipes.
- (l) Supply and installation of an electrical connection from the electrical distribution board to the hydraulic power pack by the Contractor.
- (m) Quality control and inspection by the Department shall be in accordance with Section DSP 8. The inspections shall include, but not be limited to the following:
  - i. Checking of dimensions and tolerances.
  - ii. Verification of material (Including material test certificates, hydraulic test certificates, etc. as applicable).
  - iii. Inspection of welding and weld certificates.
  - iv. Review of as-built dimensions/-measurements (where applicable).
  - v. Inspection of corrosion protection.
- (n) Supply of all gaskets, anchors, fasteners, washers and spark isolating kits for the complete installation of all items.
- (o) Workshop corrosion protection of all items modified/manufactured, complete with, where applicable, welded in-situ ancillaries.
- (p) Remedial corrosion protection where necessary to remedy damage to all items, including the items supplied by others, occurring after installation of such equipment but prior to handing over to the Department.
- (q) Supply of all Operation and Maintenance Manuals and data pack in accordance with DSP 3.6.

### DSP 1.3    Conditions of Contract

The conditions governing this Contract are as set out in the document "General Conditions of Contract for Construction Works – Third Edition (2015)".

Contracts for this Particular Specification will only be awarded to South African based Contractors who, after assessment of the Department, are found to be capable of manufacturing to the required standard. Only Specialist Contractors who can demonstrate that they or their sub-contractors are bona fide manufacturers of the equipment as specified in this Particular Specification, with their own manufacturing and service workshop within the borders of the Republic of South Africa, may quote. An established local service and spare parts network for the equipment offered shall be available at the time of closing. Workmanship shall conform to accepted industrial standards and welders shall be coded. The size of tools and equipment used shall be proportional to the task being carried out.

The Department reserves the right to unconditionally, prior to placing the order, amend the quantity, size or rating of any mechanical equipment without suffering any penalties imposed by any Contractor. Costing for any such changes after placing of the order shall be negotiated at that time.

Quotations shall only be awarded on a fixed price basis. No escalation shall be considered.

**DSP 1.3.1 Subcontractors (If Applicable):**

Subcontracting shall be in accordance with Section 4.4: Subcontracting of the General Conditions of Contract for Construction Works – Third Edition (2015).

**DSP 1.4 Guarantee**

The guarantee and defects liability period shall be twelve (12) months from the issue of the commissioning certificate. It is envisaged that the commissioning shall take place within 30 days of the completion of all outstanding points. The Contractor's guarantee shall include all aspects of the work done by any Sub-Contractors or Specialist Sub-Contractors.

The Contractor shall be responsible for the storage of the valves and pipework right up until the installation of the equipment can proceed.

**DSP 1.5 Target Date for Delivery**

The target date for delivery, installation and commissioning of the equipment at the Drakenstein Pump Station Site shall be **10 weeks** from the placement of the order.

It is essential that the delivery agreed with the Contractor is realised otherwise penalties for delay may be enforced.

**DSP 1.6 Specifications and Supporting Standards**

This Particular Specification shall where applicable, have preference over all other documents supplied or any Standard Specifications referred to.

This Particular Specification shall be read in conjunction with the following:

Departmental Standard Specifications (which are available on request):

STANDARD SPECIFICATION DWS 1601:	GENERAL MECHANICAL SPECIFICATION
STANDARD SPECIFICATION DWS 2020:	QUALITY CONTROL SPECIFICATION (October 2001 edition) and QUALITY CONTROL PROCEDURES (September 2022 edition)
STANDARD SPECIFICATION DWS 2510/01:	SUPPLY OF VALVES – GENERAL VALVE SPECIFICATION (January 2007 edition)
STANDARD SPECIFICATION DWS 2510/02:	AUXILIARY DRIVES (January 2007 edition)
STANDARD SPECIFICATION DWS 2510/14:	SUPPLY OF VALVES – SPHERICAL VALVES (January 2007 edition)
STANDARD SPECIFICATION DWS 9900:	CORROSION PROTECTION SPECIFICATION (July 2023 edition)

This Particular Specification is supported by the following standards of which the latest publication shall apply:

**(a) South African Bureau of Standards:**

SANS 62:	Steel Pipes
SANS 121:	Hot dip galvanised coatings on fabricated iron and steel articles – Specifications and test methods
SANS 719:	Electric welded low carbon steel pipes
SANS 1123:	Pipe Flanges
SANS 1213:	Mechanical cable glands
SANS 1431:	Weldable Structural Steels
SANS 1700:	Fasteners
SANS 18752:	Rubber hoses and hose assemblies
SANS 50025:	Structural steel standard
SANS 60529:	Degrees of protection provided by enclosures

(b) **Other:**

ASME B16.11:	Forged Fittings, Socket Welding and Threaded.
ASTM A240:	Standard Specification for Stainless Steel products
AWS D1.1:	Structural Welding Code
EN 1092-1:	Flanges
EN 10058-2:	Dimensional Tolerances for Hot Rolled Stainless Steels

**DSP 1.7 Definitions and Abbreviations**

**Contractor:** The successful bidder to whom the Contract comprising this Particular Specification is awarded to.

**Subcontractor:** The party appointed by the Contractor to perform part of the work of this Particular Specification. The Subcontractor is also known as the Specialist Valve Supplier.

**Employer:** Southern Operations (Worcester Office) of the Department of Water & Sanitation.

**Engineer:** Chief Directorate Engineering Services of the Department of Water & Sanitation.  
(For the purposes of this Particular Specification, the Engineer will be represented by the mechanical engineer of the Mechanical & Electrical Engineering Directorate named as "COMPILER" in the front part of this Particular Specification).

**Specification:** This Particular Specification together with any references therein to other documents.

**Supply:** This shall include, as applicable, the purchase of materials or goods, manufacture, fabrication, any specified corrosion protection measures, installation and commissioning and any off-site inspection or testing.

**Tests on Completion:** The tests which are specified in this Particular Specification, which are carried out before the works are taken over by the employer.

ABS :	Acrylonitrile-Butadiene-Styrene
AL :	Aluminium
BS :	British Standards
CI :	Cast Iron (Grade 220)
CS :	Cast Steel
DCA :	Die Cast Aluminium
DFT :	Dry Film Thickness
DN :	Nominal Diameter
DWS :	Department of Water and Sanitation
EOT :	Electric Overhead Traveling
FBE :	Fusion-bonded Epoxy
FBP :	Fusion-bonded Polyester
GRP :	Glass Fibre Reinforced Polyester
HDG :	Hot Dip Galvanized
ID :	Inside Diameter
LHS :	Left Hand Side
Masl :	Metres above sea level
MS :	Mild Steel (Grade S355JR) or any Carbon Steel
OD :	Outside Diameter
PC :	Polycarbonate
PCD :	Pitch Circle Diameter
RHS :	Right Hand Side
RL :	Reduced Level
SANS :	South African National Standards
SCADA :	Supervisory Control and Data Acquisition
SG :	Spheroidal Graphite Cast Iron – Grade 420
SS :	Stainless steel – grades 304, 304L, 316 and 316L
UV :	Ultraviolet
3CR12 :	Corrosion Resistant Steel
µm :	Micrometre

**DSP 2 MATERIALS****DSP 2.1 General**

Materials and equipment, where not specified, shall be in accordance with relevant SANS, ISO, ASTM or BS specifications and DWS 1601: GENERAL MECHANICAL SPECIFICATION. All material certificates shall be provided as stipulated in DWS 2510/01.

Welding electrodes for welding mild steel to stainless steel shall contain E309L filler metal in accordance with AWS A 5.4. Hydraulic cylinders shall be manufactured from stainless steel 316L.

**DSP 2.2 Flanges**

All flanges shall be raised face type manufactured from mild steel to SANS 50025 Grade S355JR, as indicated on the relevant drawings, preferably by forging or cut from plate.

**DSP 2.3 Gaskets**

Gaskets shall be raised face type manufactured from compressed fibre of an equivalent approved material which complies with the requirements of SANS 564. All gaskets shall be 3 mm thick and purpose-made to the dimensions of the matching flanges.

**DSP 2.4 Bolts and Nuts**

All fasteners, including washers, with the exception of the anchors covered in DSP 2.5, shall be Grade S355JR Mild Steel and hot dip galvanised to SANS 121.

**DSP 2.5 Anchors**

All anchors or anchor rods, including their washers and nuts, shall be manufactured from stainless steel 316 (A4).

**DSP 2.6 Hydraulic Piping**

All fixed hydraulic tubing (seamless), fittings, double ferrel type couplings, supports and anchorage shall be of stainless steel 316L. All flexible hydraulic hoses shall be of rubber in accordance with SANS 18752.

**DSP 3 MECHANICAL AND ELECTRICAL REQUIREMENTS****DSP 3.1 General**

The quality of the working fluid shall be regarded as raw water.

Valves shall be supplied and installed as indicated in TABLE 1 and all of the relevant drawings.

**TABLE 1  
SCHEDULE OF VALVES**

Location	Use	Type	Size DN [mm]	Nominal Pressure Rating PN [bar]	Flow velocity (m/s)		Number Off
					Normal	Maximum	
Drakenstein Pump Station Main Discharge Line (RL 141, 200)	Flow Control	Spherical	900	40	2,3	3,5	4
Drakenstein Pump Station Pressure Measuring Off- Take (RL 141, 200)	Isolation	Ball	25 (1")	25	N/A	N/A	4

Note that the spherical valves described in TABLE 1 shall be operated by means of an electro-hydraulic power pack with a manual hydraulic override (hand pump). The valves shall also be required to close against the maximum velocity at the full head ( $\pm 250$  m) in accordance with DWS 2510/01 (SUPPLY OF VALVES). The ball valves shall have 1" female BSPT thread on both sides and shall also be required to open and close against maximum unbalanced head (250 m), manually.

### DSP 3.2 Flange drilling and dimensions

Flanges of valves and flange adaptors shall have a uniform thickness, adequate in terms of an appropriate design code, to withstand the design working pressure within specified stress levels in accordance with EN 1092-1 (BS 4504), and subject to the approval of the Engineer. Flange face finish shall be of the gramophone type as indicated on Drg. Reg. Nos 181618/24 ME to 181621/24 ME. Flange types shall be in accordance with TABLE 2 below unless otherwise stated on the Drawings:

**TABLE 2**  
**SCHEDULE OF FLANGE TYPES ACCORDING TO SIZE AND PRESSURE RATING**

NOMINAL DIAMETER DN (mm)	PRESSURE RATING $\geq 1600$ kPa
$0 < \emptyset \leq 400$	Raised face gasket (i.e. raised faced flange)
$400 < \emptyset \leq 2500$	Raised face gasket (i.e. raised faced flange)

The drilling of all the flanges shall be in accordance with EN 1092-1 (BS 4504) to ensure fitment to the existing valve flanges and adjacent pipework.

The Contractor and where applicable, the Valve Supplier, shall confirm the exact drilling of the adjacent pipe flange and existing spherical valve flanges and the exact diameter of the adjacent pipe, prior to manufacturing of items.

The mounting flanges of the valves shall be drilled equi-spaced, off-centre in accordance with TABLE 3 below.

**TABLE 3**  
**SCHEDULE OF FLANGE DIMENSIONS AND DRILLING ACCORDING TO PRESSURE RATING.**

PRESSURE RATING (kPa)	VALVE SIZE [mm]	FLANGE BODY DIMENSIONS (EN 1092-1 2001 edition)	DRILLING TABLE (EN 1092-1 2001 edition)
2500	900	Appendix A	Appendix A
4000	900	Appendix A	Appendix A

According to existing records, the DN 900 spherical valves have 28, Ø56 mm drilled holes with a PCD of 1140 mm, and the DN 900 nozzle-check valve has 28, Ø48 mm drilled holes with a PCD of 1090 mm however, the Contractor shall verify and confirm the exact dimensions and drilling requirements of the mounting flange.

The flange body dimensions (excl. thickness) for the valves and pipes are consistent with EN 1092-1 (BS 4505) but not necessarily covered by this particular standard. The flange dimensions shall be in accordance with tables 4 and 5 of the NWS 1676 tables in Appendix A.

### DSP 3.3 Electrical supply

The power available is 400 V, 3 phase, 50 Hz.

All cable connections shall be protected in accordance with IP 68 of SANS 60529, supported and sealed by means of environmental glands only. All cable glands shall be of steel type and shall be in accordance with SANS 1213 and with IP 68 of SANS 60529. A suitably sized rubber shroud shall be installed around all glands. The armouring shall be clamped between substantial tapered sections that form an integral part of the gland. Cables shall enter connection boxes from below as far as possible.

Where modification is required, cabling from the existing distribution box to the hydraulic power pack shall form part of this Particular Specification.

The Contractor shall verify that the circuit breakers which were previously used for motorised actuators in the existing low voltage switchboard are sufficient to protect the new hydraulic power pack circuits.

The Contractor shall terminate and extend the cables using junction boxes for the existing rotary isolators to the hydraulic power packs with a cable of the same size as the existing one. The Contractor shall where required, extend the existing cables from the limit switches in the valves to the electronic control system using junction boxes to prevent the joining of cables using solder.

The Contractor shall where required, extend the rails and/or cable tray to support the cable running from the existing rotary isolators to the hydraulic power packs at intervals of not more than 500 mm.

#### **DSP 3.4      Lightning Surge Protection**

All electronic and susceptible equipment shall be protected from lightning surge damage in strict accordance with SANS 10142-1 and with reference to SANS 62305-4.

Earth connectors for lightning protection shall be of the flat busbar type and have a minimum, conductor section area of 70 mm<sup>2</sup>. A direct earth connection cable route to the existing dam wall earth shall be provided, if needed.

#### **DSP 3.5      Cathodic Protection**

##### **DSP 3.5.1      Insulating Flange**

A spark insulating kit shall be inserted into each of the pipelines between the upstream flange of the DN 900 cast in pipe and the downstream flange of the DN 900 spool piece.

The insulating kit shall consist of an insulating gasket, bolt sleeves and washers, appropriately sized steel bolts and washers and a voltage-limiting spark gap for protection of the insulating material.

The insulating gasket shall be a 3,2 mm thick Fabric Reinforced Phenolic (Tested to BS 5102 Appendices A - M Type III) full faced gasket in one piece with 0,8 mm thick "Prolok Super" or equivalent Compressed Fibre (to BS 1832 Grade A) full faced gaskets on each side.

Insulating sleeves shall be a minimum of 1 mm thick glass fibre reinforced polyester sleeve from each bolt. Total length of sleeves is to be 2–3 mm less than the length between the inside faces of steel washers. The insulating sleeves shall fit completely inside the insulating washers and extend partially inside the steel washers.

Insulating washers shall be 3,2 mm thick fabric reinforced phenolic resin with OD the same as that of the machined steel washers, 2-Off for each stud bolt. The ID to be sliding fit over OD of insulating sleeve.

Steel washers shall be machined with diameter and thickness to SANS 1700, Table 3.

Stud bolts and studs shall be grade 8.8 and nuts grade 8 to SANS 1700. Stud bolt diameters shall be selected to the next smaller size for installation in standard drilled flanges. Stud bolts shall be machined down to the next standard smaller size and suitable smaller nut to be used. All studs, bolts and washers are to be hot dip galvanised.

Explosion-proof Spark Gap Type ExFS shall be installed across the flange faces complete with hot dip galvanised mild steel mounting brackets to suit the flange bolt. The width of the holding bracket of the explosion-proof spark gap shall be the same as the steel insulating washers and the bottom end be rounded off to fit into the spot-faced area of the valve and/or steel flange.

#### **DSP 3.6      Bolts and nuts**

All bolts and nuts shall be in accordance with DWS 1601 – GENERAL MECHANICAL SPECIFICATION and SANS 1700. Bolts, nuts, studs, etc. which are out of the waterway, shall be hot dip galvanised to SANS 121. Bolted joints shall have a washer underneath both the bolt head and nut corrosion protected in accordance with DWS 9900, Section 9.9.1 - FASTENERS.

#### **DSP 3.7      Operating hydraulic cylinders and control gear**

Actuators and control gear shall be removed from the spherical valves prior to transportation to avoid damage during transport and the handling on the Site.

The Contractor shall be responsible to wrap and pack each actuator in accordance with the requirements of the Original Equipment Manufacturer. Covers and cable entrances shall be protected in accordance with the requirements for the specified environmental protection IP 65 rating. Only the Specialist Valve Contractor shall be allowed to unpack and install the new hydraulic cylinders on Site. The Specialist Valve Contractor shall make the final adjustments and settings after installation.

#### **DSP 3.8      Operation and Maintenance Manuals**

In addition to the requirements stipulated in Section 3.24 of DWS2510/01: SUPPLY OF VALVES – GENERAL VALVE SPECIFICATION (January 2007 edition), the Specialist Valve Contractor shall provide a complete hardcopy in triplicate and an electronic copy of the final Operation and Maintenance Manual(s) of the modified spherical valves, in a format mutually agreed upon with the Engineer.

Complete material certificates for all materials used shall also be provided as stipulated in Section 3.14 of DWS2510/01: SUPPLY OF VALVES – GENERAL VALVE SPECIFICATION (January 2007 edition).

**DSP 4 DESIGN, MANUFACTURE AND MODIFICATIONS OF VALVES****DSP 4.1 Spherical Valves****DSP 4.1.1 Valve Requirements**

The spherical valves shall be operated as pump discharge control valves. The spherical valves shall be required to control the pump discharge from fully closed to 100% open. They shall be required to open under unbalanced conditions.

The spherical valves shall have an opening time of between 25 and 30 seconds.

The spherical valves are required to work under a maximum no-flow pumping head of 195 metres and be specified for a pressure of 2500 kPa.

Under normal operating conditions, the maximum flow rate will result in a mean velocity that will not exceed 3,5 m/s. The complete valve with new hydraulic cylinders shall be designed to operate under these conditions for a prolonged period.

The hydraulic operating actuator of the hydraulic cylinder and mounting bracket shall not reach below the baseplates of the valve.

**DSP 4.1.2 Valve Modifications**

Modifications to the hydraulic operating actuators shall be made in order to comply with the valve requirements.

The existing counterweight for the valve shall be removed and the counterweight lever arm shall be shortened as seen in Sketch A found in Appendix B of this Particular Specification to enable the lever arm to stay above the baseplates of the spherical valve.

The existing mounting bracket that connects to the spherical valve shaft with the counterweight lever arm and new hydraulic cylinder shall be rotated 180° about the valve spindle so that the orientation shall be in accordance with Drg. Reg. Nos 181618/24 ME to 181621/24 ME. The seal direction plate and the valve position indication plate shall also be removed and replaced on the mounting bracket to show the true seal direction of the valve as well as the true valve opening indication.

The existing baseplate of the spherical valve shall also be modified to suit the new spherical valve support as seen in Drg. Reg. Nos 181618/24 ME to 181621/24 ME. The modifications shall be made in accordance with Sketch B found in Appendix B of this Particular Specification.

**DSP 4.1.3 Mounting**

The valves shall be mounted onto 3CR12 steel pipework with mild steel flanges for which the necessary hot dip galvanised bolts, studs, nuts, washers, packing, etc. shall be supplied by the Contractor.

When installing the new spherical valves, the Contractor shall supply the upstream flange adaptor (14 Notches to suit Thrust Restraint Collar) with its associated hot dip galvanised bolts, studs, nuts, washers, packing, etc. to render the installation to the surrounding pipework fully functional, as indicated on Drg. Reg. Nos 181618/24 ME to 181621/24 ME.

The Contractor shall provide as-built drawings of the new valve layout, complete with detailed dimensions, upon completion of the valve modifications. Upon completion of the work on-site, the Contractor shall provide as-built dimensions of any design deviations to the Engineer.

The spherical valve support structure required to support the new spherical valves as shown in Drg. Reg. Nos 181618/24 ME to 181621/24 ME shall be provided by the Contractor which shall form part of the valve installation work.

**DSP 4.1.4 Operating Actuator**

Each Drakenstein Pump Station DN 900 spherical valve shall be operated by its own separate, attached hydraulic actuator. The orientation of the actuators shall be in accordance with TABLE 1 and Drg. Reg. Nos 181618/24 ME to 181621/24 ME.

The operating actuator shall also make provision for integration with the SCADA control system (24 VDC signal basis). The operating actuators shall be capable of regulating the pump discharge by opening and closing of the valves from 0% open to 100% open.

**DSP 4.2 Ball Valves**

DN 25 Ball valve, shall be supplied and installed as indicated in TABLE 1 and DSP 1.2.1.

The supply and installation of the DN25 (1") ball valves shall include the high pressure stainless steel DN 25 (1") threaded hexagon nipples, in accordance with ASME B16.11 (Class 3 000 lb), as shown on Drg. Reg. Nos 181618/24 ME to 181621/24 ME with male BSPT thread on both sides.

**DSP 5 DESIGN AND MANUFACTURE OF PIPEWORK****DSP 5.1 New Pipework**

Four existing DN 800 to DN 900 expander pipes, upstream of the existing nozzle-check valves shall be cut off at the expanding joint and four new DN 800 to DN 900 expander pipes shall be installed as shown on Drg. Reg. Nos 181618/24 ME to 181621/24 ME. After installation, the entire pipe assembly, including the existing cast in pipe section and newly added parts, shall be corrosion protected in accordance with DWS 9900 and Section DSP 6.3 of this Particular Specification.

Four new straight pipes are required for installation between the nozzle-check valves and the new spherical valves as shown on Drg. Reg. Nos 181618/24 ME to 181621/24 ME. The new straight pipe shall be manufactured in accordance with Drg. Reg. No. 181620/24 ME.

Four new spool pieces are required for installation downstream of the new spherical valves. The installation layout is shown on Drg. Reg. Nos 181618/24 ME to 181621/24 ME. The new spool pieces shall be manufactured in accordance with Drg. Reg. No. 181621/24 ME. The supply and installation shall include all bolts, studs, nuts, washers, packing, etc. for the complete installation to render the new discharge pipework fully operational. The removal and transport of the existing pipework to be modified, from and to Site, shall form part of this Contract.

All flanges on new and modified pipework shall be in accordance with TABLE 2 and Drg. Reg. Nos 181618/24 ME to 181621/24 ME.

**DSP 6 CORROSION PROTECTION**

Corrosion protection of the equipment supplied under this Particular Specification shall conform to DWS 9900 – CORROSION PROTECTION. Colour coding shall be in accordance with Annexure J of DWS 9900 (2023 edition). Technical details of all corrosion protection products shall be submitted to the Engineer for approval before application.

**DSP 6.1 Toxicity of Lining Material**

Materials used for the lining of valves and pipes shall be non-toxic and shall not impart any odour, taste, or colour to the water. Certification shall be submitted to the Corrosion Engineer for his approval.

**DSP 6.2 Proprietary Items**

Components that are supplied painted or protected e.g. gearboxes, actuators etc. **shall only be accepted** provided that they meet the corrosion protection requirements of this Particular Specification. If this specification cannot be adhered to the Contractor **shall submit full details of the equivalent paint systems** at quotation stage for approval by the Corrosion Engineer.

**DSP 6.3 Coating Systems**

(a) Valves (including hand pump lever and hydraulic cylinder mounting)

ENVIRONMENT	MATERIAL	SURFACE	SYSTEM	MINIMUM DFT (µm)
N/A	MS SG	Lining	1. Two pack Epoxy	600
			2. FBE	250
	SS 316	Lining	1. Two pack Epoxy	150
			2. FBE	125
			3. Pickle & passivate - See note 4 of Clause DSP 6.3(l)	
Wet	MS SG	Coating	1. Two pack Epoxy plus top coat of recoatable Polyurethane	600 50
			1. Two pack Epoxy plus top coat of recoatable Polyurethane	600 50

(b) Pipework

ENVIRONMENT	MATERIAL	SURFACE	SYSTEM	MINIMUM DFT (µm)
Above Ground	MS	Lining	1. Two pack Epoxy	600
		Coating	1. Two pack Epoxy plus top coat of recoatable Polyurethane	300 50
	3CR12	Lining	1. Two pack Epoxy	600
		Coating	1. Two pack Epoxy plus top coat of recoatable Polyurethane	300 50

(c) Base Plates and Steelwork

ENVIRONMENT	MATERIAL	SURFACE	SYSTEM	MINIMUM DFT (µm)
Dry	MS		1. HDG	105

## (d) Flange Adaptors

MATERIAL	SURFACE	SYSTEM	MINIMUM DFT (µm)
MS	Lining and Coating	1. Two pack Epoxy	600
		2. FBE	320
		3. HDG plus Epoxy primer plus Two pack Epoxy	105 40-80 300
		4. HDG plus FBE	105 250
SS 304	Coating and Coating	Pickle and passivate – See note 4 of Clause DSP 6.3(l)	N/A

## (e) Pipe Joints

ENVIRONMENT	MATERIAL	SYSTEM	MINIMUM DFT (µm)
Plain Ended Pipes where couplings or flange adaptors are to be fitted	3CR12	Same as lining material for 300 mm from end.	600
Flange Faces	MS	Two pack Epoxy or FBE	80

## (f) Hydraulic Cylinders

ENVIRONMENT	MATERIAL	SURFACE	SYSTEM	MINIMUM DFT (µm)
Dry/Wet	SS 316L	Coating	Pickle and passivate – See note 4 of Clause DSP 6.3(l)	N/A

## (g) Hydraulic Pipes

ENVIRONMENT	MATERIAL	SURFACE	SYSTEM	MINIMUM DFT (µm)
Dry/Wet	SS 316L	Coating	Pickle and passivate – See note 4 of Clause DSP 6.3(l)	N/A

## (h) Power Packs

ENVIRONMENT	MATERIAL	SURFACE	SYSTEM	MINIMUM DFT (µm)
Dry	MS	Lining	1. Two pack Epoxy	300
			2. FBE	125
	MS	Coating	Two pack Epoxy plus top coat of recoatable Polyurethane	300 50
			FBE plus top coat of recoatable Polyurethane	200 50
Wet	MS	Coating	1. Two pack Epoxy plus top coat of recoatable Polyurethane	600 50
			2. FBE plus top coat of recoatable Polyurethane	600 50
	3CR12	Lining	1. Two pack Epoxy	600
			2. FBE	125
	SS 304	Coating	1. Two pack Epoxy plus top coat of recoatable Polyurethane	300 50
			2. FBE plus top coat of recoatable Polyurethane	125 50
			Pickle and passivate - See note 4 of Clause DSP 6.3(l)	

## (i) Electrical Panels and Enclosures

ENVIRONMENT	MATERIAL	SYSTEM	MINIMUM DFT (µm)
Indoor - Dry	MS	1. Multi-purpose Epoxy plus recoatable Polyurethane if required.	250 50
		2. Two pack Epoxy plus recoatable Polyurethane	250 50
		3. FBE	125
	PC ABS	Un-coated	
	GRP	Polyester gelcoat	250
	3CR12	1. Multi-purpose Epoxy plus recoatable Polyurethane if required	125 50
		2. Two pack Epoxy plus recoatable Polyurethane	125 50
		FBE	100
	Indoor - Wet	1. Two pack Epoxy plus recoatable Polyurethane	250 50
		2. FBE	125
		DCA	75
Outdoor	PC ABS	Un-coated	
		GRP	250
	3CR12 or SS 304	1. FBP	150
		2. Multi-purpose Epoxy plus recoatable Polyurethane if required	250 50

## (j) Fasteners

ENVIRONMENT	MATERIAL	SYSTEM	MINIMUM DFT (µm)
<b>Fasteners and washers - Dry</b>	MS	HDG plus threads coated with Molybdenum Disulfide lubricant or wax	45
	SS 304	Threads coated with Molybdenum Disulfide lubricant or Nickel Anti-seize compound	Uniform cover
<b>Fasteners and washers - Wet/Submerged</b>	SS 316	1. Pickle and passivate - See note 4 of Clause DSP 6.3(l) plus threads coated with Molybdenum Disulfide lubricant or Nickel Anti-seize compound	Uniform cover
		2. FBE coated (thread surfaces excluded) plus threads coated with Molybdenum Disulfide lubricant or Nickel Anti-seize compound.	50
<b>Fasteners for flanges</b>	MS	HDG plus complete fastener system coated with an approved spray type lubricant. Bolt heads and nuts to be covered with plastic bolt caps.	45

## Anchors

ENVIRONMENT	MATERIAL	SYSTEM	MINIMUM DFT (µm)
<b>Anchors in concrete - Dry</b> See Paragraph 4.5.2 of Section C3 of DWS 9900.	SS 316	Threads coated with Molybdenum Disulfide Lubricant or Nickel Anti-seize compound	Uniform cover
<b>Anchors in concrete – Wet</b> See Paragraph 5.3.2 of DWS 9900	SS 316	Threads coated with Molybdenum Disulfide Lubricant or Nickel Anti-seize compound plus nut and washer FBE coated	Uniform cover 50

## (k) Stainless Steel Items

ENVIRONMENT	MATERIAL	SYSTEM	MINIMUM DFT (µm)
<b>Dissimilar materials in submerged conditions</b>	Stainless steel components	Two pack Epoxy or FBE to a smooth, glossy and uniform finish	600
<b>Dissimilar materials in submerged conditions</b>	3CR12 steel components	Two pack Epoxy or FBE	600 250
<b>Dry or compatible metal conditions</b>	Stainless steel components	Pickle and passivate – See note 4 of Clause DSP 6.3(l)	
<b>Dry conditions only</b>	3CR12 steel components	Pickle and passivate – See note 4 of Clause DSP 6.3(l)	

## (l) Notes

**The following items shall be approved by the Corrosion Engineer**

1. Hot-dip galvanising
  - Only for pipes up to 200 mm diameter maximum and flow velocity less than 2 m/s.
  - Pipes shall not be embedded in concrete.
  - Water analysis shall be provided.
  - Pipes over 200 mm diameter to be coated with a duplex system
2. Sealant
  - Interfaces of different environments shall be sealed with a Polyurethane or Polysulphide flexible sealant to be applied in accordance with the manufacturer's data sheets.

- 3. Un-coated stainless steel
  - Only to be used if no galvanic reaction and anaerobic conditions are found.
- 4. Pickle and passivate
  - If not in contact with less noble material.
  - If exposed to anaerobic conditions seal-coat all crevices with solvent-free Epoxy.
  - Shall be done by the dipping process.
- 5. Galvanic cells
  - Where a galvanic cell is situated within a water path <150 mm and concrete cover <75 mm, both the MS, 3Cr12 or SS shall be coated.
- 6. Anaerobic conditions
  - SS grade 316L shall be used under anaerobic and aggressive water conditions.
- 7. Polyurethane for colour coding
  - Recoatable Polyurethane where required colour for colour coding. Only UV resistant Polyurethane shall be used.
- 8. Primers
  - Primers shall only be used in special cases i.e. over-coating of galvanized surfaces.
- 9. 3CR12
  - In view of superior corrosion resistance, coated 3CR12 material is preferred.
- 10. Epoxy primer
  - Epoxy primer may not be required if appropriate two pack Epoxy/ Recoatable Polyurethane is being used.

#### DSP 6.4 Colour Coding

See the table below for specific colour coding, for further information refer to Annexure J of DWS 9900 (July 2023 edition).

ITEMS	COLOUR	SANS 1091 CODE
<b>Pipework and Spherical Valves Remedial Work</b>	Brilliant Green	H10

#### DSP 7 QUALITY ASSURANCE AND INSPECTIONS

Quality assurance and inspections shall be in accordance with this Particular Specification, DWS 1601: GENERAL MECHANICAL SPECIFICATION (Revision 0), STANDARD SPECIFICATION DWS 2020: QUALITY CONTROL SPECIFICATION (October 2001 edition) and as further described hereunder. The Contractor shall compile the Date Book of QCP's (for manufacturing and corrosion protection), material certificates, test certificates, welder qualifications and welding procedures.

#### DSP 7.1 Visual Inspection

All finished equipment shall be visually examined and shall be free of injurious defects as defined in the relevant specification.

The Contractor shall refer to the tolerances specified and the relevant Drawings. The Contractor shall confirm all relevant dimensions on the Site prior to manufacturing of any equipment.

#### DSP 8 HANDLING AND TRANSPORT

All handling and transport of equipment shall be in accordance with DWS 2510/01: Section 3.25 (January 2007 edition).

The Contractor shall provide all the necessary balks of timber and sawdust bags used to support the components on soil, concrete or other hard surface and to separate them from each other during storage.

The Contractor shall be deemed to have included in the pricing schedule or the Bill of Quantities for all materials and packing cases necessary for the safe packing and storage of the equipment.

All crates, packages, steel fabrications and machinery shall be clearly marked with a waterproof material to show the weight, the position to which slings may be attached and shall have an indelible identification mark relating them to the packing lists. In addition, all packages shall be clearly painted with a distinctive site identification colour and sign, so that the final location of each item can be easily identified at the Site in order to avoid delay, double handling or loss. These special identification marks shall be in addition to the normal shipping and transport marks.

Machined flanges of pipes, valves and fittings shall be protected by wooden discs attached by means of service bolts (which shall not be used on the Works) or by other approved means.

Wherever possible, lifting of painted items shall be from approved lifting attachments. All coated items shall only be lifted by means of broad band slings that shall not damage the coating. Slings shall not be less than 50 mm wide or as approved by the Engineer.

Stainless steel items shall be handled and packed in a way that prevents contamination.

The use of ropes, wire ropes or chains without suitable padding is expressly forbidden.

When loading onto vehicles, precautions shall be taken to support and chock the components to prevent movement. Components shall be firmly lashed or chained with padded lashing, supported on sawdust bags. The area of padded surfaces shall be adequate to prevent damage to the coating.

Any repairs necessary shall be to the cost of the Contractor. Any damage that occurs during the handling and storage of equipment and components at the storage shall be repaired by the Contractor at his own cost, in accordance with the Specification and to the approval of the Engineer.

Damage repair to corrosion protection shall only be carried out by a specialist corrosion protection applicator.

## **DSP 9      INSTALLATION AND COMMISSIONING**

### **DSP 9.1    Valves**

All valves and hydraulic equipment shall be installed by the Contractor as part of the Particular Specification. The Valve Supplier shall be responsible to reinstall and fully adjust the actuators to factory and tight shut off specifications. During these operations, the Valve Supplier shall provide, if required, the temporary power supply to the valves. All reinstallation and adjustment procedures on Site shall be deemed as part of the original Quotation.

The most probable pumping period for Drakenstein Pump Station is between April and September each year however, the pump station may require full pumping capacity throughout the year. Therefore, the Contractor shall ensure that three (3) pumping lines are at full pumping capacity at all times. This will entail that the Contractor shall complete the required work on one pumping line at a time.

The Contractor shall be responsible for the security of the equipment on Site from the time of delivery of the equipment on Site to the time when commissioning of the equipment is complete. The Contractor shall ensure that they have the capabilities to complete the work within the allocated timeframe as penalties shall be applied if the Contractor does not meet the deadline.

### **DSP 9.2    Hydraulic Power Pack and Control Console**

The four hydraulic power packs and control consoles for the operation of the DN 900 spherical valves shall be installed against the downstream wall of the pump station at RL 140,100 as indicated on Drg. Reg. No. 181622/24 ME.

The Contractor shall be responsible for the provision of electricity from the existing distribution board to the hydraulic power packs in accordance with SANS 10142-1.

### **DSP 9.3    Pipework**

All pipework and spool pieces shall be installed by the Contractor as part of this Specification in accordance with Drg. Reg. Nos 181618/24 ME to 181621/24 ME. The existing cast in pipework shall be corrosion protected in-situ in accordance with this Particular Specification and Standard Specification DWS 9900.

## **DSP 10      TESTS**

The Contractor shall be responsible for the installation of all the equipment covered by this Particular Specification.

All equipment supplied under this Particular Specification shall be tested for compliance with this Particular Specification as well as any other Specification referred to herein.

### **DSP 10.1    Valves**

Full mechanical (including welding preparation and welding) and corrosion protection inspection of the items shall be carried out at the Manufacturer's Works in the presence of the relevant DWS representative. Workmanship and dimensional correctness shall be checked prior to corrosion protection procedures. All equipment shall be completely assembled for functional tests and inspection at the Manufacturer's Works. Each valve shall be seal tested at the Manufacturer's workshop in accordance with Standard Specification DWS 2510/01, Section 3.20. Each valve supplied shall be operated in both opening and closing directions and through its full travel by means of the new hydraulic cylinders and existing hydraulic power packs for that valve.

During commissioning, all valves shall be operated under the full design pressure and full flow conditions to ensure fully functional valves after installation. The valves shall be operated through their full opening and closing travel and tested for accurate mechanical and electronic percentage open indication.

The slow opening and closing time of the valves shall be tested for normal operation of the valves where the valves are controlling the pump discharge, to ensure that the electronic controller can accurately open and close the valves to the correct opening. It shall be tested that the opening and closing speed is adjustable using the adjustable throttle valves on the hydraulic actuator.

It shall be tested that the valves and hydraulic actuators are fully functional with the pump station control system. The full functionality of the hand pump for the hydraulic actuator shall be tested under full operating conditions.

All of the above requirements form part of this Contract and shall be provided as part of the rates by the Contractor.

## **DSP 10.2 Pipework**

Full mechanical (including welding preparation and welding) and corrosion protection inspection of the items shall be carried out at the Manufacturer's Works in the presence the Engineer. Workmanship and dimensional correctness shall be checked prior to corrosion protection procedures.

All items welded that cannot be hydraulically pressure tested shall undergo non-destructive testing of the Radiographic or Ultrasonic type.

The relevant DWS official shall at all times be responsible for quality control on Site installation work as well as all tests carried out on Site.

The Contractor shall during installation be responsible for all operations necessary for the adjustment and testing of the discharge pipework until it has been taken over. During the entire testing (and pre-testing) period, the Contractor shall be wholly responsible for the preservation, care and remedying of any installation defects of the pipework. The Contractor shall provide all plant and labour, including supervision, guarding, apparatus, materials, stores, instruments etc., necessary for the effective compliance with these obligations.

The Contractor shall permit and facilitate the Engineer's observation of the erection, installation and testing procedure of the pipework. Any damages caused during such operations shall be for the Contractor's account.

## **DSP 11 MEASUREMENT AND PAYMENT**

### **DSP 11.1 Basic Principles**

Notwithstanding the breakdown as indicated in the Bill of Quantities, all the work and requirements of any nature as specified in this Particular Specification shall be covered by the Contractor in the pricing as reflected in the Bill of Quantities. No additional cost for any work or requirement in this Particular Specification shall be allowed.

### **DSP 11.2 General**

Items are provided for the Contractor to price for:

- Procurement and manufacture of all mechanical equipment
- Corrosion protection
- Delivery from/to Site
- Installation and testing of all mechanical equipment
- Provision of Operating and Maintenance Manuals
- Handover and tests on completion

The Contractor shall price each of these items separately.

### **DSP 11.3 Scheduled Items**

The Contractor shall price each of the under-mentioned items separately for each specific piece of equipment supplied.

#### **DSP 11.3.1 Procurement and Manufacture of all Mechanical Equipment**

Unit: No & Sum

The rates quoted against the items in the Bill of Quantities shall include for full compensation of all costs incurred in the design, procurement, manufacture, inspection and testing of the specified valves, jointing material and fasteners, associated operating or control equipment and pipework. The rates quoted against shall also include for full compensation of all costs incurred for the functional tests of the spherical valves with the new hydraulic cylinders and existing power packs at the Manufacturer's workshop. Payment will be made per unit.

DSP 11.3.2 Corrosion Protection

Unit: Sum

The rates quoted against the items in the Bill of Quantities shall include full compensation of all costs incurred in the preparation for corrosion protection, procurement, application, inspection, and testing of corrosion protection of the specified valves, supports, pipework, jointing material, fasteners, anchors and associated hydraulic power pack and new hydraulic cylinders. Payment will be made per unit. Payment will only be effected after full compliance of the items with the Particular Specification has been certified by the Engineer.

DSP 11.3.3 Delivery from/to Site

Unit: Sum

The rates quoted against the items in the Bill of Quantities shall include for full compensation of all costs incurred in the packaging, loading and off-loading and delivery into storage on the Site of the specified items, jointing material and fasteners and associated operating or control equipment. The rates quoted against shall also include the packaging and transport of the spherical valves from their current location (Kliphoek PS) to the manufacturer's workshop and from the Manufacturers workshop to the Site. Payment will be made per unit. Payment will only be effected after full compliance of the items with the Particular Specification has been certified by the Engineer.

DSP 11.3.4 Installation and Testing

Unit: No &amp; Sum

The rates quoted against the items in the Bill of Quantities shall include for full compensation of all costs incurred in the installation of the pipework, spherical valves and associated manual and hydraulic power pack, valve position indicators, all hydraulic pipe work, electrical equipment, calibration of the position indicator and flange adaptors upstream of valves and all other aspects necessary for the operation and control of the valves in terms of the Particular Specification and other documentation. The rate shall also include the provision of all labour, equipment, transport, materials and temporary works necessary to test and install the pipework, valves, install and adjust the associated power pack, auxiliary equipment for valves, on-site quality assurance, quality control, inspection and testing in accordance with this Particular Specification. Payment will be made per unit. Payment will only be effected after full compliance of the items with the Particular Specification has been certified by the Engineer.

DSP 11.3.5 Provision of Operating and Maintenance Manuals

Unit: No

The rates quoted shall include for full compensation of all costs incurred in preparing and submitting to the Engineer the updated Operating and Maintenance Manuals in accordance with DSP 3.8 requirements and approved drawings for the spherical valves. Payment will only be effected after full compliance of the items with this Particular Specification has been certified by the Engineer.

DSP 11.3.6 Handover and Tests on Completion

Unit: Sum

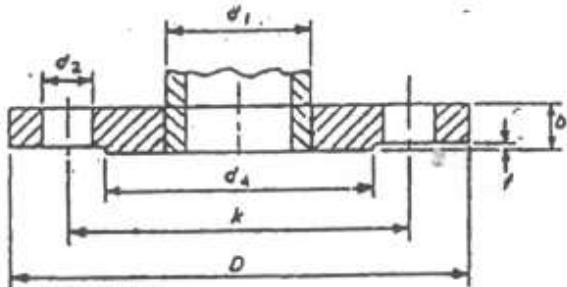
The rate quoted shall include for full compensation for all Tests on Completion including labour, supervision, materials, tools, instruments, etc., necessary for the testing of the system, remedial work and any other work as specified. All costs incurred in pressure testing and completion testing of the system during both pressure testing and flow testing shall be included in the quoted rate.

# APPENDIX A

NWS 1676 FLANGE DIMENSIONS TABLES 4 & 5:

TABLE 4

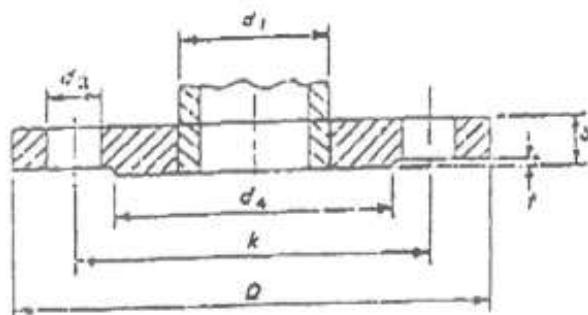
STEEL PLATE FLANGES FOR WELDING  
CONSISTENT WITH, BUT NOT COVERED BY,  
TABLE WITH, 25/3 OF BS4504:PART 1:1969  
NOMINAL PRESSURE 2,5 MPa.



NOM. SIZE	PIPE OD	FLANGE		RAISED FACE		BOLTING	DRILLING		
		d <sub>1</sub>	D	b	d <sub>4</sub>	f	d <sub>2</sub>	k	
150	168,3	300	24	218	3	M24	8	26	250
225	246,1	395	30	305	3	M27	12	30	340
550	558,8	785	60	680	4	M36	20	39	710
650	660,4	895	70	770	5	M36	24	39	820
700	711,2	960	74	820	5	M39	24	42	875
750	762,0	1020	78	880	5	M39	24	42	935
800	812,8	1085	82	930	5	M45	24	48	990
900	914,4	1185	90	1030	5	M45	28	48	1090
1000	1016,0	1320	98	1140	5	M52	28	56	1210
1100	1118,0	1420	106	1240	5	M52	32	56	1310
1200	1220,0	1530	116	1350	5	M52	32	56	1420
1300	1320,0	1645	124	1450	5	M56	32	62	1530
1400	1420,0	1755	134	1560	5	M56	36	62	1640
1500	1520,0	1865	144	1670	5	M56	36	62	1750
1600	1620,0	1975	154	1780	5	M56	40	62	1860
1800	1820,0	2195	170	1985	5	M64	44	70	2070

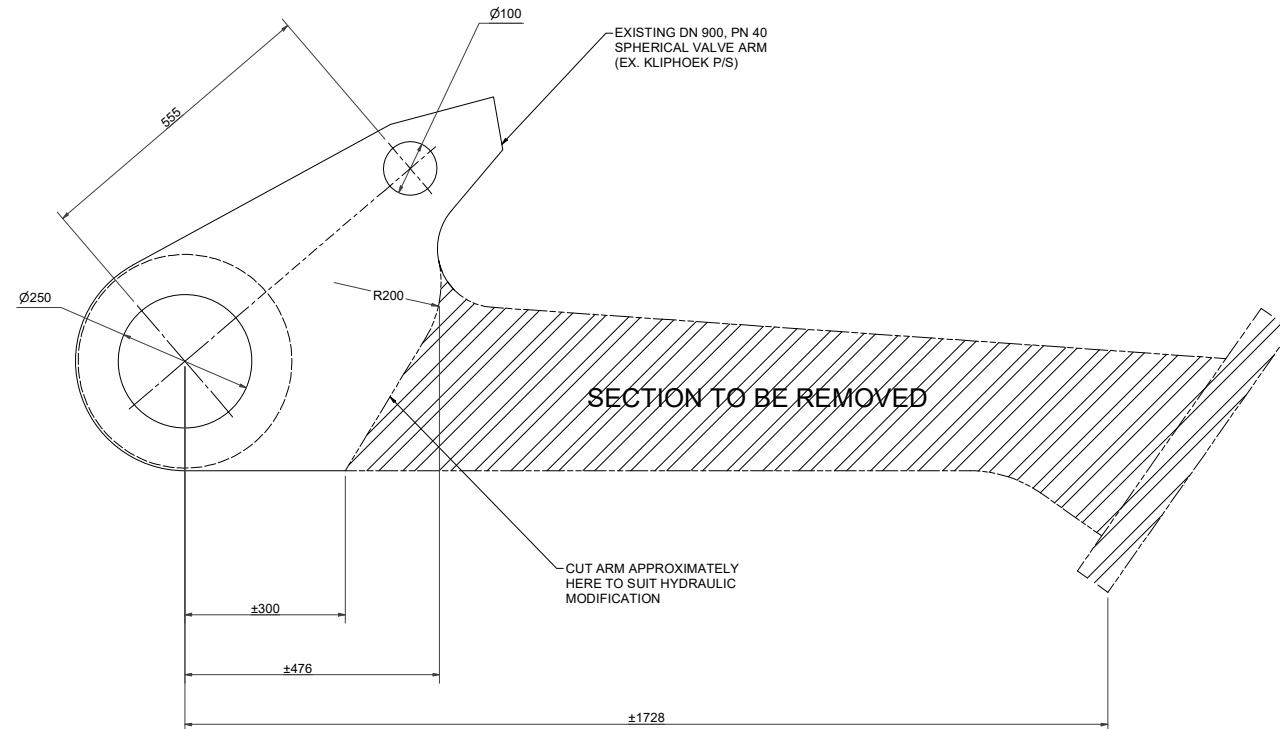
TABLE 5

STEEL PLATE FLANGES FOR WELDING  
CONSISTENT WITH, BUT NOT COVERED BY,  
TABLE 40/3 OF BS4504:PART 1:1969  
NOMINAL PRESSURE 4,0 MPa



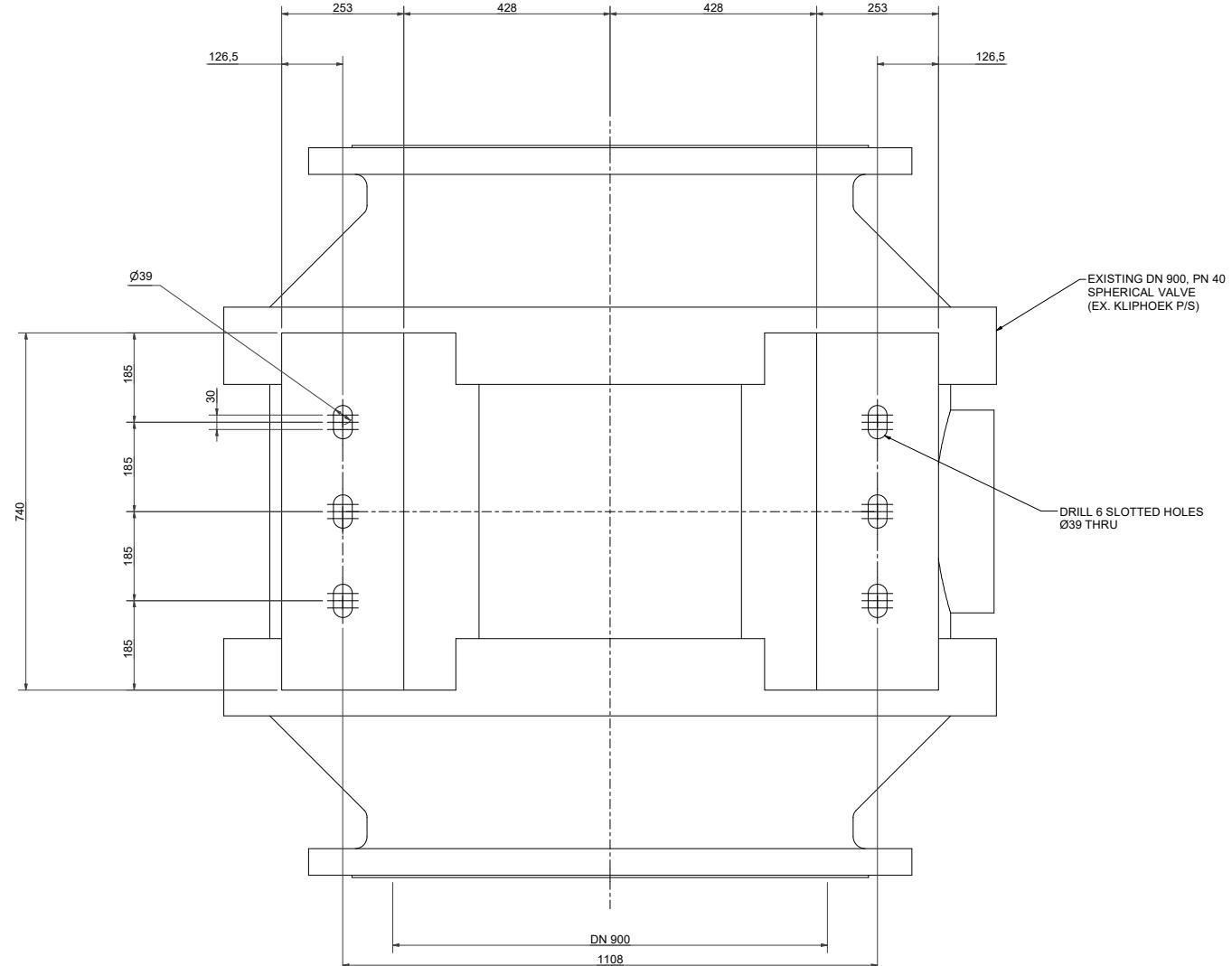
NOM. SIZE	PIPE OD	FLANGE		RAISED FACE		BOLTING	DRILLING		
		d <sub>1</sub>	D	d <sub>4</sub>	f		No.	d <sub>2</sub>	k
225	246,1	420	38	315	3	M30	12	33	355
350	358,8	635	78	680	4	M45	20	48	740
600	609,6	890	84	735	5	M45	20	48	795
650	660,4	945	90	790	5	M45	24	48	850
700	711,2	995	96	840	5	M45	24	48	900
750	762,0	1080	102	900	5	M52	24	56	970
800	812,8	1140	108	960	5	M52	24	56	1030
900	914,4	1250	120	1070	5	M52	28	56	1140
1000	1016,0	1360	132	1180	5	M52	28	56	1250
1100	1118,0	1460	142	1280	5	M52	32	56	1350
1200	1220,0	1575	154	1380	5	M56	32	62	1460
1300	1320,0	1685	166	1490	5	M56	32	62	1570
1400	1420,0	1795	178	1600	5	M56	36	62	1680

# APPENDIX B



SIDE VIEW  
HYDRAULIC LEVER ARM MODIFICATION (4-OFF)  
SCALE 1:5

GENERAL NOTES:		 0 5 10 50 100 SCALE (mm)	REVISION			DEPARTMENT OF WATER AND SANITATION REPUBLIC OF SOUTH AFRICA			BERG RIVER WATER SUPPLY SCHEME			
REV No.	DATE		DESCRIPTION	SIGNED	HEAD OFFICE M / E ENGINEERING PRIVATE BAG X313 PRETORIA 0001	SEDIBENG BUILDING 185 FRANCIS BAARD STREET PRETORIA (012) 336-7300	DIRECTOR GENERAL	DRAKENSTEIN PUMP STATION				
0	07/2024		ISSUED FOR CONSTRUCTION					SKETCH A:				
								EXISTING DN 900, PN 40 SPHERICAL VALVE LEVER ARM MODIFICATION				
								-DETAILS-				
ROUND ALL SHARP EDGES / REMOVE BURRS					DESIGN: A VAN SCHALKWYK							
ALL DIMENSIONS IN MILLIMETERS					CHECKED: DATE: DRAWN: A VAN SCHALKWYK							
DO NOT SCALE DRAWING		PROJECTION SANS 10111			ENGINEER: DATE: EXTERNAL APPROVAL: DATE		PROVINCE: WESTERN CAPE KEYCODES OTHER NUMBER					
						LOCALITY No: G100-02 DISTRICT: WORCESTER						
						CALCULATION FILE: TENDER CONTRACT No:						
						1 OF 2	REG. No.	REV. No.				



VIEW ON BOTTOM BASEPLATES  
DN 900 SPHERICAL VALVE BASEPLATE MODIFICATION (4-OFF)  
SCALE 1 : 5

GENERAL NOTES:		 0 5 10 SCALE (mm) 100  ROUND ALL SHARP EDGES / REMOVE BURRS  ALL DIMENSIONS IN MILLIMETERS  DO NOT SCALE DRAWING <small>PROJECTION SANS 10111</small> 	REV No.	DATE	REVISION DESCRIPTION	SIGNED	DEPARTMENT OF WATER AND SANITATION REPUBLIC OF SOUTH AFRICA		BERG RIVER WATER SUPPLY SCHEME			
0	07/2024		ISSUED FOR CONSTRUCTION					SEDIBENG BUILDING 185 FRANCIS BAARD STREET PRETORIA (012) 396-7000				
							DIRECTOR GENERAL					
							DESIGN: A VAN SCHALKWYK					
						CHECKED: DATE: DRAWN: A VAN SCHALKWYK						
						ENGINEER: DATE: EXTERNAL APPROVAL: DATE		PROVINCE: WESTERN CAPE	KEYCODES		OTHER NUMBER	
						CHEF ENGINEER (Pv. Enr.): DATE: DIRECTOR: DATE		LOCALITY No: G100-02	DISTRICT: WORCESTER			
								CALCULATION FILE: <small>TENDER CONTRACT No.</small>				
								2 OF 2	REG. No.	REV. No.	0	