7.1. Technical Specifications – For Wafer Valves and U Section Flanged Butterfly Valves

1. SCOPE

This specification covers the material and construction requirements for wafer butterfly valves for the control of water in sizes 80mm to 1000mm nominal bore for working pressure 1.6 and 2.5 Mpa and for u – section flanged butterfly valves for the control of water in sizes 1100mm to 1600mm nominal bore for working pressure 1.6 and 2.5 Mpa .

2. INTERPRETATIONS

2.1 Supporting Specifications

These valves shall be manufactured in accordance with EN593 Standard (NF E 29 - 430 and 29 - 431), Ductile Iron and Carbon Steel Wafer Valves for General Purposes, as far as is applicable. Where in conflict the requirements contained in this specification shall take precedence over the above-mentioned specifications.

The face to face dimensions to conform to IS0 5752-20 or EN558.1 Series 20.

The water leakage test must conform to 1S0 5208 or EN12266.

2.2 Application

The valves shall be used in the following applications:

(a) In water reticulation systems connected to services reservoirs; and

(b) In trunk mains supplying water to service reservoir.

The basic requirements for application (a) shall be fulfilled by Class 16 Valves while application (b) shall use Class 16 or 25 valves.
The number, size, class and type of valves required shall be detailed in the schedule of quantities.

3. MATERIALS

General

The following classes of valves are covered by this specification.

Class	Working Pressure	Pressure Rating
16	1600 kpa	PN16
25	2500 kpa	PN25

The materials used for construction of the wafer valves are listed in the following section.

4. CONSTRUCTION

4.1.1 Design

The valves shall be used on water services for positive shut off only. The valves shall be manufactured in accordance with EN593 Standard (NF E 29-430 and 29-431) as far as is applicable. Where conflict exists, the requirements in this specification shall take precedence.

The following criteria for construction shall be met:-

4.1.2 **Body**

These shall be of wafer type butterfly (flangeless) for all size 75mm dia up to 1000mm dia and u-section flanged butterfly valve for size 1100mm dia up to 1600mm dia. For valves from 75mm dia. up to 300mm dia. the valves is to be supplied with an additional flange where the bolt holes are tapped to suit the studs supplied with the valve. The additional flange allows for dismantling of the downstream pipework. U- Section flanged butterfly valves will be permitted as an alternative to providing an additional flange. Valve sizes above 300mm dia. no additional flange is required as dismantling of the downstream flanged pipework will not be permitted.

All valves shall be used for isolating purposes and the maximum allowable pressure differential across the valves with the disc in the closed position shall be the same as the working pressure:-

Class	Working Pressures	Pressure Ratings
16	1600kPa	PN16
25	2500kPa	PN25

The face to face dimensions to conform to 150 5752-20 or EN558.1 Series 20. Bodies shall be one piece casting , Ductile Iron, Cast Steel and shall never be in contact with the fluid conveyed i.e. fully protected internally by the resilient seat.

4.1.3 **Disc**

Shall be cast or stamped, spherically machined and positively splined or keyed internally to the driving shaft (use of pins or bolts is totally unacceptable).

The disc for 75mm dia up to 1600mm dia valves is to be made of either stainless steel grade 316, or Aluminum bronze.

4.1.4 **Shaft**

Wafer valve technology shall be such that the shaft will be located inside the disc and will never be wetted (dry shaft) stainless steel (with 13% chrome) shall be used. It is required that the shaft be internally positively splined or keyed to the disc. The upper and lower shaft and tie-bolt, when assembled to the disc, shall give in effect a one piece shaft/disc assembly.

4.1.5 **Liner**

The resilient, synthetic rubber seat shall 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. Liners shall be manufactured from EPDM unless otherwise specified. The liner must be approved by a recognised national body (SABS or similar) as suitable for used on potable water systems.

Note that the dimension of flanges to be used on connecting pipework shall comply with the relevant requirements of SANS1123 and flange detail as per Sketch A & B for wafer valves.

Where necessary, the liner shall be keyed to the body with annular groves, in the bore of the valve. 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.

Valves with ‘O’ ring shaft backup seals shall only be considered for particular applications.

4.2 **GEARBOX SPECIFICATIONS (MASTER GEAR OR SIMILAR APPROVED)**

1. The gearbox body material shall be cast in Spheroidal Graphite Iron Grade 42 and the mounting base conforms to ISO 5211.

2. The gearbox lid shall be in Spheroidal Graphite Iron Grade 42, and be fitted with a

bronze/PTFE bush where contact with the Quadrant Journal is made.

3. The gear-quadrant shall be cast in Spheroidal Graphite Iron Grade 42, only machine cut /rolled gears will be acceptable (no cast gears).

4. The minimum tooth size on gears or Quadrants shall be module 2.

5. The wormgear must be one piece or splined with the Input shaft, pins will not be accepted. EN57 or Nitempered steel to B.S. 5970 .606 M36.

6. The gearbox input shaft shall run in bronze bushes, or sintered iron copper bearing and be sealed where it passes through the gearbox housing, by means of an oil seal; the non drive end shall not be exposed to the atmosphere.

7. The gearbox body and lid shall be fully coated with powder epoxy/polyurethane coated to a minimum thickness of 50 microns .

8. All external fasteners shall be stainless steel.

9. The maximum hand wheel rim effort to operate the valve shall not exceed 400N.
10. The gearbox indicator shall indicate the valve position by means of non erasable markings and shall protect the valve stem from elements.

4.3 **OPERATING**

The valves shall be capable of being easily operated by one man against the maximum unbalanced pressure. The effort required to operate the valve shall not exceed a handwheel rim pull of 360 newtons and to achieve the maximum rated output of the gearbox. The handwheel diameter shall not exceed 450mm for valves up to 700mm dia. and not exceed 800mm for valves greater than 800mm dia.

The gear operator shall be designed with a worm and quadrant or Skotch Yoke system and shall conform to the specification as detailed in item 4.2.

The gear operator shall be irreversible in any position.

The drive gearing shall not be an integral part of the main body, but shall be situated on the right hand side of the valve, separate unit, bolted to the body for easy removal.

If compound gearing is necessary, a torque limiting device shall be provided at the input handwheel. All hand wheels shall be fitted with suitable sized shear pins that fail before damage can be done to the drive gearing or the valve.

The design of the drive gearing shall be such that the dynamic torque acting on a partially closed disc shall not cause the gearing to become motorised resulting in the uncontrolled closing of the disc.

Positive limit stops shall be provided to prevent over - opening and closing of the valves.

The direction of opening of the butterfly blade shall be such that the bottom of the blade moves in a downstream direction.

The gear shall have a handwheel and an indicator showing the position of the disc.

When sizing a gearbox, a factor of safety of at least 25% must be applied to the torque listed by the valve supplier.

The number of turns to open or close the valves must be filled in Annexure B and C and conform to International Best Practice for operating trunk watermains.

Suitable lifting lugs shall be provided.

4.4 **TYPE OF END TREATMENT**

All flanges adjacent to the wafer valve shall comply with the requirements of Sketch A & B to ensure adequate clamping of the elastometer liner.

The wafer valves and u – section flanged butterfly valve shall be supplied with socket weld type matching flanges, with flange diameters and thickness, bolt circle diameters, diameter of bolts, number of bolts and holes drilled off centre, in accordance with the appropriate pressure tables in SANS 1123 steel pipe flanges or B.S.4504: Part 1. Flanges and Bolting for pipes, valves and fittings except that where M27 and M33 bolts are specified in B.S. 4504, M24 and M30 bolts, respectively, shall be used or * BS EN 1092 PN 16, PN 25.

The valve shall be supplied complete with all necessary bolts, nuts, washers, ring gasket insertions ('Klinger' or similar approved) and slip-on type matching flanges. The bolts, nuts and washers shall be Grade 4.6, ordinary bolts hop-dipped galvanised (Class A - Heavy Duty). All jointing materials and matching flanges shall be mounted onto each valve on delivery.

All matching flanges shall be coated with a weldable primer (Plascon PA 10 etching Primer or similar approved) to a minimum dry film thickness of 25 micrometers.

4.5 MARKING

Each valve shall have a plate securely fixed to the body on which the following information shall be stamped:

a) the manufacturer's name;
b) the size of the valve;
c) the pressure rating of the valve; and
d) an arrow indicating the direction of flow.

5. CORROSION PROTECTION OF VALVES

5.1 General

5.1.1 Options

All valves shall be coated (external) and lined (internal) as specified hereunder.

5.1.2 Toxicity and Tainting of Conveyed Water

All products shall be approved by a recognised national body (SABS or similar) as suitable for used on potable water systems.

The cured materials shall be chemically unaffected by free chlorine or chloramine in water in concentrations up to 10mg/l and to ozone concentration up to 5mg/l in water and by pH ranging from 4 to 10.

5.1.3 Tender Submissions

A comprehensive Quality Control Plan (QCP) shall be submitted with the tender. The QCP shall be based on the proformas given in Annexures 1 & 2. No change shall be made to the QC without the approval of the Engineer.

Failure to submit a QP with the minimum information required for tender purposes may disqualify the tenderer.

Prior to coating and lining application, the QP shall be approved by both eThekwini Water and the Epoxy Supplier. The Contractor will be responsible for obtaining such approval.

5.1.4 **Inspection During Manufacture**

Ethekwini Water reserve the right to insist upon inspection of valves following grit-blasting and following application of coating in the event of there being a problem with coatings or linings.

In the event that inspections are required, the Contractor shall give eThekwini Water Services 24 hours notice for inspection. All costs due to any delays for such inspections shall be to the Contractor's account.
Excessive coating build up in flange bolt holes will not be permitted.

5.2 **Surface Preparation**

5.2.1 **Substrate Condition**

The surface shall be free of all weld splatter, slag and loose scale.

5.2.2 **Degreasing**

Valves shall be degreased by the use of a water rinsable solvent degreaser such as that complies with SABS 1344 or, for use in enclosed systems, with SABS 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.

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

5.2.3 **Blast Cleaning**

The valve shall be blast cleaned by air blast cleaning methods, then vacuum cleaned or blown off to achieve the following standards:-Cleanliness shall be equal to SA3 of Swedish Standard SIS 05 5900 when tested in accordance with SABS method 767.

The profile produced by blast cleaning shall be angular and shall have an average peak to valley height of 60 to 100 micrometers, when tested in accordance with SABS Method 772. Hackles shall be removed with coarse abrasive paper.

Residual dust and debris shall not exceed 0,2% when tested in accordance with SABS Method 769.

Water soluble salts shall not exceed 100mg/m^2 at any point when tested with the Weber-Reilly Reagent.

Any laminations revealed by blast cleaning shall be ground out and reblasted. If grinding penetrates the body to a depth greater than 8% of the nominal wall thickness the valve shall be rejected.

5.2.4 **Handling of Cleaned Valve**

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

5.2.5 **Chemical Treatment**

Chemical pretreatment of the blast cleaned pipe may be applied provided that:-
The process to be used is approved by the Engineer in writing.

The process is applied in a manner and in such quantities as specified by the manufacturer of the process.

5.3 Corrosion Protect of Flanges

The mating face 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 then receive one coat of rust inhibitor (Plascon Rustrix 84 or equal approved).

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.

5.4 Fusion Bonded Epoxy Powder Coating System (Option 1)

5.4.1 Heating of Valve

Heating of the valve shall be effected by heat soaked in an oven provided that:-

- The valve surface is not contaminated by fumes, soot deposition, acid deposits or other harmful contamination.
- The valve surface is not discoloured by excessive heat.
- The surface temperature of the valve is uniform and does not vary by more than ± 5 degrees Celsius from optimum coating temperature when measured immediately prior to coating. Valve temperature shall not exceed 275 degrees Celsius at any point.
- Infra-red pyrometers for measurement of pipe temperature shall be calibrated by thermocouple, heat sensitive crayon or other approved method.

5.4.2 Requirements in respect of Fusion Bonded Epoxy Powder.

5.4.2.1 Approval of Supplier

The epoxy coating shall be a fusion bonded epoxy powder coating, Mobilox 1004-R1, Vedoc VPC 2001 or similar approved.
To obtain approval, the supplier shall provide manufacturer's test results in writing that demonstrate that the powder is capable of meeting the requirements specified in Table 4.

QUALIFICATION REQUIREMENTS OF EPOXY POWDER

NO.	PROPERTY	REQUIREMENT	TEST METHOD
1	I. R. Spectrogram	For reference against Contract supplies	Potassium Bromide disc
2	Thermal Characteristics	For reference against contract supplies Delta H (Enthalpy) Delta H (Enthalpy) Tg1 and Tg2 (Glass transition temperatures uncured and cured) to be supplied	Differential Scanning Calorimetry 20° C/min scan rate
3	Gel Time at 180□ C	For reference against contract supplies	Hot plate
4	Sieve analysis	Sieve size in micrometers Zero retained on 500. Not more than 1% retained on 250	Mechanically agitated stack of sieves
5	Dielectric Strength	Not less than 30kV/mm	SABS1217. Section 8.10
6	Cathodic Disbonding	Total disbonded area not to exceed 20mm diameter after 30 days. Current flow not to exceed 5mA	AST< G8. Method B - Magnesium Anode - 20°C 7mm diameter holiday
7	Accelerated Cathodic Disbonding	Total disbonded area not to exceed 12mm diameter inclusive of artificial holiday	Impressed current -3.5 volts potential at 75°C for 48 hours 3mm diameter holiday
8	Adhesion (Hot water soak)	Disbonded length not to exceed 5mm from point of V	Immerse in water at 75°C 48h. Remove and make V-cut at 30° angle. Test adhesion when cooled to 25°C
9	Flexibility Test	No electrical insulation defects after bending	Bend at 0° to 2% strain
10	Impact Resistance	No electrical insulation defects after impact	ASTM G 14 but using flat panel clamped firmly to a rigid base such as 12mm thick flat steel, impacted at 2 Joules

NOTE: Tests 5-10 are carried out on 6mm thickness steel test panels, blast cleaned, prepared, coated and cured in accordance with the powder manufacturer's recommendation.

TABLE 4

5.4.2.2 **Approval of Batches**

The Contractor shall satisfy himself as to the suitability of the powder in terms of the requirements of Table 4 prior to commencement of coatings.

Before commencing work, the Contractor shall furnish eThekwini Water with documentation indicating that the proposed Epoxy Powder will comply with requirements of Table 4.

5.4.3 **Application of Coating**

5.4.3.1. **Method of Application**

Powder shall be applied by electrostatic spray guns.

Powder shall pass through a magnetic separator (which shall be regularly cleaned) in order to remove any iron or steel particles.

Powder reclaimed from the spray booth shall not be mixed with virgin powder.

The specified thickness shall be achieved in one application. In the event of thickness being less than the minimum specified the coating shall be removed and the valve shall be reblasted and recoated to comply with the specification.

5.4.3.2 **Handling of Coated Valve**

Until the coating has cured, the valve shall be handled in such a manner to ensure that the coating is not damaged and remains blemish free.

5.4.3.3 **Quenching of the Coated Valve**

Quenching of the valve with clean water is permitted provided that the coating is fully cured and complies in all respects with the requirements of the specification.

5.4.3.4 **Requirements of Cured Fusion Bonded Epoxy Powder Coating**

The cured fusion bonded epoxy powder coating shall meet the requirements specified in Table 5.

REQUIREMENTS OF CURED FUSION BONDED EPOXY POWDER COATING

	PROPERTY	REQUIREMENT	TEST METHOD	FREQUENCY
1	Visual	Smooth glossy or semi glossy finish, free from excessive runs, sags, orange peel, occlusions or other visible defects	Use an experienced observe	Each Valve
2	Coating Thickness	Min. 200 Max 500 microns	SABS Method 141. Minimum 6 readings/valve.	Each Valve
3	Electrical Insulation Defects	Nil defects at 3500 Volts. For Conditions of repair see Clause 3.4.7.	SABS 1217 Section 8.12.2	Each Valve
4	Impact Resistance	No defects at 2 Joules	SABS 1217 Section 8.7	Random 5% of valves
5	Degree of cure: Dynamic Test	No softening or discoloration	20 double rubs with cotton wool swab soaked in MEK	Each Valve

TABLE 5

5.4.4 **Repair of Small Areas of Mechanical Damage**

This procedure describes the method of repair of small areas of mechanical damage to the coating film.

- Thoroughly degrease the affected area and surround by washing with water - rinsable solvent or detergent to achieve a water break-free surface. Rinse the washed area with running clean, potable water and allow to dry.

- Remove any loose or cracked paint, by suitable mechanical means such as grinding or sanding. If the metal substrate is exposed, clean to rough bright metal during this process. Be sure not to burnish or polish the metal substrate if sanding is the selected method, as this may result in poor adhesion.

- Thoroughly roughen the paint surface to minimum of 100mm radius around the areas treated as above, feathering the coating towards the outer perimeter of the repair. Brush off any dust formed.
Immediately apply to an approved repair “squish pack” (Plascon Hicote 151 or similar approved).

- On completion a 10mm halo of feathered sound coating should be evident around the entire repair.

- Holiday testing of all repairs shall comply with the original coating specification.

5.5 **Solvent Based Epoxy Coating System (Option 2)**

5.5.1 **Materials**

The materials shall comply with SABS 1217 - 1984 Type 1A solvent borne chemically cured epoxies.

The following proprietary products, or similar approved, are acceptable to eThekwini Water

- Carboline 891
- Copon EP2300 & Plascogard KSIR 88
- Sigmaguard EHB

The applied coating and lining shall comply with the requirements of Table 6 and the relevant product data sheet.

5.52 Dry Film Thickness

- Solvent Borne Epoxy (Type 1 A)
- Coating : 350 microns ± 50 microns
- Lining : 250 microns ± 50 microns

The number of coats to achieve these coating thicknesses will be addressed in the Quality Control Plan (Annexure 2)

5.5.3 **Repair of Small Areas of Mechanical Damage**

This procedure describes the method of repair for small areas of mechanical damage to the coating film. Three repairs per square metre of valve coating will be permitted. In the event that more repairs are required, the coating will be rejected and the entire valve shall be prepared for re-coating.

Thoroughly degrease the affected area and surround, by washing with water - rinsable solvent or detergent to achieve a water break free surface. Rinse the washed area with running clean, potable water and allow to dry.

Remove any loose or cracked paint, by suitable mechanical means such as grinding or sanding. If the metal substrate is exposed, clean to rough bright metal during this process. Be sure not to burnish or polish the metal substrate if sanding is the selected method, as this may result in poor adhesion.

Thorough roughen the paint surface to minimum of 100mm radius around the areas treated as above, feathering the coating towards the outer perimeter of the repair. Brush off any dust formed.

Immediately apply a coat of the original coating (repair kits available in small packages) to the prepared area, in accordance with the original coating specification. Build up with successive coats to achieve required total dry film thickness, observing application and curing conditions as stated on the relevant product data sheet.

On completion a 10mm halo of feathered sound coating should be evident around the entire repair.
Holiday testing of all repairs shall comply with the original Coating Specification.

REQUIREMENTS OF SOLVENT BASED EPOXY

NO.	PROPERTY	REQUIREMENT	TEST METHOD	FREQUENCY
1	Visual	The lining shall be smooth, free from excessive runs, sags, orange peel, occlusions or other visible defects	Use an experienced observer.	Each Valve
2	Coating Thickness	Minimum : 200 microns	SABS Method 141	Minimum 6 readings/valves
3	Electrical Insulation Defects	Nil defects when tested at 90 Volts 2 Megaohms	SABS 1217 - Section 8:12	Each Valve
4	Degree of Cure	No softening or discolouration	20 double rubs with cotton wool swab soaked in MEK	Each Valve
5	Adhesion	Destructive testing not recommended		

TABLE 6

5.6 THERMOPLASTIC POLYMIDE 11 POWDER COATING (RILSAN, OR SIMILAR APPROVED) OPTION 3

5.6.1. PRE TREATMENT

5.6.1.1 Visual Inspection of Components Before Proceeding

All items intended for coating shall be visually examined for manufacturing and materials defects, which could render them unsuitable for coating. The design and manufacture of all items for coating shall be in accordance with good surface engineering practices. Wherever possible, any items intended for coating must have radiused edges and corners.

a) All casting shall be free from porosity, cracks, sharp edges and corners.

b) Welded fabrications shall be used continuous welds, All welds must be free from porosity, slag, weld splatters and undercuts.

c) All items for coating shall be uncoated and free from silicone or lanolin based oil and grease.

5.6.1.2 Degreasing

a) Where necessary, all items intended for coating shall be degreased to remove all oil, grease and residual surface solids.

b) Ferrous items too large for conventional degreasing (e.g. large diameter pipe couplings) must also be free of oil and grease. Pre-baking at a temperature/time parameter sufficient to rid them of oil or grease is permissible.

c) Non-ferrous items may be treated as per 5.6.1.2.(b). Items too large for conventional de-greasing and where it is intended to fluid bed coat, the items shall be hand wiped prior to grit blasting.

d) Non-ferrous items intended for electrostatic coating shall be chromate pre-treated, following an appropriate chemical cleaning process.

5.6.3 Grit-Blasting

5.6.3.1 Grit-Blasting : For Fluid Bed Coating

All items intended for coating by the Fluid Bed and Flock Spray methods must be grit blasted. The air projecting the grit must be dry and oil free . Wheel blasting is acceptable . The blast profile shall be between 40 microns and 90 microns . (peak and valley height of 60 to 100 microns, when tested in accordance with SABS method 772. Hackles must be removed with coarse abrasive paper). The graphite layer beneath the surface of cast iron shall not be exposed.

5.6.3.2 Grit-Blasting : For Electrostatic Spray Coating

Items intended for electrostatic spray coating shall be subjected to grit blasting. The air projecting the grit shall be dry and oil free. Wheel blasting is acceptable. The blast profile shall be a maximum of 30 microns peak to valley height. All grit blasted surfaces shall comply with Standard ISO 8501-01 SA 2.5/3 quality and shall be dedusted. The surface roughness, accordingly to Standard ISO 4287-1, shall comply with Rz range 40 to 90 microns and Ra 7 to 10.5 microns.

a) All items shall be primed or processed within 8 hours of grit blasting shall be housed in a dry ambient atmosphere in the interim period. If any visual sign of rusting is observed immediately prior to processing, the items shall be re-grit blasted. (See also 5.6.2).

b) All threaded holes shall be protected during grit blasting. The use of wood, rubber and some other suitable bungs or slave studs in permissible.

5.6.1.4 Out-Gassing

a) Ferrous castings, which suffer non visible porosity, resulting in blistered coatings, shall be out-gassed by pre-heating at a temperature between 235 degrees C and 265 degrees C for approximately two hours. Coating shall take place as soon as the castings have cooled sufficiently to process and within four hours of out-gassing.

b) Non-ferrous casting which gives rise to blistered coatings, shall be pre-heated at between 235 degree C and 265 degree C for approximately two hours.
Coating shall take place as soon as the castings have cooled sufficiently to process and within four hours of out-gassing.

a) Out-gassing, when conducted, shall precede grit blasting.

5.6.2 PRIMING

Priming for all processes shall take place onto surfaces, which are clean and have been de-dusted and with eight hours of grit-blasting pre-treatment.

5.6.2.1 Primer for Fluid Bed Coating

All surfaces shall be sprayed with RILPRIM type P23V40, or similar approved, so that a continuous film is obtained when dry. Items shall not be stacked for spraying. Each item shall be treated individually. The primer shall be allowed to become dry to the touch before pre-heating is conducted. Application may be conducted by conventional or electrostatic spray gun. Primer thickness shall be 10 to 20 microns (dry film).

Evidence must be provided, if requested, that the shelf/pot life of one year of Primer P23V40, or similar approved, has not been exceeded.

5.6.2.2 Primer for Electrostatic Spray Coating on Ferrous Metals

All surfaces shall be sprayed with RILPRIM type 104B/204A, or similar approved. This two pack primer material shall be mixed 50:50. Application may be conducted by use of a conventional spray gun so that a continuous film is obtained when dry. The primer shall be dry before the application of the power. Primer thickness to be 8 to 15 microns (dry film).

The shelf life of unmixed primer 104/204A , or similar approved, components of one year shall not be exceeded.

Even if it is still liquid after five days, blended primer 104B204A, or similar approved, shall be discarded after that period.

5.6.2.3 Primer for Electrostatic Spray Coating on Zinc of Aluminum

All surface shall be sprayed with RILPRIM type 16A + BD16, or similar approved. This two pack material shall be mixed 100 to 30 Part A to Part B by weight (or 5 to 1 Part A to Part B by volume).

Application made by conventional spray gun is acceptable provided that a continuous film is obtained when dry. The primer shall be dry before the application of the powder. Primer thickness shall be 8 to 15 microns (Dry film)
The shelf life of unmixed primer type BD15A/BD15B, or similar approved, of one year shall not be exceeded.

The pot life of blended primer 16A + BD16B, or similar approved, of one year shall not be exceeded.

5.6.3. COATING METHODS (SUITABILITY FOR VARIOUS COMPONENTS)

The fluid bed (Dip) method and electrostatic spray coating methods are to be used on castings and fabrications where coating thicknesses of 180 microns are required.

In all processes only RISLAN, or similar approved coating powders with approval for use in contact with potable water shall be employed. The current colours and grades available shall be obtained from the suppliers and approval for their selection shall be obtained from eThekwini Water.

5.6.3.1 Fluid Bed Coating : Masking

Masking : Threaded holes shall be masked with heat proof bungs, glass wool or slave studs to prevent them from being coated.

5.6.3.2 Fluid Bed Coating : Pre-heating

Pre-heating shall take place in ovens fitted with temperature indicators/controllers which are capable of controlling within the supplier's recommended dip coat temperature ranges. (The Supplier's Application Handbook which provides specific temperature recommendations is to be complied with). Ovens shall preferably be of the forced air circulation type and accurate to ±5 degree C anywhere in the work space at 350 degree C.

5.6.3.3 Fluid Bed Coating : Dipping, Coating Appearance, Cooling

Dipping shall take place in such a way as to produce an even, smooth, uniform colour, fully fused, and unburned coating with a pinhole free aspect.

The coated component shall be allowed to air cool to ambient temperature prior to inspection and packing.

5.6.3.4 Electrostatic Spray Coating : Masking

Where necessary, masking may be conducted by means of proprietary self adhesive tapes or by means of solid masks, to facilitate powder removal (after spraying) on selected areas.

5.6.3.5 Electrostatic Spray Coating : Coating Procedures, Coating Thickness

Items to be coated shall be suspended in a suitable manner and primed in accordance with Section 2. Powder must then be applied to give a visually even covering.

A fused, pinhole free coating film thickness of 150 to 300 microns must result after stoving.

5.6.3.6 Electrostatic Spray Coating : Post Fusion

Post fusion shall only take place in ovens fitted with temperature indicator/controllers capable of providing an air temperature of 220 ° C 230 ° C. The oven must be of the forced air circulation type, accurate to ±5 ° C anywhere in the work compartment at the specified temperature. The speed of air circulation shall not exceed 3m/s.

Only after the powder has melted to form a completed smooth glossy film, may the item be removed from the oven and allowed to air cool to ambient temperature before inspection and packing.

5.6.4. RILSAN TOUCH-UP (EPASFILL PT521DW) OR SIMILAR APPROVED

5.6.4.1 Description

This two-component solvent free epoxy coating may be applied in a thick film of 100-450 microns by brush, palette knife or a two component hot-airless spray. These methods are permissible.

5.6.4.2 Application

Rilsan Touch-up, or similar approved, is acceptable as an impact-resistant and chip-proof coating and as a repair paste for steel fittings.

5.6.4.3 Physical Data

The following physical data shall be of relevance:-

Appearance:	Semi-Gloss
Colour:	Black
Solids contents:	100% - by volume (mixed product)

- Film Thickness to be achieved: 350 microns plus or minus 50 microns

Curing times at 350microns shall be:-

	at 20° C/65% RH	at 40° C/60% RH
dust dry	2 hours	0.5 hours
tack-free	3 hours	1 hour
hardened	6 hours	4 days

Overcoating intervals / (times)

	at 20° C/65% RH	at 40° C/60% RH
Minimally	8 hours	3hours
Maximally	1 day	l day

NOTE: Curing and overcoating times are to be varies with temperature. Before recoating, any pollutants must be removed carefully from the surface. Where the maximal overcoating interval is exceeded, the surface must be made rough (e.g. by slight shot-blasting) so that the suture achieved is achieved.

- Head Resistance. The maximally achievable temperature of 140° C (dry exposure) is to be obtained. (This value is to be confirmed by eThekwini Water after experimentation).
- Flash point (closed cup method)
- A-component (base) : 200° C
- B-component (hardener) : 130° C

5.6.4.4 Preliminary Treatment of Steel Surface

5.6.4.4.1 New Steel

The welds shall be connected without chain welds and overlaps. The steel shall be shot-blasted with a dry shot blast agent according to the Swedish Standard SIS 05 5900-1967 degree of purity SA2,5 and a roughness profile of circa 50microns (top-valley-height). The surface shall be cleaned carefully.

5.6.4.4.2 Pre-Treatment

The surface shall be leaned with a suitable detergent that contains a solvent or a water-soluble emulsifier so as to remove oil, grease and dirt. Salt and other water-soluble pollutants shall be removed by spraying with fresh water under high pressure. All rust etc. shall be removed by shot-blasting to achieve degrees of purity of SA 2,5 in accordance with the Swedish Standards SIS 05 5900-1967. Dust and all remaining pollutants shall be removed before painting commences by brushing off or vacuuming the surface carefully. Epasfill PT, or similar approved, is to be used to touch up to achieve the prescribed film thickness.

5.6.4.4.3 Application

Epasfill PT 521 DW, or similar approved, shall be applied directly to the steel. Before the parts are finished off, those parts which are polluted during building and storage shall be thorough cleaned and rust removed from damaged areas and touched up.

5.6.5. STRIPPING

It is permissible for a non-conforming coating to be removed from a salvageable work piece

using one of the difference processes listed below.

- Burning coating with a propane gas flame,

- Burning coating in an oven at 450° C equipped with fume filtration,

- Burning coating in a pyrolysis oven at 450° C equipped with an afterburner at 200° C and fume filtration,

- Burning coating in a fluid bed furnace at 420° C/450° C equipped with an afterburner at 900°C and fume filtration,

- After burning off, the work piece shall be grit-blasted as outlined in 5.6.3.

5.6.6. COATING QUALITY

5.6.6.1 Visual Inspection

The coating shall appear uniform in colour and texture and not have blisters, bubbles, grazed areas or contaminate inclusions. It shall be completely fused to a smooth continuous film. No bare metal shall be visible except where masking has been conducted. No tears, runs, sags or excessive coating build up shall exist.

5.6.6.2 Thickness Test

Coatings applied on ferrous substrates shall be measured with the conventional magnetic type thickness gauges after calibration to provide for galvanising or plating in the case of this type of workpiece and calibrated to account for the grit blast profile, if in use.

5.6.6.2.1 Coatings on Aluminium or Non Ferrous Metals

Coatings on aluminum or non ferrous metals shall be measured by electrical meters (e.g. from ELCOMETER, FISCHER) calibrated from the metal concerned, and the grit to blast profile, if in use.

5.6.6.2.2 Coating thickness

Coating thickness shall be measured in at least three places around couplings etc.

5.6.6.2.3 Fluid Bed Applied Coatings

Electrostatic spray applied coating should be a minimum of 150 microns thick and a maximum of 300 microns thick.

5.6.6.3 Adhesion Test

Periodic checks shall be made. These checks shall be in accordance with the technical information obtainable from the supplier.

5.6.6.4 Holidays/Pinhole Check

- Periodic check for porosity and coating continuity shall be conducted using an ELCOMETER wet sponge type (9volts DC) HOLIDAY DETECTOR or similar instrument operating in a similar manner which when drawn across the surface, emits a signal if a holiday pinhole or discontinuity is discovered. Particular attention shall be paid to edges.

- Items found to be defective shall be rectified, or rejected, or rejected for re-coating, if touch up repair is not practical.

5.6.7. HANDLING, TRANSPORTATION AND STORAGE REQUIREMENTS

The coated items shall be handled without causing damage, either to the ends, or to the coatings.

Accordingly, the direct use of steel or slings or of any equipment the shape or type of which could damage the coating and the ends is prohibited.

The items shall not be stored directly on a rough ground, either in the storage area of the coating works, or in the final user warehouse or on site.

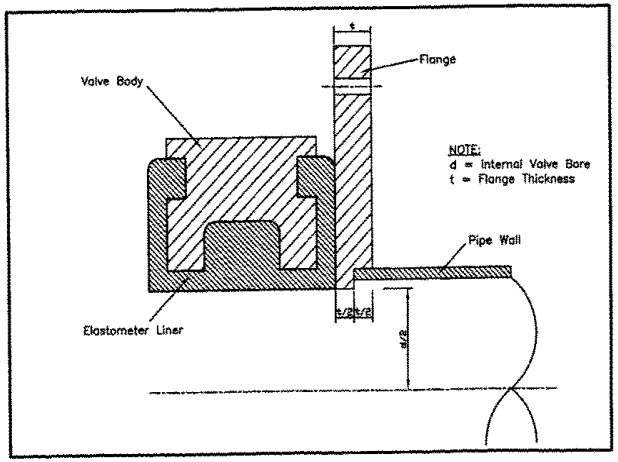
The storing of these items shall be on a piece of wood to avoid coating damage.

The handling for transportation shall be carried out with care in order to avoid coating damages.

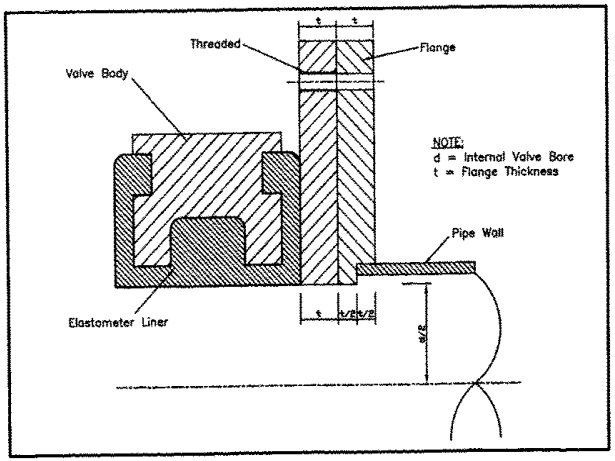
It shall be ensured that coated goods are not damaged during storage.

ANNEXURE A : FLANGE SKETCH A, B & C

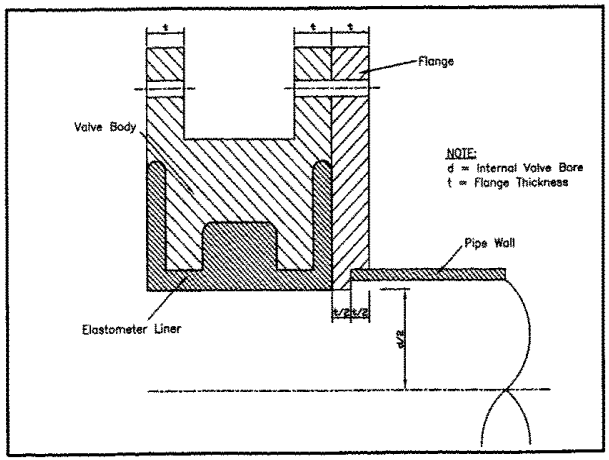
The Designer shall ensure that flanges adjacent to Butterfly Valves comply with the requirements of Sketch A, B & C to ensure adequate clamping of the Elastometer liner.



SKETCH A : SLIP-ON FLANGE DETAIL FOR ELASTOMETER VALVES



SKETCH B : ADDITIONAL FLANGE DETAIL FOR DOWNSTREAM DISMANTLING OF PIPEWORK



SKETCH C : SLIP-ON FLANGE DETAIL FOR ELASTOMETER VALVES FOR U SECTION FLANGED VALVE

6.**TESTING**

6.1 **Hydraulic Test**

Notwithstanding, the test pressure of both the body and the disc shall be twice the working pressure. The test pressure for the disc test, shall be the working pressure.

A test certificate shall be provided by the manufacturer for each valve. Unless otherwise specified in Part "AA" Project Specification tests may be witnessed by a nominated representative and eThekwini Water Services bylaws, all valves must be approved.

6.2 **Samples and Descriptive Matter**

The Tenderer's attention is drawn to the fact that all valves must be approved by eThekwini Water and Sanitation.

The valve supplier shall submit with their quotation a copy of the manufacturer's specification of the valves offered supported by illustrated pamphlets or brochures and drawings showing all leading dimensions, material composition of all parts, intake and discharge capabilities and test results undertaken by independent bodies of the valves offered.

7.MEASUREMENT AND PAYMENT

No payment shall be made until satisfactory test certificates have been provided.

ANNEXURE 1

PROFORMA

QUALITY CONTROL PLAN

FUSION BONDED EPOXY POWDER COATING SYSTEM (OPTION 1)

ESSENTIAL INFORMATION TO BE FURNISHED WITH TENDER	
ITEM	**INFORMATION**
Powder Supplier	:
Address & telephone no. of Powder Supplier, Contract Person, Powder Brand Name	:
Name of Body which has approved product for use on portable water systems.	:
Coating Applicator	:
Address & Telephone no. of Coating applicator	:
Contact Person	:

Before commencing work the contractor shall furnish eThekwini Water with documentation indicating that the proposed epoxy powder will comply with the requirements of Table 4 of this Specification.

FUSION BONDED EPOXY COATING SYSTEM (OPTION 1)

QUALITY CONTROL PLAN			
NO.	ITEM	STANDARD (CLAUSE REF.)	OBSERVATION
1	Valve Description:		
2	Valve Serial No:		
3	Surface Preparation		
	*Substrate Condition	Corrosion Protection	
	* Degreasing	Corrosion Protection	
	* Blast Cleaning	Corrosion Protection	
	* Chemical Treatment	Corrosion Protection	
4	Corrosion Protection of Flanges	Corrosion Protection	
5	Heating of Valve	Corrosion Protection	
6	Coating Performance		
	* Visual	Table 5	
	*Coating Thickness	Table 5	
	* Electrical Insulation Defects	Table 5	
	*Impact Resistance (1 in 10)	Table 5	
	* Degree of Cure	Table 5	

SIGNED:ETHEKWINI WATER: .....

CONTRACTOR: .....

POWDER SUPPLIER: .....

The Contractor shall obtain approval of the QCP from eThekwini Water and the Powder Supplier before commencing work.

ANNEXURE 2

PRO FORMA

QUALITY CONTROL PLAN

SOLVENT BASED EPOXY COATING SYSTEM (OPTION 2)

ESSENTIAL INFORMATION TO BE FURNISHED WITH THE TENDER	
ITEM	**INFORMATION**
Proposed Product	:
Address & Telephone No. of Supplier	:
Contract Person	:
Name of Body which has approved Product for use on Potable Water Systems	:
Coating Applicator	:
Address & Telephone No. of Coating applicator	:
Contact Person	:
Application Method (e.g. Airless Spray)	:

PRO FORMA

SOLVENT BASED EPOXY COATING SYSTEM (OPTION 2)

QUALITY CONTROL PLAN			
NO.	ITEM	STANDARD (CLAUSE REF.)	OBSERVATION
1	Valve Description		
2	Valve Serial No:		
3	Surface Preparation		
	* Substrate Condition	Corrosion Protection	
	* Degreasing	Corrosion Protection	
	*Blasting Cleaning	Corrosion Protection	
	* Chemical Treatment	Corrosion Protection	
4	Corrosion Protection of Flanges	Corrosion Protection	
5	No. of Coats	No.	No.
6	Minimum Overcoat Time	Hr.	Hr.
7	Maximum Overcoat Time	Hr.	Hr.
8	Minimum Temperature	°C	
9	Maximum Humiture		
10	Coating Performance		
	* Visual	Table 6	
	* Dry Film Thickness (min)	Table 6	
	*Dry Film Thickness (max)	Table 6	
	* Electrical Insulation	Table 6	
	*Degree of Cure	Table 6	

SIGNED : ETHEKWINI WATER:.....

CONTRACTOR: .....

EPOXY SUPPLIER: .....

The Contractor shall obtain approval of the QCP from eThekwini Water and the Epoxy Supplier before commencing work.