

WATER SUPPLIES DEPARTMENT
STANDARD SPECIFICATION M-02-03
STAINLESS STEEL PIPEWORK

(FOR PRESSURE RATING OF PN 16 AND PN 25)

1. GENERAL

- (1) This standard specification covers stainless steel pipes, fittings and specials (collectively termed as 'pipework' hereunder) of pressure rating PN 16 and PN 25, and of nominal size from 150 mm to 1,000 mm inclusive.
- (2) Where specified in the Particular Specification, the pipework shall be made of either (i) duplex stainless steel of grade EN 1.4462 or ASTM S31803, or (ii) stainless steel of grade ASTM 316/316L (EN 1.4401/1.4404) or its superior equivalent. The yield strengths of duplex stainless steel and austenitic stainless steel at room temperature shall not be less than 450 N/mm² and 215 N/mm² respectively.
- (3) All pipes shall conform to the requirements of BS EN 10216-5 (seamless), BS EN 10217-7 (welded) or ASTM-A312 or ASTM-A928 as appropriate.
- (4) All standard fittings shall conform to the requirements of BS EN 10253-3 or shall be manufactured in accordance with ASME B16.9 and ASME B16.28 as appropriate. Bends formed by welding of segments together shall not be allowed unless otherwise approved by the Purchaser/Engineer.
- (5) All pipes, special sections and fittings shall be fabricated at factory or workshop in accordance with the requirements for piping of class I of BS EN 13480-4. On-site fabrication shall NOT be allowed unless otherwise approved by the Purchaser/Engineer. All openings shall be suitably reinforced where necessary.
- (6) Welding shall be executed in accordance with BS EN 1011-3 by qualified welders possessing valid welder certificates complying with BS EN ISO 9606-1:2017 or other relevant internationally recognised standards for the appropriate category of welding. Welding shall be carried out with appropriate welding procedure specifications in accordance with BS EN ISO 15614-1:2017. Welding consumables shall be compatible with the parent metals and the selected welding process. All welded joints and heat affected zones shall be thoroughly cleaned, pickled and passivated in accordance with Annex A of BS EN 13480-4. Radiographic test shall be performed for 100% circumferential butt welded joints, whilst dye penetration test shall be performed for 100% branch and fillet welded joints so as to ensure weld quality. The test results shall be assessed by qualified examiners in accordance with the requirements specified under BS EN 13480-5.
- (7) Connection flanges shall comply with BS EN 1092-1 PN 16 or PN 25 as appropriate except those for joining to existing pipework/equipment, which shall be drilled to suit the mating flanges of 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 connection of instruments and drain valves shall conform to BS 3799 and be made of duplex stainless steel or stainless steel to BS 970 grade 316S16 as appropriate.

2. THICKNESS

The pipework shall be designed to withstand the specified pressure rating without yielding under hydraulic test pressure. Notwithstanding that, its wall thickness shall refer to that specified under EN ISO 1127 or for Schedule 40S/STD under ASME B36.19M, and shall not be less than that listed below:

| Nominal Size (mm) | Outside Diameter (mm) | Minimum Wall Thickness (mm) |
|-------------------|-----------------------|-----------------------------|
| 150 | 168.3 | 7.1 |
| 200 | 219.1 | 8.2 |
| 250 | 273 | 9.3 |
| 300 | 323.9 | 9.5 |
| 350 | 355.6 | 9.5 |
| 400 | 406.4 | 9.5 |
| 450 | 457 | 9.5 |
| 500 | 508 | 9.5 |
| 600 | 610 | 9.5 |
| 700 | 711 | 9.5 |
| 800 | 813 | 9.5 |
| 900 | 914 | 9.5 |
| 1,000 | 1,016 | 9.5 |

3. FLANGE ADAPTORS

- (1) Flange adaptors shall be provided at joints between pipework and valves/equipment and any other positions to facilitate dismantling of pipework necessary for maintenance purpose.
- (2) Flange adaptors shall be designed and manufactured suitable for connection to the pipework, valves and equipment. The flanges shall comply with BS EN 1092-1 PN 16 or PN 25 as appropriate except those for joining to existing pipework/equipment, which shall be drilled to suit the mating flanges of the existing pipework/equipment.
- (3) Unless otherwise specified in the Particular Specification, flange adaptors shall be made of either duplex stainless steel or, stainless steel of grade 316L or superior. For flange adaptor made of mild steel, it shall be coated with fusion-bonded epoxy or nylon coating to a dry film thickness of at least 400 microns.
- (4) Stud bolts and nuts of the flange adaptors shall be made of stainless steel. Sealing

material shall be made of natural rubber or EPDM.

- (5) Flange adaptors shall be positively restrained from movement by tie bars/bolts where necessary.
- (6) For flange adaptors to be used in raw or potable water application, the coating and gaskets shall comply with BS 6920 or equivalent.

4. SLIP-ON TYPE COUPLINGS

- (1) Slip-on type couplings for use with plain-end pipe shall conform to the requirements of BS EN 10224 Annex C Clause C.4.
- (2) Unless otherwise specified in the Particular Specification, couplings shall be made of either duplex stainless steel or stainless steel of grade 316L or superior. For coupling made of mild steel, it shall be coated with fusion-bonded epoxy or nylon coating to a dry film thickness of at least 400 microns.
- (3) Stud bolts and nuts of the couplings shall be made of stainless steel. Sealing material shall be made of natural rubber or EPDM.
- (4) The pipes joined by couplings shall be positively restrained from movement by tie bars/bolts where necessary.
- (5) For couplings to be used in raw or potable water application, the coating and gaskets shall comply with BS 6920 or equivalent.

5. BOLTING

- (1) Bolts, studbolts, washers and nuts (collectively termed as bolting hereunder) for flange joints of pipework shall be made of stainless steel of grade 316 and in metric size and shall conform to BS EN 1515-1, BS EN 1515-2 and BS EN 1515-3 where appropriate. High strength bolting, i.e. of strength class 8.8, shall be supplied.
- (2) 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.

6. GASKETS

- (1) Gaskets shall be Type WA elastomeric joint seals 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 either full face or ring type and of not less than 3mm in thickness.
- (3) For gaskets to be used in raw or potable water application, they shall comply with BS 6920 or equivalent.

7. MARKING AND DOCUMENTATION

- (1) The construction material and pressure rating of pipes shall be marked on pipe surfaces for identification.
- (2) All relevant material certificates, welders' qualifications, welding procedure specifications, non-destructive examination reports, examiners' qualifications shall be submitted at appropriate stages to substantiate that the pipework is fabricated in accordance with the requirements of this specification.

8. FINAL TESTING AND INSTALLATION

- (1) The pipework shall be hydraulically tested to 1.5 time the PN rating of the pipework for a duration of at least 10 minutes before installation.
- (2) The surfaces of pipework where flange adaptors/couplings are to be fitted and the seating surfaces of flange faces of pipework shall be protected by suitable primer/coating before installation to prevent crevice corrosion between the contacting surfaces. For pipework to be used in raw or potable water application, the primer/coating shall comply with BS 6920 or equivalent.

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