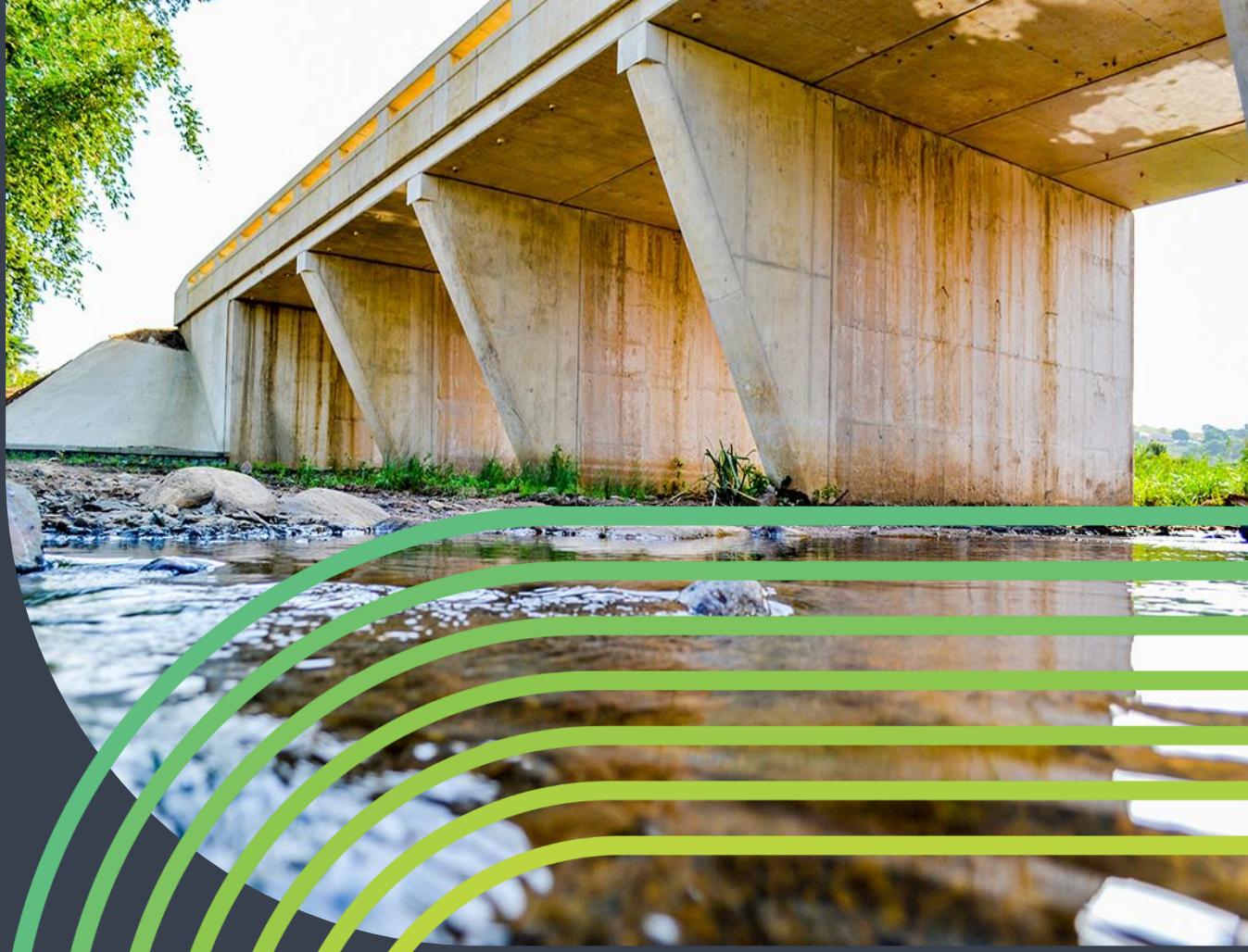

Project Particular Specification

Valves

PS VS

NAIDU CONSULTING
ENGINEERING DEVELOPMENT

Trenance 3 Reservoir: The Construction of a 6 Mℓ Reinforced Concrete Reservoir, Pump Station, Inlet & Outlet Pipework, 400Kℓ Elevated Tank and Ancillary Works: Ward 59

Revision 0

June 2025

NAIDU CONSULTING

Table of Contents

PREAMBLE

This specification, titled "*VS: VALVES*", is based on the eThekwini Water and Sanitation (EWS) particular specifications titled "*VSS: VALVE STANDARD SPECIFICATION*". However, this specification supersedes the EWS particular specifications and shall serve as the definitive standard for the design, manufacture, supply, installation, and testing of all valves within its scope.

In the event of any discrepancy between this specification and the original EWS document, the provisions of this specification shall take precedence. All contractors, suppliers, and stakeholders are required to comply fully with the requirements outlined herein.

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PS VS 1 PREAMBLE AND SCOPE

This particular specification covers materials, manufacturing and testing requirements for wedge gate, resilient seat gate valves, check, butterfly and air valves for use in water installations.

This specification must be read in conjunction with the project specification and drawings which provide specific detail related to the scope of work.

In the event of any discrepancy between a part or parts of the Standard Specifications and the Project Specification, the Project Specification shall take precedence. In the event of a discrepancy between the Specifications, (including the Project Specifications) and the drawings and / or the Bill of Quantities, the discrepancy shall be resolved by the Employer's Agent before the execution of the work under the relevant item.

PS VS 2 INTERPRETATIONS

PS VS 2.1 Supporting Specifications

The following form part of this specification:

a) SANS 664-1:2011 – Wedge Gate and Resilient Seal Valves for Waterworks: Part 1: General
b) SANS 664-2:2011 – Wedge Gate and Resilient Seal Valves for Waterworks: Part 2: Wedge Gate
c) Valves
d) SANS 664-3:2011 – Wedge Gate and Resilient Seal Valves for Waterworks: Part 3: Resilient Seal
e) Valves
f) SANS 191:2015 – Cast Steel Gate Valves
g) SANS 1849:2008 – Butterfly Valves for General Purposes
h) SANS 1551-1: 2008 – Check Valves (flanged and wafer types): Part 1: PN Series (DN 40 to DN
i) 600 with PN up to 2500 kPa)
j) SANS 1551-2: 2007 – Check Valves (flanged and wafer types): Part 2: Class Series (DN 40 to DN 600 with PN up to 4200 kPa)

Where there is conflict, the requirements contained in this specification shall take precedence over the above-mentioned SANS specifications.

PS VS 2.2 Abbreviations

EPDM	Ethylene Propylene Diene Monomer (M-Class)
DN	Nominal Diameter
PN	Nominal Pressure
NBR	Nitrile Rubber
QCP	Quality Control Plan

PS VS 3 MATERIALS, WORKMANSHIP AND CONSTRUCTION

PS VS 3.1 General

The types, sizes, end connections and pressure ratings of the valves required are as scheduled in the Bills of Quantities and specification and on the relevant drawings.

Unless specifically stated otherwise, all valves are to be suitable for use in terminal positions.

Technical Data Sheets are included in the Returnable Schedules section of the tender document to enable tenderers to provide specific details of the valves offered.

PS VS 3.2 Quality Verification

The valve manufacturer shall have in place, and shall fully comply with, a certified SANS 9001 integrated quality system that is applicable to the valve design, manufacturing, testing and coating and lining processes.

A QCP shall be prepared by the manufacturer well in advance of commencement of manufacture and submitted to the Employer's Agent for consideration and amendment as deemed necessary and shall thereafter be updated and adhered to be the manufacturer.

PS VS 3.3 Corrosion Protection

PS VS 3.3.1 General

All valves shall be coated externally and lined internally as specified hereunder.

Coating and lining materials shall be suitable for use on potable water systems. The cured materials shall be chemically unaffected by free chlorine or chloramine in water up to concentrations of 10mg/l and to ozone concentration up to 5mg/l in water and by fluids with a pH ranging from 4 to 10.

The coating and lining of valves shall be carried out at the factory prior to the dispatch of the valves. Nonferrous metals or stainless-steel surfaces must not be painted.

PS VS 3.3.2 Surface Preparation

All cast iron and steel surfaces of every valve shall be prepared for painting to a thoroughly clean condition, free of all grease and deleterious matter.

Surfaces shall be degreased using a water-free solvent degreaser such as that that complies with SANS 1344 or, for use in enclosed systems, with SANS 1365.

After complete removal of oil or grease contamination, the valve shall be thoroughly washed with clean potable water to remove all residues. The surface shall be water break free. The valve shall then be allowed to dry.

PS VS 3.3.3 Blast Cleaning

Abrasive materials used for blast cleaning shall be free from oil or grease, as shall be the compressed air used in air blast cleaning.

Surfaces shall be blast cleaned by air clast cleaning methods, then vacuum cleaned or blown off to achieve a standard equal to Sa3 of Swedish Standard SIS 05 5900 when tested in accordance with SANS 5767.

The profile produced by blast cleaning shall be angular and shall have an average peak to valley height of 60 to 100 microns, when tested in accordance with SANS 5772. Hackles shall be removed with coarse abrasive paper.

Residual dust and debris shall not exceed 0.2% when tested in accordance with SANS 5769.

Water soluble salts shall not exceed 100mg/m2 at any point when tested with the Webber-Reilly Reagent.

Any laminations revealed by clast cleaning shall be ground out and re-blasted. If grinding penetrates the body to a depth greater that 8% of the nominal wall thickness the valve shall be rejected.

PS VS 3.3.4 Handling of Cleaned Valve

After cleaning, the surfaces shall not be contaminated in any way. Operators shall wear clean gloves and all surfaces in contact with the valve shall be clean and free from oil, grease, grit, dirt and other contamination.

PS VS 3.3.5 Coating and Lining Materials

The materials shall comply with SANS 217: 2015 Type 1A for solvent bourne chemically cured epoxies.

A total minimum dry film thickness of 250 µm that is to be pinhole free over the entire painted surface shall be achieved.

Coating and lining repairs shall be carried out using repair systems that comply with the specified performance requirements and shall be compatible with the coating and lining materials. The Contractor shall submit proof to the Employer's Agent from the suppliers of the lining and coating suppliers to this effect.

The mating faces of flanges shall be masked and left uncoated. All runs or drips of epoxy shall be removed from the mating faces of the flanges and the flange profiling shall be clearly visible over the entire flange face.

The mating face shall receive on coat of an approved polymer based, waterborne rust inhibitor.

Care shall be exercised to ensure that after application of all coatings there are no runs or drips and that the flange profiling is clearly visible over the entire flange face.
Excessive coating build up in flange bolt holes that could snag bolts will not be permitted.

PS VS 3.3.6 Inspection

Low voltage, wet sponge detection of pinholes is to be conducted on all coated surfaces of the valves. There shall be no defects in the coatings and linings when tested in accordance with ASTM D5162. The finish coating is to be smooth and glossy, free from pinholes, excessive runs, sags, "orange peel" finish, occlusions and other visible defects.

PS VS 4 INTENTIONALLY LEFT BLANK

PS VS 5 WEDGE GATE VALVES (SANS 664 Part 1 & Part 2)

Where no materials are specified, the valve shall be constructed with materials as stated in Table 4 — General materials for valves as specified in SANS 664-1:2011. Generally, valves shall be providing with rising spindles, where space permits.

With reference to Annex A.1 to SANS 664-1:2011 Wedge Gate and Resilient Seal Valves for Waterworks: Part 1: General:

a) The sizes, pressure ratings, end connections and other specific details of the valves required are as scheduled in the Bill of Quantities.
b) The method(s) of operation of the valves shall be as stated in Table A below.
c) The direction of turning the spindle to close the valve shall be as shown in Table A below.
d) The valves shall be provided with a means for repacking the gland whilst the valve in under pressure.
e) The flange details are given in Table A below.
f) Flanges are to be either flat faced or raised face as shown in Table A below. The backs of each flange shall be spot faced over areas large enough to accommodate every washer and nut.
g) All flanges are to be drilled with the holes off horizontal and vertical centrelines.
h) Hexagon-head bolts shall comply with the requirements of SANS 1700-5-1.
i) All valves shall be double flanged unless otherwise scheduled in the Bills of Quantities.
j) Unless stated in Table A below, no position indicators are required.
k) Unless stated in Table A below, no identification plates are required.
l) Test certificates are required and shall be submitted to the Employer's Agent.
m) The Employer reserves the right to arrange for inspections and/or witnessing of the manufacture and/or testing and/or coating and lining of the valves. Full details shall be prescribed in the QCP – refer to VS.3.2 above.
n) The body ends of the valves need not be sealed.
o) Unless otherwise stated in Table A below, the coating system specified in VS.3.3 above is applicable.

With reference to Annex A.2 to SANS 664-1: 2011 Wedge Gate and Resilient Seal Valves for Waterworks: Part 1: General:
The requirements shall be agreed and documented in a QCP – refer to VS.3.2 above.

With reference to Annex A to SANS 664-2: 2011 Wedge Gate and Resilient Seal Valves for Waterworks: Part 2: Wedge Gate Valves:

a) The type of trim shall be "Type 3 – Standard" as shown in Table 1 – Trim Materials
b) Trim rings shall be pinned to the body. Trim rings secured by pressing are not permitted. Bonding liquids are not acceptable as the primary means of securing trim rings.
c) Working pressures of valves are not normally given as they may vary significantly.
d) Shoes and channel guides of non-corrosive material, namely bronze, are required for valves:
    i. DN150 or larger with differential pressures of 500 kPa of higher,
    ii. Installed where the valve is at an angle to the vertical
    iii. Wherever gearing or an actuator is installed
e) Seat leakages in accordance with table 2 are permissible.

PS VS 5.1 Testing

Notwithstanding the requirements of SANS 664-1: 2011, the test pressure requirements are as follows: All wedge gate valves DN 300 and larger shall be subjected to:

a) An open end gate strength test of 1.5 times the "Pressure Rating" of the valve on both sides of the gate. Drop tightness (gate leakage) in respect of this gate strength test is not required but shall comply with the requirements of SANS 664.
b) A body test of 2.0 times the "Pressure Rating" of the valve.

TABLE A – WEDGE GATE VALVES

SANS 664-1		PN 10	PN 16	PN 25	PN 40
Annex A.1 (b)	Operation	Valve cap/ hand wheel	Hand wheel	Valve Cap	Hand wheel / actuator
Annex A.1 (c)	Direction of closing	Anti-clockwise	Anti-clockwise	Anti-clockwise	Anti-clockwise
Annex A.1 (e)	Flanges	SANS 1123: Table 1000	SANS 1123: Table 1600	SANS 1123: Table 2500	SANS 1123: Table 4000
Annex A.1 (f)	Flange faces	Flat face	Flat face	Flat face	Flat face
Annex A.1 (j)	Position indicator	N/A	Required	N/A	Required
Annex A.1 (k)	Identification plates	Required	Required	Required	Required
Annex A.1 (o)	Coating System	VS.3.3	VS.3.3	VS.3.3	VS.3.3

PS VS 6 RESILIENT SEAT VALVES (SANS 664 Part 3)

Where no materials are specified, the valve shall be constructed with materials as stated in Table 3—General materials for valves as specified in SANS 664-3:2011. Valves shall generally be provided with rising spindles unless otherwise specified in the Bills of Quantities.

With reference to Annex A.1 to SANS 664-3:2011 Resilient Seal Valves for Waterworks:

a) The sizes, pressure ratings, end connections, and other specific details of the valves required are as scheduled in the Bill of Quantities.
b) The method(s) of operation of the valves shall be as stated in Table A below.
c) The direction of turning the spindle to close the valve shall be as shown in Table A below.
d) The valve seat shall be resilient and bonded or mechanically secured to ensure a tight seal under all specified operating pressures.
e) Flange details are given in Table A below. Flanges are to be either flat-faced or raised-faced as shown in Table A below. The backs of each flange shall be spot-faced over areas large enough to accommodate every washer and nut.
f) All flanges are to be drilled with the holes off horizontal and vertical centrelines.
g) Hexagon-head bolts shall comply with the requirements of SANS 1700-5-1.
h) All valves shall be double-flanged unless otherwise scheduled in the Bills of Quantities.
i) Unless stated in Table A below, no position indicators are required.
j) Unless stated in Table A below, no identification plates are required.
k) Test certificates are required and shall be submitted to the Employer's Agent.

With reference to Annex A.2 to SANS 664-3:2011 Resilient Seal Valves for Waterworks: The requirements shall be agreed and documented in a QCP – refer to VS.3.2 above.

PS VS 6.1 Testing

Notwithstanding the requirements of SANS 664-3:2011, the test pressure requirements are as follows:

a) All resilient seat valves DN 300 and larger shall be subjected to:
b) A hydrostatic strength test of 1.5 times the pressure rating of the valve.
c) A leakage test at the rated pressure of the valve to ensure drop-tight sealing.

Table AA – Resilient Seat Valves

SANS 664-3	PN 10	PN 16	PN 25	PN 40
Annex A.1 (b) Operation	Handwheel/Valve Cap	Handwheel	Handwheel	Actuator/Handwheel
Annex A.1 (c) Direction of closing	Anti-clockwise	Anti-clockwise	Anti-clockwise	Anti-clockwise
Annex A.1 (e) Flanges	SANS 1123: Table 1000	SANS 1123: Table 1600	SANS 1123: Table 2500	SANS 1123: Table 4000
Annex A.1 (f) Flange faces	Flat face	Flat face	Flat face	Flat face
Annex A.1 (j) Position indicator	Not required	Required	Not required	Required
Annex A.1 (k) Identification plates	Required	Required	Required	Required
Annex A.1 (o) Coating system	VS.3.3	VS.3.3	VS.3.3	VS.3.3

PS VS 7 CHECK VALVES (FLANGED AND WAFER TYPES) – PN SERIES (SANS 1551 Part 1)

With reference to Annex. A.1 to SANS 1551-1:2008 – Check Valves (Flanged and Wafer Type):

a) The rating of the valves shall be as scheduled in the Bills of Quantities.
b) Door return springs are not permitted.
c) Unless otherwise stated in Table B below, the coating system specified in VS.3.3 above is applicable.
d) The sizes of the valves are as scheduled in the Bills of Quantities.
e) Valves with a nominal bore greater than 600 mm must be of the double door or multi-door type and, if so shown in Table B below, shall be fitted with an integral valved bypass. In other respects they must be in accordance with the specifications for the single door type. A suitable arrow indicating the flow direction through the valve shall be cast onto the body of the valve.
f) All valve flanges shall have bolt holes unless otherwise indicated in Table B below.
g) All valves shall be double flanged. Flange details are given in Table B below. The backs of each flange shall be spot faced over areas large enough to accommodate every washer and nut. All flanges are to be drilled with the holes of horizontal and vertical centre lines.
h) Unless stated in Table B below, no identification plates are required.

With reference to Annex. A.2 to SANS 1551-1:2008 – Check Valves (Flanged and Wafer Type):

a) None of the valves will be used at temperatures that exceed 120 °C.
b) The materials shall be suitable for purpose and shall be agreed and documented in a QCP which is to be approved by the Employer's Agent before manufacture commences.
c) The Volvo trim materials shall be suitable for purpose and shall be agreed and documented in the QCP - refer to VS.3.2 above.
d) Door seat rings shall be fixed with non-corrosive if fixing screws.

e) The maximum permissible leakage rate shall be as stated in column 2 of Table 1 and Table 2 for metal seated and resilient seated valves respectively.
f) No defects are acceptable unless accepted in writing by the Employer's Agent or his representative, who is duly authorised in writing to approve defects and the method of repair.
g) Unless otherwise stated in Table B below, the coating system specified in VS.3.3 above is applicable.
h) The face-to-face dimensions shall be suitable for the proposed installation and shall be agreed and documented in the QCP, which is to be approved by the Employer's Agent before manufacture commences – refer to VS.3.2 above.
i) The dimensions "A" and "E" are to be agreed and recorded in a QCP prior to commencement of manufacture of the valves.
j) Unless otherwise stated in Table B below, no additional features are required.
k) All flanged check valves shall have an access cover.
l) Unless otherwise stated in Table B below, bolt holes shall be drilled and not tapped.
m) None of the valves will be used at temperatures exceeding 50 °C.
n) Unless stated in Table B below, no identification plates are required.
o) The symbols shown in 7.2.2 are to be used.

PS VS 7.1 Testing

Notwithstanding the requirements of SANS 1551-1:2008, the test pressure requirements are as follows:
All PN Series check valves DN 300 and larger shall be subjected to:

a) An open end gate strength test of 1.5 times the "Pressure Rating" of the valve on both sides of the gate. Drop tightness (gate leakage) in respect of this gate strength test is not required but shall comply with the requirements of SANS 664.
b) A body test of 2.0 times the "Pressure Rating" of the valve.

TABLE B - CHECK VALVES - PN SERIES

SANS 1551-1		**PN 10**	**PN 16**	**PN 25**	**PN 40**
Annex A.1 (c)	Coating system	VS.3.3	VS.3.3	VS.3.3	VS.3.3
Annex A.1 (e)	Bypass	Integral DN 25 valved bypass	Integral DN 25 valved bypass	Integral DN 25 valved bypass	Integral DN 25 valved bypass
Annex A.1 (e)	Additional features	Extension arm and counterweight	Extension arm and counterweight	Extension arm and counterweight	Extension arm and counterweight
Annex A.1 (f)	Bolt holes	No bolt holes	No bolt holes	No bolt holes	No bolt holes
Annex A.1 (g)	Flanges	SANS 1123: Table 1000	SANS 1123: Table 1600	SANS 1123: Table 2500	SANS 1123: Table 4000
Annex A.1 (g)	Flange faces	Flat face	Flat face	Flat face	Flat face
Annex A.1 (h)	Identification plates	Required	Required	Required	Required
Annex A.2 (g)	Coating system	VS.3.3	VS.3.3	VS.3.3	VS.3.3
Annex A.2 (j)	Additional features	Extension arm and counterweight – must state position ie. left or right side when viewed in direction of flow	Extension arm and counterweight – must state position ie. left or right side when viewed in direction of flow	Extension arm and counterweight – must state position ie. left or right side when viewed in direction of flow	Extension arm and counterweight – must state position ie. left or right side when viewed in direction of flow
Annex A.2 (l)	Bolt holes	Drilled & tapped	Drilled & tapped	Drilled & tapped	Drilled & tapped
Annex A.2 (n)	Identification plates	Required	Required	Required	Required

PS VS 8 BUTTERFLY VALVES

With reference to Annex A.1 to SANS 1849: 2008 – Butterfly Valves:

a) The types of valves required are as scheduled in the Bills of Quantities
b) The nominal sizes (DN) of the valves are as shown in the Bill of Quantities and on the Technical Data Sheet(s).
c) The nominal pressures (PN) of the valves are as scheduled in the Bills of Quantities.
d) None of the valves will operate at a temperature above 50 °C.
e) Flange details are given in Table C below. The backs of each flange shall be spot faced over areas large enough to accommodate every washer and nut. All flanges are to be drilled with the holes off horizontal and vertical centrelines.
f) The face-to-face dimension of the valves shall be in accordance with Table 5 unless as agreed and recorded in a QCP – refer to VS.3.2 above.
g) The service application shall be "tight-shut-off" as per 4.6.1 a).
h) Wafer lugged valves shall have drilled through holes unless otherwise stated in Table C below.
i) Tapping connections shall be in the side of the valve opposite to the operator end of the shaft.
j) Support feet shall be provided for valves greater than DN 400.
k) The service differential pressure shall be "Nominal Pressure PN" of the valve.
l) The operating devices shall be as stated in the Table C below.
m) The direction of turning the spindle to close the valve shall be as shown in Table C below.
n) Details of the actuators required, if any, are given in the tender document.
o) The locking mechanism is not required to provide for an intermediate position.
p) The valve body and disc material shall be ductile iron unless otherwise agreed and recorded in a QCP prior to commencement of manufacture of the valves.
q) The leakage rate for low leakage valves shall be rate D.
r) Valves will not be used for regulating purposes.
s) A test certificate is required for every valve.
t) Unless otherwise stated in Table C below, the coating system specified in VS.3.3 above is applicable.
u) All valves shall have their jointing surfaces protected during transit and storage.
v) All valves shall have their body ends sealed to exclude foreign matter during transit and storage.
w) Each valve shall have a manufacturer's certificate.

With reference to Annex A.2 to SANS 1849:2008 – Butterfly Valves:

a) This specification does not deal with the "other types of valves, shouldered, socketed, etc."
b) The design and function of position indicators shall be as agreed and recorded in a QCP – refer to VS.3.2 above.
c) The maximum allowable leakage rate shall be agreed and recorded in a QCP prior to commencement of manufacture of the valves.

In addition to the requirements of SANS 1849:2008, all valves shall comply with the following minimum requirements:

a) Valves shall be double flanged and be suitable for installation in terminal positions unless otherwise stated.
b) Valves shall be of the "tight shut off type" and water seals shall be the resilient seal type.
c) All stainless-steel components shall be Grade 316 stainless steel unless the design of the valve warrants a higher strength, high chrome steel.
d) Hubs for shaft bearing housings shall form an integral part of the valve body.
e) Valve bodies shall have adjustable mechanical stops to prevent over travel of the valve disc in the open and closed position.
f) Valves shall have the configurations shown in the table below:

(a) Nominal Pressure	PN 10 & PN 16	PN 25	PN 40	> PN 40
(b) Seal	EPDM or Nitrile – see g) below	EPDM or Nitrile – see h) below	EPDM or Nitrile – see h) below	Metal – see i) below
(c) Eccentricity	Nil	(d) Double eccentric	(e) Double eccentric	(f) Triple eccentric

a) For PN 10 and PN 16 valves, the resilient, synthetic rubber EPDM or Nitrile seal shall preferably be easily replaceable (not bonded), and shall entirely cover the inside of the body overlapping over the sides to form the seal between the body and matching pipework. The liner shall be keyed to the body with the annular groves in the bore of the valve to minimise distortion of the material. However, a fully bonded seal is acceptable, in which case, the seal should be bonded onto a phenolic backing ring, the valve manufacturer will be required to guarantee that they are able to reline their valves in RSA.
b) For PN 25 and PN 40 valves, the resilient, synthetic rubber EPDM or Nitrile seal shall be fixed to the disc with Grade 316 stainless steel retaining rings protected against galvanic corrosion in accordance with VS 3.3 above. The recess for the retaining ring in the blade or body shall be coated as specified or the seal face shall be assembled with a coat of wet solvent free epoxy having been applied. Seal retaining screws shall not be recessed but have a hexagonal or Allen key bolt head and spring washer underneath to ensure that water seepage does not occur into the screw area. The seal assembly should be done with the use of ‘‘Anti-seize’’ to ensure ease of removal and further prevent water seepage and corrosion.
c) For valves with a PN > 40, the disc seal shall be stainless steel and, as they need to be carefully matched the manufacturer shall supply a complete spare set including fixings and the costs shall be included in the tendered rate quoted for the valve. Furthermore, the valve manufacturer will be required to confirm that a facility to recondition the valve exists in RSA.
d) The design shall be such as to allow the disc to seal drop-tight to the liner, so that there is no ingress of fluid to the shaft area.\
e) The seat shall be sufficiently wide to permit at least 10 mm ‘‘lead’’ distance on each side for the resilient seal.
f) The resilient seal shall be ‘‘non-stick’’ and shall be stable and not deteriorate under conditions of continuous submersion in chlorinated potable water.
g) The valve seal and seat shall be replaceable without dismantling the valve - not applicable to PN 10 and PN 16 valves that may have bonded seals.
h) Discs shall be a single casting of a hydrofoil section with a smooth continuous surface. The maximum combined stresses in the disc shall not exceed 20% of the minimum yield stress of the material used when the specified unbalanced pressure is applied on either of the two sides.
i) Shafts may either be continuous or of a stub-shaft configuration. In the case of stub shafts, they must extend into the disc hub for a distance of at least 1,5 times the diameter of the shaft and they shall not protrude from the hubs i.e. the shaft shall not be exposed.
j) Shafts may be either round or hexagonal in cross section. The disc shall be attached to the shaft by means of a 'square drive' or spline or key. No allowance shall be made on dowel pins or taper pins to transmit torque. The connection of the disc to the shaft shall be capable of transmitting a shaft torque equivalent to at least 75% of the design torsional strength of the shaft. Dowel and taper pins that may be required to prevent lateral movement shall be mechanically secured.
k) Shafts shall be fabricated from high strength, high grade, stainless steel and be located in self lubricating sleeve type bearings/bushes. Each valve shall be fitted with at least one adjustable thrust bearing set to hold the disc securely concentric with the body or seat.
l) Shafts shall be located inside the disc and not be in contact with the water.
m) Shaft sealing shall be achieved with two replaceable O-rings at each end of the shaft and, where applicable, the rubber lining is to be moulded along the stem.
n) Each valve shall be equipped with an operating lever, or a gearbox with a handwheel, or an actuator as stated in Table C below.
o) Each valve shall be so protected as to minimize the possibility of damage during transit and storage. All valves shall be individually crated.

p) The valves will be installed with their shafts horizontal and the valve operating spindle, vertical. The direction of opening shall be such that the bottom of the disc moves in a downstream direction. The 'handing' of the valves shall be as shown in Table C below.

PS VS 8.1 Testing

Notwithstanding the requirements of SANS 1849:2008, the test pressure requirements are as follows:

a) All valves shall be subjected to an open-end gate strength test of 1,5 times the 'Pressure Rating' of the valve on both sides of the gate. Drop tightness in respect of this gate strength test is not required but shall comply with the requirements of SANS 1849.
b) All valves shall be subject to a body test of 2.0 times the 'Pressure Rating' of the valve.

PS VS 8.2 Gearboxes (for Butterfly Valves)

Where required and/or where specified, all gearboxes on butterfly valves shall comply with the following:

a) Gearboxes shall be side mounted and of the spur/worm type capable of being manually operated, by one person under the maximum unbalanced working pressure whilst applying a torque of no more than 120 Nm.
b) Shear pins shall be fitted to gearboxes in order to provide overload protection.
c) Water must not be able to leak past the main shaft and enter the actuator.
d) Disc position indicators shall be fitted to the gearbox and shall clearly indicate the fully open and closed positions.
e) A suitable arrow indicating the preferred flow direction through the valve, where such preference is applicable, shall be cast onto the body of the valve and, where applicable, the inappropriate arrow ground off.
f) The gearbox shall be fitted to the right-hand side or left-hand side of the valve when viewed from the upstream side as stated in Table C below.
g) The handwheel shall be of appropriate size and the direction of rotation of the operating hand wheel to close the valve shall be as stated in Table C below.
h) Gearboxes shall be coated in accordance with the coating specification for its associated valve.

TABLE C - BUTTERFLY VALVES

SANS 1849		**PN10**	**PN16**	**PN25**	**PN40**
Annex A.1 e)	Flanges	SANS 1123: Table 1000	SANS 1123: Table 1600	SANS 1123: Table 2500	SANS 1123: Table 4000
Annex A.1 e)	Flange faces	Flat face	Flat face	Flat face	Flat face
Annex A.1 h)	Holes in wafer valves	Drilled and tapped	Drilled and tapped	Drilled and tapped	Drilled and tapped
Annex A.1 l)	Operating device	Hand wheel	Hand wheel	Hand wheel	Actuator/ Handwheel
Annex A.1 t)	Coating System	VS.3.3	VS.3.3	VS.3.3	VS.3.3
VS.8.2 f)	Location of gearbox	Left / right hand side when viewed in the direction of flow	Left / right hand side when viewed in the direction of flow	Left / right hand side when viewed in the direction of flow	Left / right hand side when viewed in the direction of flow
VS.8.2 g)	Direction of closing	Anti-clockwise	Anti-clockwise	Anti- clockwise	Anti-clockwise

PS VS 9 AIR VALVES

PS VS 9.1 Design and Performance

The design and performance characteristics of the air valves must have been tested and approved by the Council for Scientific and Industrial Research (CSIR) or other similar testing authority.

Valves shall be capable of discharging high volumes of air through the large orifice under positive line pressure filling conditions and shall be capable of letting in high volumes of air under negative pressure conditions. In addition, the valve shall be capable of releasing small quantities of dis-entrained air at all line pressures up to the rated working pressure of the valve.

Air valves shall not exhibit the characteristics of dynamic closure in both the exhaust and vacuum mode. The valves shall be dual acting and suitably sized to enable the following without creating shock or pressure surges in the pipeline:

- Unrestricted intake of air under negative (sub atmospheric) pressure
- Unrestricted discharge of air under pressurised air pressure conditions and,
- Slow discharge of air that may come out of solution when the space beneath the air valve is full of water under pressure

The primary intake/discharge orifice shall be equivalent in cross-sectional area to the nominal diameter of the air valve. The discharge/intake port shall be protected by a non-corrosive screen or shield that shall not impair the discharge characteristics of the valve.

Discharge of pressurised air shall be controlled by the seating and unseating of a small orifice nozzle which shall only open in the presence of air and shall not leak under normal operating conditions.
The valve construction shall be proportioned with regard to the inherent material strengths such that excessive deformation or damage of any kind or leaks do not occur when the air valve is subjected to twice its rated pressure.

Valves shall react immediately to negative pipeline pressure in order to prevent the formation of unacceptably high negative pressure conditions.

During air discharge conditions, the large orifice shall close at a differential pressure across the large orifice of between 4 and 6 kPa in order to minimize transient pressure effects. The design shall enable air to continue to be released once the large orifice has closed under such conditions. This may be achieved by means of a secondary orifice or other approved manner. A slow closing characteristic is an important feature so as to sudden rate of change of velocity which will result in a pressure spine and concomitant surges in the pipeline.

The valve shall seal drop tight, without the use of a mechanical spring device, at all line pressures from 10 kPa up to 1,5 times the rated working pressure of the valve.

The valve floats and seals shall require minimal maintenance and it shall be possible to carry out such maintenance without removing the valve. Provision shall be made for the installation of a 6 mm stainless nipple and ball valve for the fitting of pressure gauges for testing purposes. The stainless-steel nipple shall extend through the body to cover all the threads.

Unless otherwise stated in Table D below, all ferrous components shall be treated as specified in VS.3.3 above.

All stainless-steel components shall be painted with “Everbond” or similar material applied in accordance with the manufacturer's instructions, the purpose of which is to disguise the stainless steel to minimise the risk of theft.

All air valves shall be supplied with a copy of the relevant factory test certificates that reflect the test pressure and valve serial number. Original factory test certificates together with a copy of the QCP referred to in VS.3.2 above, shall be issued for each valve.

Flange details are given in Table D below. The backs of each flange shall be spot faced over areas large enough to accommodate every washer and nut. All flanges are to be drilled with the holes off horizontal and vertical centrelines.

TABLE D – AIR VALVES

	PN10	**PN16**	**PN25**	**PN40**
Flanges	SANS 1123: Table 1000 *	SANS 1123: Table 1600 *	SANS 1123: Table 2500 *	SANS 1123: Table 4000 *
Flange Faces	Flat face **	Flat face **	Flat face **	Flat face **
Coating System	VS.3.3	VS.3.3	VS.3.3	VS.3.3

PS VS 10 VALVE ACTUATORS

Refer to Particular Specifications for Valve Actuators.

PS VS 11 DRAWINGS

The valve manufacturer shall provide fully dimensioned drawings for each type and size of valve and actuator. Drawings must be provided in .pdf and in an CAD format as required by the Employers Agent.

PS VS 12 INSPECTION

An inspector may be appointed by the Employer to witness the hydraulic and other testing of valves and/or to inspect valves prior to their release for delivery to site. Where an independent inspector is appointed, the test and/or inspection certificates must be signed by the supplier and the inspector.

The following procedure shall be employed for the inspection of all valves:

a) All valves will be subject to inspection at their place of manufacture or assembly or, where not manufactured or assembled locally, at the valve supplier.
b) Inspection may be carried out by the Engineer or a third party appointed by or on behalf of the Employer.
c) Where valves are provided with corrosion protective coatings, provision must be made for the prepared surfaces to be inspected by the Engineer or his representative prior to the application of any coatings or linings.
d) Provision must be made for all valves to be subjected to inspection and testing following application of corrosion protection coatings and prior to release from the factory for delivery to site.
e) Tests on the coatings and linings may include visual inspection, dry film tests and wet sponge
f) “holiday” detection tests at the Engineer's discretion.