PART C

ETHEKWINI WATER AND SANITATION

TECHNICAL SPECIFICATION

FOR

PART C – WS.7545 **AIR RELEASE AND VACUUM BREAK VALVES**

AUGUST 2012

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FOR

AIR RELEASE

AND VACUUM BREAK VALVES

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TECHNICAL SPECIFICATION

FOR

AIR RELEASE AND VACUUM BREAK VALVES

1. SCOPE.

This specification covers the material and constructional requirements for 25-200mm diameter air release and vacuum break valves for the discharge and intake of air for working pressures up to 2500kPa.

2. APPLICATION.

The valves shall be used in the following applications:

a) to vent air from the pipeline while it is filling with water.

b) to release pressurized air entrained under pressure at high points of the pipeline.

c) to admit air into the pipeline to prevent the creation of a vacuum that may be the result of valve operation, the rapid draining or failure of the pipeline.

3. MATERIALS.

The following classes of valves are covered by this specification:

Class	Working Pressure	Pressure Rating
16	1600 kPa	PN 16
25	2500 kPa	PN 25

4. CONSTRUCTION.

4.1 DESIGN AND OPERATION OF SMALL BORE AIR VALVES FOR USE IN WATER RETICULATION.

25mm Single Orifice Air Valves. - D.M.W.S STOCK CODE – 4224211.

25mm Single Acting air release valves, class 16, epoxy coated ductile iron body and cover, solid HDPE float, 304L stainless steel small orifice nozzle, EPDM nozzle seat and body seal, valve outlet to be fitted with a 15mm Plastic 90 deg elbow (Screwed), air valve inlet to be screwed 25mm BSP.

50mm Double Orifice Air Valves. – D.M.W.S STOCK CODE – 4224202.

50mm Double Purpose air release / vacuum break valves, class 16, epoxy coated ductile iron body and cover, solid HDPE floats, 304L stainless steel small orifice nozzle, EPDM small orifice nozzle seat and body seal, valve outlet to be fitted with a dirt inhibitor cover, air valve inlet to be screwed 50mm BSP.

5 CONSTRUCTION.

5.1 DESIGN AND OPERATION OF AIR VALVE USED ON TRUNK WATERMAINS.

25MM TO 200MM.

D.M.W.S STOCK CODES.

Stock Code – 4240546 - 25mm PN 16/25 RBX Stainless Steel Air Valve, Screwed.
Stock Code - 4240555- 50mm PN16/25 RBX Stainless Steel Air Valve, Screwed
Stock Code - 4240493 – 100mm PN 16 RBX Stainless Steel Air Valve, Flanged.
Stock Code - 4240500 - 100mm PN 25 RBX Stainless Steel Air Valve, Flanged
Stock Code - 8221501- 200mm PN 15 RBXb Air Valve Flanged.
Stock Code - 8221502 – 200mm PN 25 RBXb Air Valve Flanged.

The Air Valves shall be the double purpose air release / vacuum break type air valves.

The air release / vacuum break valve shall be of the compact single chamber design, with a **solid cylindrical** H.D.P.E. control float, including the small orifice float be housed in a tubular 304L stainless steel body with epoxy powder coated ductile iron end flanges secured by means of stainless steel tie rods.

The air valves shall have an integral 'Anti – Shock' Orifice mechanism which shall operate automatically to limit transient pressure rise or shock induced by closure to 1.5 x valve rated working pressure.

The use of Ball type air valves are **not** acceptable.

The use of hollow floats is **not** acceptable.

Large orifice sealing shall be effected by the flat face of the control float seating against a EPDM rubber "O" ring housed in a dovetail groove circumferentially surrounding the orifice.

Discharge of pressurized air shall be controlled by the seating and unseating of the small orifice nozzle on a natural rubber seal affixed into the control float. The nozzle must have a flat seating land surrounding the orifice so that damage to the rubber seat is prevented.

The outlet orifice area shall be equal to the nominal size of the valve i.e: **100mm air valve must have a 100mm outlet orifice.**

The valve construction shall be proportioned with regard to material strength characteristics, so that deformation, leaking or damage of any kind does not occur by submission to twice the designed working pressure.

The valve design shall incorporate an over pressure safety feature that will fail without an explosive effect, such as is normally the case when highly compressed air is suddenly released. The feature shall consist of easily replaceable components such as gaskets, seals or the like.

The tenderer is to supply precise details of all materials used to manufacture valve component parts with the tender.

5.2 OPERATION.

1. Prior to the ingress of liquid into the valve chamber, as when the pipeline is being filled, valves shall vent through the large orifice when water approach velocities are relative to a transient pressure rise, on valve closure, of < 1.5 x valve rated pressure.
   At higher water approach velocities, which have the potential to induce transient pressure rises > 1.5 x valve rated pressure on closure, the valve shall automatically discharge air through the "Anti – Shock" orifice and reduce water approach velocity, so that on closure a maximum

transient pressure rise of <1.5 x valve rated pressure is realised.

2. Valves shall not exhibit leaks or weeping of liquid past the large orifice seal at operating pressures of 0.5 bar to 1.5 times rated working pressure

3. Valves shall respond to the presence of air by discharging it through the small orifice seal at any pressures within a specified design range, i.e. 0,5 bar to working pressure, and shall remain leak tight in the absence of air.

4. Valves shall react immediately to pipeline drainage or water column separation by the full opening of the large orifice so as to allow unobstructed air intake at the lowest possible negative internal pipeline pressure.

5.3 AIR VALVES WITH BIAS MECHANISMS.

Stock Code – 4240519 – 50mm PN16/25 RBXb Air Valve c/w Bias Mech. Screwed.

The above air valves are to be used on pipelines where the line pressure is below 0,5 bar where controlled air release is required.

The air valve is fitted with a **Bias Mechanism** that keeps the 'Anti-Shock' orifice in closed position, thus allowing air release via the 'Anti-Shock" orifice and in no way hinders the small orifice function or the vacuum capabilities of the air valve.

5.4 INTAKE CAPACITIES – (VACUUM INTAKE).

The valve shall pass the following minimum volumes of air during vacuum conditions:

Size(DN)mm	Differential Pressure (Kpa)	Intake (litres/sec)
25	-35	50
50	-35	203
100	-35	815
200	-35	3260

5.5 HYDRAULIC TEST.

All air release valves supplied shall be subjected to the following testing procedures in the order laid down:

1. A high pressure strength and leak test whereby the valve is filled water and pressurized to twice the rated working pressure which shall be held for a period of 2 minutes. Any leaking, weeping or sweating shall be reason for rejection.

2. A low head leak test whereby the valve is filled with water and pressurized to a maximum of 0.5 bar (7.25psi) using a visible water column connected to the test rig. The valve shall be rejected if leak tightness is not maintained for 2 minutes.

3. Every tenth air release valve of the same size and pressure rating. Must be subjected to a small orifice function test –"DROP TEST". Whereby the valve is filled with water, pressurized to above rated working pressure and isolated from the test rig by closure of an isolating valve. A chamber in the test rig immediately prior to the isolating valve must be filled with compressed air at a pressure equal to that being maintained in the air release valve.

The isolating valve is then opened so as to allow the air to rise in the air release valve without the pressure dropping lower than 2-3 bar above rated working pressure of the air release valve. The "DROP TEST" is then carried out by slowly bleeding off the pressure through a suitable cock until rated working pressure is reached and the control float drops away from the orifice to allow discharge. Failure of the air release valve to function in the manner described will be reason for rejection.

5.6 TYPE OF END TREATMENT.

25mm and 50mm Air Valves – Screwed ends to BSP.
100mm and 200mm Air Valves – Flanged ends as per below:

All valves shall be flanged with flange diameter and thickness, bolt circle diameters, diameters of bolts, number of bolts and holes drilled off centre, in accordance with the appropriate pressure tables in S.A.B.S. 1123: Steel Pipe Flanges. All valves shall have flat machined faces to the flange.

The flanged face of the valve shall be supplied complete with all the necessary bolts, nuts, washers, "Klinger" full face non asbestos gasket insertion and one mild steel matching slip-on flange coated with an approved weldable primer ("Plascon PA 10 Etching Primer or similiar). The bolts, nuts and washers shall be Grade A 2 Stainless Steel. All jointing materials and matching flanges shall be mounted onto each valve on delivery.

5.7 MARKINGS.

Each air valve shall have a plate made of corrosion –resistance material securely fixed to the body, on which the following information shall be stamped or engraved:

1. The Manufacturer's Name.
2. Size of Valve. eg: DN 100
3. Class of Valve. eg: PN 16
4. The Council Contract or Order Number.
5. The Valve Serial Number, which must tie up with the relevant test certificates.

The flanged edge of each valve shall have the following number of 3mm deep grooves cut across at top dead centre:

a) PN 16 - 2 No.

b) PN 25 - 3 No.

5.8 TEST CERTIFICATES AND QUALITY CONTROL PLANS.

All air valves shall be supplied with a copy of the relevant factory test certificates that reflects the test pressure and valve serial number. Original factory test certificates together with the Quality Control Plan for each valve shall be issued on completion of delivery of the valve consignment.

5.9 PERFORMANCE CERTIFICATION.

All air valves must have been tested and approved by the Council of Scientific and Industrial Research (CSIR) – Pretoria.

A CSIR Certificate of Calibration must be submitted at time of tender.

Performance Tests: CSIR - DAST 89
CSIR - AERO 94
CSIR – Certificate of Calibration - Cert. No. DFC-2005-4

6. SAMPLES AND DESCRIPTIVE MATTER.

The valve supplier shall on request submit a sample of the air valve to be tested by an independent body appointed by Durban Water, if required.

The valve supplier shall submit with their tender 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. COATING OF AIR VALVES OTHER THAN STAINLESS STEEL.

All valves shall be externally and internally coated for corrosion protection as follows:

a) Surface Preparation

i) Cleanliness shall be equal to Sa 3 of Swedish Standard SIS 05 5900.

ii) Blasted profile to be angular and have an average peak to valley height of 40-60 micrometers, when tested in accordance with SABS Method 767.

iii) Residual dust and debris not to exceed 0,2% to SABS 769

b) Surface Coating

i) The body of the air valve shall be fully coated with an approved coating which complies with all the requirements of :

a)	Epoxy Powder	-	Table 1
b)	Solvent Free Epoxy	-	Table 2
c)	Fusion Bonded Epoxy Powder	-	Table 3
d)	Fusion Bonded Low Density Polyethylene Powder	-	Table 4

ii) Application of coating material to be fully in accordance with the manufacturer's instructions, specifically with respect to overcoating times, curing and maximum thickness of individual coat layers.

iii) The manufacturer is to provide full details of the coating system to be used when submitting his tender.

8. MEASUREMENT AND PAYMENT.

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

TABLE 1 : QUALIFICATION REQUIREMENTS FOR EPOXY POWDER

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), Tg1 and Tg2 (Glass transition temperatures uncured and cured) to be supplied	Differential Scanning Calorimetry 20ºC/min scan rate
3. Gel Time at 180ºC	For reference against contract supplies	Hot plate
4. Sieve Analysis	Sieve sizes in micrometers. Zero retained on 500. Not more than 1% retained on 250.	Mechanically agitated stack of sieves
5. Dielectric Strength	Not less than 30 kV/mm	S.A.B.S. 1217 Section 8.10
6. Cathodic Disbonding (28 day)	Total disbonded area # 20mm dia. after 30 days. Current flow # 5 mA	ASTM G.8 Method B Magnesium anode, 20ºC , 7mm dia. holiday
7. Accelerated Cathodic Disbonding (48 hr)	Total disbonded area (including holiday) # 12mm dia	Impressed current, - 3,5V potential at 75ºC for 48 hr, 3mm dia. holiday
8. Water Soak Test	Disbonded length not to exceed 5mm from point of V	Imerse in water at 75ºC for 48 hr. Remove and make V-cut at 30ºangle. Test adhesion when cooled to 25ºC
9. Flexibility Test	No electrical insulation defects after bending	Bend at 0ºC to 2% strain
10. Impact Resistance	No electrical insulation defects after impact	ASTM G14 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 recommendations..

TABLE 2 : REQUIREMENTS OF CURED SOLVENT FREE EPOXY COATING

PROPERTY	REQUIREMENT	TEST METHOD
1. Visual	Smooth glossy or semi glossy finish, free from excessive runs, sags, orange peel, occlusions or other visible defects	Use an experienced observer
2. Coating Thickness	Min. 300 Max 500 microns	S.A.B.S. Method 141. Take a minimum of 2 readings per m^2 of surface up to 300mm nominal dia., or 1 reading per m^2 over 300mm.
3. Electrical Insulation Defects	Lining: Nil defects at 90 Volts, 10 MegaOhm	S.A.B.S. 1217 Section 8.12.1
4. Impact Resistance	No defect at 1 Joule	S.A.B.S. 1217 Section 8.7 but modified as given in Note 1 below
5. Degree of Cure: (a) Static Test	No softening or discolourisation when fully cured	S.A.B.S. 1217 Section 8.9. Cure time shall be in accordance with the manufacturer's data
(b) Dynamic Test	No softening or discolourisation when fully cured	50 double rubs with cotton wool swab soaked in MEK. Cure time shall be in accordance with the manufacturer's data
6. Adhesion (Hot water soak)	Disbonded length not to exceed 15mm from point of V	Immerse in water at 75ºC for 48 hr. Remove and make V-cut at 30ºangle. Test adhesion when cooled to 25ºC
7. Cathodic Disbonding (28 day)	Total disbonded area # 40mm dia. after 30 days. Current flow # 5 mA	ASTM G.8 Method B Magnesium anode, 20ºC , 7mm dia. holiday
8. Accelerated Cathodic Disbonding (48 hr)	Total disbonded area (including holiday) # 20mm dia	Impressed current, - 3,5V potential at 75ºC for 48 hr, 3mm dia. holiday

NOTE: Impact resistance shall be carried out on a sample of production material firmly clamped and chocked (to be rebound free) to a rigid base. No electrical insulation defects shall be detected at the point of impact when tested at 1 Joule.

TABLE 3 : REQUIREMENTS OF CURED FUSION BONDED EPOXY POWDER COATING

PROPERTY	REQUIREMENT	TEST METHOD
1. Visual	Smooth glossy or semi glossy finish, free from excessive runs, sags, orange peel, occlusions or other visible defects	Use an experienced observer
2. Coating Thickness	Min. 300 Max 500 microns	S.A.B.S. Method 141. Take a minimum of 2 readings per m^2 of surface up to 300mm nominal dia., or 1 reading per m^2 over 300mm.
3. Electrical Insulation Defects	Nil defects at 3500 Volts. For conditions of repair see clause A.5.4.2.(vii)	S.A.B.S. 1217 Section 8.12.2
4. Impact Resistance	No defect at 2 Joule	S.A.B.S. 1217 Section 8.7 but modified as given in Note 1 below
5. Degree of Cure: (a) Static Test	No softening or discolourisation when fully cured	S.A.B.S. 1217 Section 8.9.
(b) Dynamic Test	No softening or discolourisation when fully cured	50 double rubs with cotton wool swab soaked in MEK.
(c) Thermal Characteristics	Delta Tg shall not exceed 3ºC. Chemical conversion shall be not less than 90%	Differential Scanning Calorimetery Scan rate 20ºC/min
6. Adhesion (Hot water soak)	Disbonded length not to exceed 5mm from point of V	Immerse in water at 75ºC for 48 hr. Remove and make V-cut at 30ºangle. Test adhesion when cooled to 25ºC
7. Cathodic Disbonding (28 day)	Total disbonded area # 20mm dia. after 30 days. Current flow # 5 mA	ASTM G.8 Method B Magnesium anode, 20ºC ,7mm dia. holiday
8. Accelerated Cathodic Disbonding (48 hr)	Total disbonded area (including holiday) # 10mm dia	Impressed current, - 3,5V potential at 75ºC for 48 hr, 3mm dia. holiday

NOTE: Impact resistance shall be carried out on a sample of production material rigidly supported beneath the point of impact. Damage to the coating shall be assessed by measuring electrical insulation defects at the point of impact. No defect is permitted after impact at 2 Joules.

TABLE 4 : REQUIREMENTS OF CURED FUSION BONDED LOW DENSITY POLYETHYLENE POWDER COATING

PROPERTY	REQUIREMENT	TEST METHOD
1. Visual	Smooth Glossy finish, Free from visible defect	Use an experienced observer
2. Coating Thickness	> 100 # 250mm dia. - 2,0mm > 250 < 500mm dia. - 2,2mm ∃ 500 < 750mm dia. - 2,5mm ∃ 750mm dia. - 3,0mm	ISO 2820 Method 5. Take a minimum of 2 readings per m^2 of surface up to 300mm nominal dia., or 1 reading per m^2 over 300mm.
3. Electrical Insulation Defects	Nil defects at 10 kV For conditions of repair see clause A.5.6.2.(vii)	SABS 1217 Section 8.12.2 Note: DC instrument to be used
4. Impact Resistance	No defect at 10 Joules	ASTM G.14, but modified as given in Note 1 below
5. Peel Test (Bond Strength)	Bond strength shall be ∃ 2,5N/mm width of strip	AS 2518 Appendix E
6. Cathodic Disbonding (28 day)	Total disbonded area # 20mm dia. after 30 days. Current flow # 5 mA	ASTM G.8 Method B Magnesium anode, 20ºC , 7mm dia. holiday
7. Cathodic Disbonding (48 hr - Accelerated)	Total disbonded area (including holiday) # 10mm dia	Impressed current, - 3,5V potential at 60ºC for 48 hr, 3mm dia. holiday
8. Density	Density shall be within the range 915 to 940 kg/m^3	ISO 1183
9. Environmental Stress Cracking Resistance	The F_{50} value ∃ 3hr	AS 2518 Appendix F
10. Tensile Strength and Elongation	Tensile stress at yield: Mean ∃ 3,5 Mpa with no single result < 8,3 MPa. % Elongation at break: Mean ∃ 300% with no single result < 200%.	AS 2518 Appendix G
11. Shore Hardness D	35 to 45	

NOTE: Impact resistance shall be carried out on a sample of production material rigidly supported beneath the point of impact. Damage to the coating shall be assessed by measuring electrical insulation defects at the point of impact. No defect is permitted after impact at 10 Joules.

PART C – WS.6371 **AIR RELEASE AND VACUUM BREAK VALVES**

QUESTIONNAIRE 1

This questionnaire forms part of the tender documents and must be completed in its entirety. Failure to complete this questionnaire may preclude the tender from acceptance.

1. Are your prices **firm** for the duration of the contract ?

   _____

2. If not, state method of price adjustment. _____

3. Company name:

   _____

4. (a) Is this a cc, (Pty) Ltd, Partnership, Sole Trader, Joint Venture - (T tick) :-

(i) cc	
(ii) (Pty) Ltd	
(iii) Partnership	
(iv) Sole Trader	
(v) Joint Venture	

   (b) If (iii), (iv) or (v) name of partners or owner must be stated below.

   _____

5. Are you a registered VAT Vendor? _____

   If so, please state VAT Number - _____

NAME AND ADDRESS OF TENDERER :- (Firm=s Name)

_____ _____

NAME OF SIGNATORY IN BLOCK LETTERS

_____ _____

CAPACITY OF SIGNATORY

_____

TELEPHONE NUMBER : _____

FAX NUMBER : _____

DATE : _____

SIGNATURE : _____