WATER SUPPLIES DEPARTMENT

STANDARD SPECIFICATION M-02-02

MILD STEEL PIPEWORK
(FOR PRESSURE RATING OF PN 16 AND PN 25)

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MILD STEEL PIPEWORK (FOR PRESSURE RATING OF PN 16 AND PN 25)

1. GENERAL

(1) This standard specification covers mild steel pipes, fittings and specials (collectively termed as 'pipework' hereunder) of pressure rating PN 16 and PN 25.

(2) Unless other specified in the Particular Specification, all pipework applied in salt water shall be stainless steel and comply with WSD Standard Specification M-02-03. If it is deemed necessary to employ mild steel in salt water pipework, such pipework shall comply with this Standard Specification.

(3) The steel pipework shall conform to the requirements of BS 534 (BS EN 10224), BS EN 10216-1, BS EN 10217-1 and BS EN 10220 where appropriate unless otherwise specified.

(4) The minimum tensile strength of the steel grade shall be 430 N/mm^2. Certified Mill Test Certificate, with inspector's signature and necessary manufacturer's information, shall be provided upon request for the verification of material standard, material grade, chemical composition, tensile strength, etc.

(5) The pipes shall be manufactured by the electric resistance welding (including induction welding) process or the submerged arc welding process. Branches or tees of nominal size equal to or less than 450 mm may be manufactured by other processes as listed in BS EN 10216-1/BS EN 10217-1. Gusseted steel bends and tees shall be fabricated in accordance with BS EN 10224, BS 2633 and BS 4515.

(6) Alternatively, the pipework can be made from steel pipes, fittings and specials to BS EN 10255:2004 (formerly BS 1387) or ASME B36.10M or stainless steel to ASTM-A312-TP316.

(7) The flanges shall comply with BS EN 1092-1 (formerly BS 4504-3.1) PN 16 or PN 25 as appropriate. For flanges joining existing pipework/equipment, they shall be drilled to suit the existing pipework/equipment.

(8) Drain valves and connection points for instruments shall be provided at suitable positions of the pipework. Bosses welded on the pipework for the connection of instruments and drain valves shall conform to BS 3799 and shall be made of stainless steel 1.4401 to BS EN 10250-4.

2. THICKNESS

The minimum wall thickness of various size of pipework shall be as follows:

Nominal Size (mm)	Outside Diameter (mm)	Minimum Wall Thickness (mm)			
		Raw, Fresh and Reclaimed Water		Salt Water	
		PN16	PN25	PN16	PN25
80	88.9	3.2		4.5	
100	114.3	5.0		6.3	
150	168.3				
200	219.1	5.4		7.1	
250	273				
300	323.9	5.4	6.3	7.1	8.0
350	355.6	5.6		8.0	
400	406.4		7.1		8.8
450	457	6.3	8.0		10.0
500	508		8.8		11.0
600	610	7.1	11.0	8.8	12.5
700	711	8.0	-	10.0	-
800	813	10.0		11.0	
900	914	11.0		12.5	
1000	1016	12.5		14.2	
1200	1219	14.2		16.0	
1400	1422	16.0		17.5	

3. PAINTING/COATING

(1) Both the external and internal surfaces of the mild steel pipework shall be blast cleaned to Sa 2.5 of BS EN ISO 8501-1 or the requirement of the coating manufacturer, whichever is more superior.

(2) Prior to abrasive blasting, all sharp edges shall be rounded or chamfered, all surface laminations or scabs and weld spatter shall be removed by suitable grinding and all rough weld seams shall be smoothened.

(3) All welds shall be inspected and if necessary repaired before final cleaning of the area.

(4) The pipework shall then be applied with the following coating systems:

(a) External surface

A Fusion Bonded Epoxy system, complying with the latest revision of ANSI/AWWA C213 and factory applied to a minimum dry film thickness of 400 microns,

OR

A chemically cured Liquid Epoxy system, complying with the latest revision of ANSI/AWWA C210 and factory applied to a minimum dry film thickness of 400 microns.

AND

For pipes to be installed outdoor under direct sunlight, a topcoat of aliphatic polyurethane at 50 microns shall be applied for extra protection.

(b) Internal surface

(i) Raw, Fresh and Reclaimed Water Pipework:

A Fusion Bonded Epoxy system, complying with the latest revision of ANSI/AWWA C213 and factory applied to a minimum dry film thickness of 400 microns,

OR

A chemically cured Liquid Epoxy system, complying with the latest revision of ANSI/AWWA C210 and factory applied to a minimum dry film thickness of 750 microns.

AND

The coating shall be suitable for use with potable water with compliance to BS 6920 or equivalent.

(ii) Salt Water Pipework:

A coating system based on polyester or vinyl ester resin filled with flaked glass. The coating system must have good abrasion and corrosion resistance to chlorinated salt water and shall have a total dry film thickness of not less than 1,200 microns.

(5) To fully protect the wetted surface of the pipework, the internal coating shall be extended to cover the jointing faces of the pipe flanges of appropriate thickness without affecting the sealing effect. For plain ended pipes to be fitted with flange adaptor or coupling, the internal coating shall be extended to cover the external surface of the pipe end where the flange adaptor/coupling fitted.

(6) The coating systems shall be submitted to the Engineer for approval.

(7) For salt water application, the following requirements shall also be complied:

(a) The Contractor shall provide a representative from the coating manufacturer at his own cost to supervise all coating application related work including but not limited to surface preparation, coating application and acceptance test. Subsequent to the final acceptance of the coating application by the coating manufacturer's representative and the Independent Inspection Body (IIB), the Contractor shall be

responsible for all defect/imperfection due to material or workmanship during the defects liability period. The Contractor shall submit the nomination of the coating manufacturer's representative for the approval of the Engineer's well before the work to be carried out.

(b) All surface preparation work must be inspected and accepted by the coating manufacturer's representative and the IIB before coating application should proceed. Fail to do so, the Contractor may be asked to remove the coating applied and perform the surface preparation work again at his own cost.

(c) In case the coating is required to be made good or repaired at the Site, the Contractor shall provide a representative from the coating manufacturer at his own cost to supervise the repairing work to be carried out. In order to provide adequate local technical support for future maintenance and services, the manufacturer of the proposed coating shall have a qualified technical services team in Hong Kong. The Contractor shall submit previous job reference related to the technical support in Hong Kong and the workforce of the local technical services team of the coating manufacturer together with other technical information of the proposed coating to the Engineer for consideration.

4. FLANGE ADAPTORS

(1) Flange adaptors shall be provided at joints between pipework and valves/equipment and any other positions where removal of pipework is necessary for future maintenance.

(2) Flange adaptors shall be designed and manufactured to suit the pipework and valves supplied. The flanges shall comply with BS EN 1092-1 PN 16 or PN 25 as appropriate except those joining existing pipework/equipment, which shall be drilled to suit the existing pipework/equipment.

(3) Flange adaptors shall be made of mild steel and shall be coated with epoxy coating. The epoxy coating shall be applied by the fusion-bounded method or airless spray method. The minimum thickness of the epoxy coating on flat surface shall be at least 250 microns and 400 microns for fusion bonded method and airless spray method respectively. The minimum thickness of the epoxy coating on convex outer edges shall be at least 150 microns and 300 microns for fusion bonded method and airless spray method respectively.

(4) Stud bolts and nuts of the flange adaptors shall be made of stainless steel. Gaskets shall be made of natural rubber or EPDM.

(5) Flange adaptors shall be positively restrained from movement by tie bars/bolts.

(6) For flange adaptors to be used in raw, fresh and reclaimed water application, the coating and gaskets shall comply with BS 6920 or equivalent.

5. SLIP-ON TYPE COUPLINGS

(1) Slip-on type couplings for use with plain end pipe shall conform to the requirements of BS EN 10331.

(2) The couplings shall be made of mild steel and shall be coated with epoxy coating. The epoxy coating shall be applied by the fusion-bounded method or airless spray method. The minimum thickness of the epoxy coating on flat surface shall be at least 250 microns and 400 microns for fusion bonded method and airless spray method respectively. The minimum thickness of the epoxy coating on convex outer edges shall be at least 150 microns and 300 microns for fusion bonded method and airless spray method respectively.

(3) Stud bolts and nuts of the couplings shall be made of stainless steel. Gaskets shall be made of natural rubber or EPDM.

(4) The pipes joined by couplings shall be positively restrained from movement by tie bars/bolts.

(5) For couplings to be used in raw, fresh and reclaimed water application, the coating and gaskets shall comply with BS 6920 or equivalent.

6. BOLTING

(1) Bolts, studbolts, washers and nuts (collectively termed as bolts hereunder) for pipework shall be in metric size and zinc coated and shall conform to BS EN 1515-1 and BS EN 1515-2 where appropriate.

(2) Zinc coated items M10 and larger shall have the nuts cut oversize and shall be spun galvanised (or equivalent) to BS EN ISO 1461. Smaller zinc coated items shall be to BS EN 12329.

(3) Bolt lengths shall be sufficient to ensure that nuts are full-threaded when tightened in their final position and that at least two but no more than four threads are protruded.

7. GASKETS

(1) Gaskets shall be Type W (water) elastomeric joint rings to BS EN 681-1.

(2) Gaskets shall be made of natural rubber or EPDM suitable for use with the water medium specified. The gaskets shall be of full face or ring type and not less than 3mm in thickness.

(3) For gaskets to be used in raw, fresh and reclaimed water application, they shall comply with BS 6920 or equivalent.

8. INSPECTION AND TESTING

(1) All pipework shall be inspected by an Independent Inspection Body (IIB) as detailed in WSD Standard Specification EM-00-01 in the manufacturer's works.

(2) In addition to those inspections/tests specified in WSD Standard Specification EM-00-01, the following shall be carried out to all pipework in the presence of the IIB:

(a) Hydraulic test to 1.5 times the PN rating of the pipework for at least 15 minutes;

(b) Surface preparation including sand blasting after the final blasting and before the application of the first coat of paint;

(c) Measurement of total dry film thickness of the coating;

(d) 100% Spark Test of the coating in accordance with ASTM D5162. Test voltage shall be as recommended in ASTM D5162. For the internal coating of salt water pipework, the test voltage shall be not less than 5 kV.

(3) The IIB shall pay particular attention to the requirements of surface preparation as stipulated in Clause 3(2) of this Standard Specification. The IIB shall examine every welded joint and seam before application of coating and record the results of the examination in his inspection report to ensure that the surface preparation is in compliance with relevant Particular Specifications, WSD Standard Specifications and the recommendations of the coating manufacturer.

(4) Unless otherwise specified in the Particular Specification, the Contractor shall repeat the tests of sub-clauses (2)(a), (2)(c) and 2(d) above in the presence of the Engineer's Representatives after delivery on site.

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