

TECHNICAL GUIDELINE**DECOMMISSIONING
WATER MAINS**

Issued by: Manager Asset Management

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MAJOR CHANGES INCORPORATED IN THE XXXX EDITION

The following lists the major changes to the XXXX edition of TG 125, which have been incorporated in this edition:

1. First Edition

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Referenced Documents

Australian Standards

| | |
|-------------------------|---|
| AS 1110.1: | ISO Metric hexagonal head bolts and screws – Grade A & B |
| AS 1111.1: | ISO Metric hexagonal head bolts and screws – Grade C |
| AS/NZS 1252: | High strength steel bolts for structural engineering |
| AS/NZS 1554: | Structural Steel Welding |
| AS 1579: | Arc-welded steel pipes and fittings for water and waste-water |
| AS 2129: | Flanges for pipe, valves and fittings |
| AS/NZS 2451: | Bolts, screws and nuts with British Standard Whitworth threads (rationalized series) |
| AS/NZS 2465: | Unified hexagon bolts, screws and nuts (UNC and UNF threads) |
| AS 2528: | Bolts, stud bolts and nuts for flanges and other high and low temperature applications |
| AS/NZS ISO 9001: | Quality management systems – Requirements |
| AS/NZS 3678: | Structural Steel – Hot rolled plates |
| AS/NZS 3679: | Structural Steel |

SA Water References:

Water Supply Construction Manual – Authorised Items (see SA Water internet site)

<http://www.sawater.com.au/SAWater/DevelopersBuilders/NetworkInfrastructureStandards>

TS29 Pipeline Petrolatum Anti-corrosion tape system

TS30 Welding MSCL

TS59 Flanges (Obsolete – Background Information only)

SWPs As Required (check register on Aquanet)

<http://im1.sawater.sa.gov.au/ohsw/Lists/Standard%20Work%20Procedures/Standard%20Work%20Procedures.aspx>

NOTE:

Wording shown as normal text is an SA Water requirement.

Wording shown as italic text is for information only.

Section 1: General

This Technical Guideline supersedes all other documentation issued on pipework decommissioning in the water networks. It covers all of the general considerations and methodology for taking existing mains out of service and disconnecting it from any live pipework. It covers all mains \geq DN100 and all types of pipeline materials and is intended for all decommissioning projects in metropolitan and country areas.

The document has been produced by Asset Management section in conjunction with Engineering specialists and is based on Water Services Association of Australia (WSAA) and Australian Standards recommendations. The document will be revised on a two yearly basis and be signed off by the Manager Asset Management. Minor technical amendments may be added in the intervening period and these will be signed off by the Infrastructure Standards Manager

Assets Planning staff, generally in consultation with operations staff, will make recommendations regarding existing mains to be taken out of service. In all cases, they should be consulted during the planning stages regarding the best method to be used when taking the main out of service.

It should be noted that even though a main may be decommissioned (sometimes referred to as “abandoned”), SA Water still retains full responsibility for the main.

Potential future use of the main eg relining, optical fibre communication cables etc should be considered as part of the planning process before taking the main out of service. This may determine the end treatment of the pipe and filling methodology.

1.1 ADDITIONAL INFORMATION

Unless otherwise specified, all enquiries regarding this Technical Guideline shall be referred to the Infrastructure standards Group.

Section 2: Design

2.1 DESIGN

Mains may be taken out of service for a number of reasons:

- Main is no longer required for operational purposes
- Main is being replaced (not necessarily on the same alignment)
- Pipe condition renders the main unsuitable for further use

Note: If mains are in good condition, but are no longer required operationally because the system has adequate capacity to cope without them, mains may be allowed to remain in service, but with increased checks on water quality and additional disinfection as required.

Design considerations for changes to pipework should take into account the following:-

- Water mains no longer required for use should be decommissioned and disconnected from the networks at the perimeters of each section.
- Pipework redesign should be such that no dead-ends are created and water quality standards are not compromised.
- If a dead-end section is created, then adequate provision for mains flushing is to be provided.
- Old pipework, if remaining “in ground” must have all opened ends and connections sealed with stop plates or blanks flanges.
- Old pipework \geq DN300, if remaining “in ground” must be filled with sand or in special cases with cement eg where building /structure will be built over the main. See Appendix A
- All surplus fittings such as valves, fireplugs, scours and chambers can be removed for reuse or scrap.
- Plans or sketches for decommissioning and pipework redesign must be produced for GIS records and gazettal purposes ie an “as decommissioned” drawing is required that can be incorporated into the GIS system as per other “as constructed” drawings.
- During reinstatement of operational mains, only approved methodology and fittings shall be used. See SA Water’s Water Supply Construction Manual (<http://www.sawater.com.au/NR/rdonlyres/A5B496D6-4766-48E6-B9F3-F90A4D6F9069/0/WMainlss3R2.pdf>).
- SA Water has a duty of care under OH&S legislation to others who may encounter asbestos pipes in the course of their legitimate activities, eg road workers, so they must be warned of its presence at the same time as being notified of the presence of live mains eg “Dial Before You Dig”..

2.2 REASONS FOR PIPE REMOVAL

- Road incorporating the pipe is to be reconstructed by Transport SA or the relevant local council.
- Free-up space for other services and new construction.
- Recoup and reuse if cost effective.
- Danger of collapse subsidence in road surface due to vehicular loading.
- Adverse effect on groundwater flow direction.
- Aesthetic reasons. eg above ground pipeline.
- Recoup scrap value if cost effective.

2.3 REASONS FOR PIPE REMAINING “IN GROUND”

- Potential use by other utilities, e.g. cables, conduit.
- Removal/restoration is cost prohibitive.
- Possible/likely reuse by SA Water in future (eg by lining original pipe)
- Disruption to other services/business or traffic if removed.

Section 3: Materials

3.1 STEEL

All steel used in revised/ altered MS pipe system plus fabrication of MS flanges and fittings for closure of decommissioned main shall conform to AS 3678 Grade 250.

3.2 FLANGES

All new flanges and flanged fittings used shall be in accordance with AS4086 and be of the appropriate pressure classification:

- <PN16 - (dimensions equivalent to Table "C"/"D" in AS 2129)
- PN16 – PN35 - (dimensions equivalent to Table "F"/"H" in AS 2129)

Note AS4087 is the current manufacturing standard for valves and fittings for waterworks purposes. AS2129 - 2000 has deleted Table "C" flanges and refers users to AS4087 in lieu. (Flange PCD and hole dimensions used in AS2129 were the same for Table "C" and Table "D" and the same for Table "F" and Table "H") (see Appendix B). For this reason drawings and specifications must detail this information to avoid confusion with flanges/fittings manufactured to other standards.

Where it is necessary to mate with existing flanges that are not in accordance with AS 2129 / AS 4087, full manufacturing details shall be provided on the design drawing including the following:

- Flange internal and external diameter and thickness (based on existing mating flange)
- Bolt Pitch Circle Diameter (PCD)
- Bolt hole diameter
- Number of holes

3.3 BOLTING

It is recommended that metric bolts or studs be used in flange assembly. Imperial series bolts or studs should only be used if metric equivalents are not available. See also TS59.

- Normal grade bolts/studs shall be used for all flanges except Table "H".
- Metric series bolts/studs shall be in accordance with AS2528 Grade 4.6
- Imperial (inch) series bolts/studs should be in accordance with AS2451, 28 Tons /sq inch (tsi) tensile strength or AS2465 grade 2.

Where metric bolting is unavailable, the following equivalent inch series bolt shall be used:

| | | | | | | | | | |
|------|------|------|------|-----|--------|--------|--------|--------|--------|
| M12 | M16 | M20 | M24 | M27 | M30 | M33 | M36 | M39 | M45 |
| 1/2" | 5/8" | 3/4" | 7/8" | 1" | 1 1/8" | 1 1/4" | 1 3/8" | 1 1/2" | 1 3/4" |

3.4 GASKETS

Full face gaskets are to be used on all PN16 flanges $\geq 600\text{mm}$ and all PN35 flanges $\geq 300\text{mm}$. For details on the use of “O” ring gaskets and narrow face gaskets refer to TS59.

3.5 WELDING

All field welding of steel pipes shall be in accordance with TS30.

SECTION 4: PIPEWORK INSTALLATION

4.1 GENERAL

All pipework configurations required for isolation of remaining operational main(s) shall, where possible, be fabricated / constructed out of similar materials (eg steel, CICI/DICL or PVC) Where this is not possible a section of the remaining main is to be cut out and replaced with pipe and/ or fittings which can be effectively sealed off.

The following principles shall be followed:

- Existing valves shall not be used to isolate ends of existing mains
- Ensure that flanges/fittings are level and supported so as not to create undue stress on the pipework.
- Ensure that steel pipework is level and supported prior to welding flanges or closing collars.
- On MSCL pipework $\geq 600\text{mm}$ all damaged or removed internal cement lining is to be reinstated (where possible).
- Following assembly all bolts shall be tightened evenly to a snug tight condition.
- All bolts on flanges shall be tightened by torque control. Refer to TS59 for torque tables.
- Flanges including bolts are to be petrolatum tape wrapped in accordance with TS29

SECTION 5 – TESTING AND DISINFECTION

5.1 HYDROSTATIC TESTING

Unless specified otherwise by SA Water, all operational sections of new pipework, greater than one (1) pipe length, which have been isolated from the decommissioned main shall be hydrostatically tested in accordance with the test requirements detailed in the WSAA Water Supply Code of Australia and SA Water’s supplementary documentation. The pressure shall not exceed the rated pressure for the fittings or flanges used in the installation.

Testing of pipework on site in a field location shall be done with the use of blank flanges or “spades”. DO NOT ATTEMPT TO TEST AGAINST CLOSED VALVES IN PIPE SECTIONS.

5.2 DISINFECTION

Where contaminants may have entered the operational main during de-commissioning of adjacent pipework the main shall be flushed and disinfected before being put back into operation.

Unless specified otherwise by SA Water, all new sections of pipework greater than one (1) pipe length shall be flushed and disinfected.

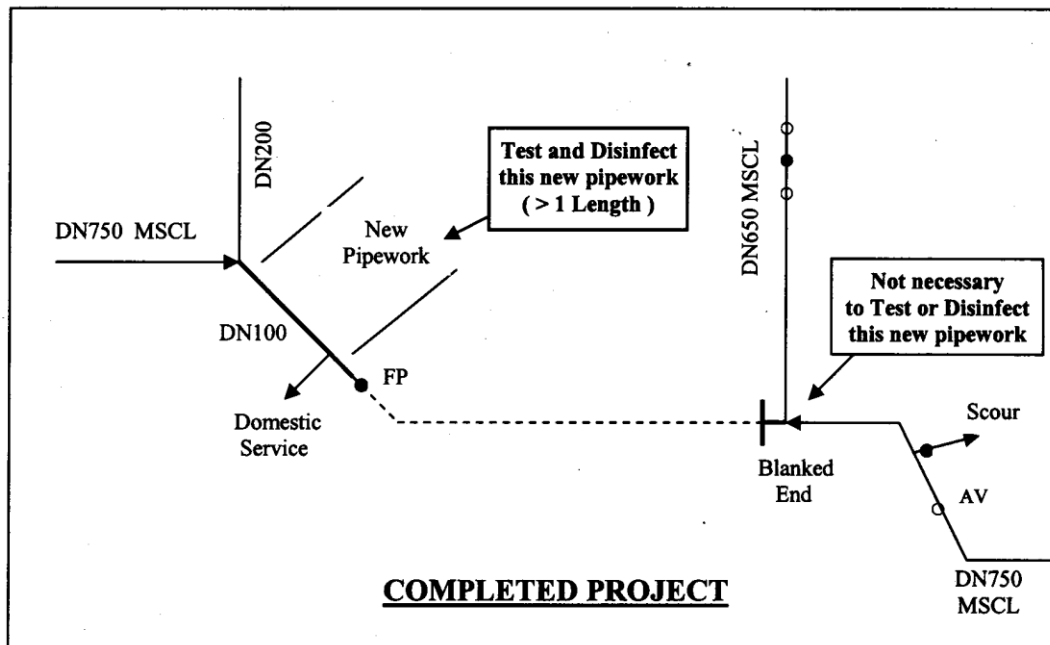
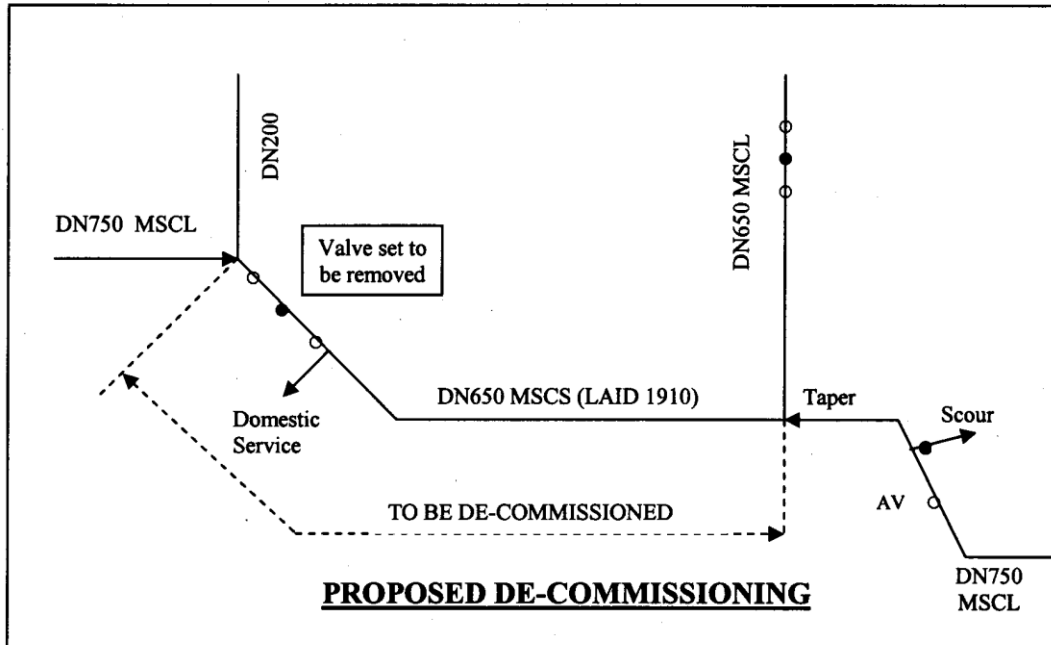


Figure 1 - Example of Testing and Disinfection Requirements

SECTION 6 - AS-DECOMMISSIONED DRAWINGS

6.1 GENERAL

Design Drawings will normally be produced for pipework de-commissioning projects and will detail the following:

- Arrangement of changes to existing pipework,
- Pipe material requirements (type, size, rating etc) and any special fittings to be used,
- Method of closure of the existing pipework system, and
- Method of closure of the ends of the decommissioned pipework.

These drawings will also be used as the As-Decommissioned drawings. Where site changes are made to the design drawing requirements these changes are to be added to the design drawings and the drawings marked "As-Decommissioned".

Where no design drawings have been produced a set of As-Decommissioned drawings detailing the arrangement and location of all changes, materials used, pipe filling details etc are to be produced.

6.2 CHECKING OF AS-DECOMMISSIONED DRAWINGS

SA Water Administered Contracts

SA Water technical staff shall carry out (or SA Water shall arrange for a suitably qualified person to carry out) the As-Decommissioned checks, record all variances and certify that the As-Decommissioned drawings are correct. SA Water technical staff shall ensure the information is forwarded for inclusion in asset management records.

Contracts Administered by Contractors operating under SA Water authority

Contractor's technical staff shall carry out (or contractor shall arrange for a suitably qualified person to carry out) the As-Decommissioned checks, record all variances and certify that the As-Decommissioned drawings are correct. The contractor shall forward the information to SA Water for inclusion on asset management records.

6.3 SUBMISSION OF AS-DECOMMISSIONED DRAWINGS

All As-Decommissioned Drawings, whether altered or not, together with all relevant field information, shall be submitted to:

**Infrastructure Information Services Manager
Level 7 SA Water House
250 Victoria Square, Adelaide SA 5000**

Appendix A: Filling De-commissioned Mains

A1 GENERAL

There are three methods for filling mains (applies to \geq DN300 pipes) based on the future use of the land above the pipe. They are as follows;

- Under roadways or open space – Cement/Sand fill (5 MPa)
- Under proposed structural building – Concrete fill (20 MPa)
- Proprietary expansive grouts

These methods may use pumps to place the fill.

A2 UNDER ROADWAYS OR OPEN SPACE

This method is relatively simple to install and consists of a Sand: Cement: Water grout mix which flows like a liquid, but when in place the water rises to the surface out of the mix and gravitated towards the high spot. This grout mix is often termed "Controlled Low Strength Material". The grout mix usually needs super-plasticiser to make it flowable.

Experienced installers:

City Concrete (Nick) (08) 8365 4000 (m) 0418 804 244

Experience to date:

City Concrete have filled a number of decommissioned mains using this method and have filled lengths of up to 800 m and believe 1 km is possible.

The main is blocked off at the downstream end including an air release arrangement at the top of the shut off (see sketch). When the grout mix reaches the air release valve it is shut and the remaining air escapes through the filling end of the pipe. The mix continues to be applied until the main is filled and the upstream end is then blocked of as well.

The grout mix can have considerable head and this must be taken into consideration when designing the block off system. Existing holes in the main can cause a loss of mix material and an additional 5% should be ordered for this type of contingency.

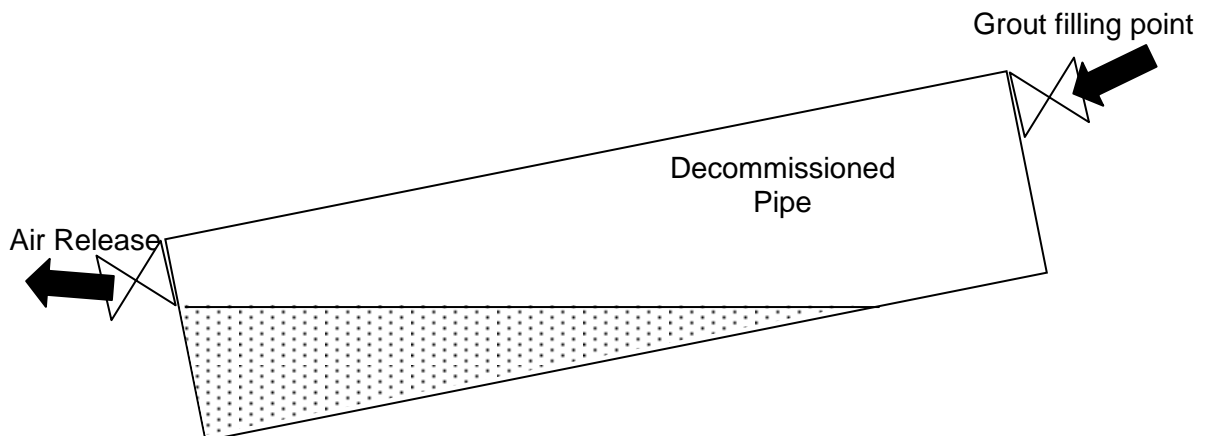


Figure 2 - Typical Grout Filling Method

A3 UNDER PROPOSED STRUCTURES

This method is more complicated to install as it involves the use of a standard concrete mix (Sand: Aggregate: Cement) which is pumped into position. This system is only suitable for short lengths of decommissioned pipe and is specifically suited for mains under areas on which it is proposed to construct some type of structural building.

The principles used are the same as for the sand / cement grout where the mix is applied from the upstream end and the downstream end is blocked off.

Experience to date:

This system has not been applied in SA to date,

Potential installers:

City Concrete (Nick) (08) 8365 4000 (m) 0418 804 244

A4 PROPRIETRY EXPANSIVE GROUTS

Proprietary expansive grouts may also be used in lieu of flowable cement based fills. Brands such as Uretek and Benefil may be suitable – Further information is available from the following specialists in Engineering and Projects:

- Principal Material Scientist
- Principal Engineer - Geotechnical

Refer to www.groutingplus.com for further information.

Appendix B: Flange Tables

Contains:

EWS Table-C

EWS Table-F

EWS Table-H

TABLE EMS
H

| NOM. SIZE | DETAILS OF FLANGE DRILLINGS | | | | | | | | | | MILD STEEL FLANGES | | | CAST IRON FLANGES | | | CAST STEEL FLANGES | | | NOM. SIZE |
|-------------------|-----------------------------|---------------------|--------------------------------|--------------------|----------------|---------------------------------------|------------------|--------------------------------------|----|-----|--------------------------|-------------------------------|------------------------------|-------------------|-------------------------|------------------------------|--------------------|-------------------------|------------------------------|-------------------|
| | Max OD for no Bolt Fouling | Flange Outer Dia. D | Outside Dia of O-Ring Groove S | Bolt Circle Dia. P | No. of Bolts N | High Tensile Bolt Size O ₂ | Bolt Hole Dia. V | Details for Cast Steel Welding Necks | | | Min. Thick of Pipe t min | Flange with F.F. Gasket T min | Flange with O-R Groove T min | Mating O-R T min | Min Thick of Pipe t min | Flange with O-R Groove T min | Mating O-R T min | Min Thick of Pipe t min | Flange with O-R Groove T min | |
| 80 | 107 | 205 | - | 165 | 8 | M16 | 18 | - | - | - | 4 | 15 | - | 15 | 29 | - | - | - | - | 80 |
| 90 | 120 | 215 | - | 178 | 8 | M16 | 18 | - | - | - | 4 | 15 | - | 15 | 29 | - | - | - | - | 90 |
| 100 | 133 | 230 | - | 191 | 8 | M16 | 18 | - | - | - | 4 | 15 | - | 15 | 32 | - | - | - | - | 100 |
| 125 | 170 | 280 | - | 235 | 8 | M20 | 22 | - | - | - | 4 | 20 | - | 20 | 35 | - | - | - | - | 125 |
| 150 | 195 | 305 | - | 260 | 12 | M20 | 22 | - | - | - | 4 | 20 | - | 20 | 35 | - | - | - | - | 150 |
| 200 | 259 | 370 | - | 324 | 12 | M20 | 22 | - | - | - | 4 | 35 | - | 30 | 38 | - | - | - | - | 200 |
| 250 | 309 | 430 | - | 381 | 12 | M24 | 26 | - | - | - | 4.5 | 45 | - | 35 | 41 | - | - | - | - | 250 |
| 300 | 366 | 490 | 395 | 438 | 16 | M24 | 26 | - | - | - | 4.5 | - | 35 | 35 | - | - | - | - | - | 300 |
| 350 | 418 | 550 | 455 | 495 | 16 | M27 | 30 | - | - | - | 5 | - | 40 | 35 | - | - | - | - | - | 350 |
| 400 | 475 | 610 | 510 | 552 | 20 | M27 | 30 | - | - | - | 5.5 | - | 40 | 35 | - | - | - | - | - | 400 |
| 450 | 527 | 675 | 565 | 610 | 20 | M30 | 33 | - | - | - | 6.5 | - | 45 | 40 | - | - | - | - | - | 450 |
| 500 | 590 | 735 | 630 | 673 | 24 | M30 | 33 | - | - | - | 7 | - | 50 | 45 | - | - | - | - | - | 500 |
| 550 | 641 | 785 | 680 | 724 | 24 | M30 | 33 | - | - | - | 7.5 | - | 50 | 45 | - | - | - | - | - | 550 |
| 600 | 693 | 850 | 735 | 781 | 24 | M33 | 36 | 2 | 10 | 55 | 8 | - | 50 | 45 | - | - | - | - | - | 600 |
| 700 | 763 | 935 | 805 | 857 | 24 | M36 | 39 | 3 | 15 | 70 | 9.5 | - | 55 | 50 | - | - | - | - | - | 700 |
| 750 | 892 | 1090 | 935 | 991 | 24 | M39 | 42 | 5 | 20 | 85 | 10 | - | 65 | 60 | - | - | - | - | - | 750 |
| 800 | 896 | 1060 | 935 | 984 | 28 | M33 | 36 | 5 | 20 | 85 | 11 | - | 65 | 60 | - | - | - | - | - | 800 |
| 850 | 922 | 1090 | 965 | 1016 | 32 | M36 | 39 | 5 | 20 | 85 | 11 | - | 65 | 60 | - | - | - | - | - | 850 |
| 900 | 1057 | 1255 | 1100 | 1156 | 36 | M39 | 42 | 5 | 22 | 90 | 12 | - | 70 | 65 | - | - | - | - | - | 900 |
| 1000 | 1100 | 1275 | 1145 | 1194 | 36 | M36 | 39 | 5 | 22 | 90 | 13 | - | 70 | 65 | - | - | - | - | - | 1000 |
| 1050 ₄ | 1172 | 1370 | 1225 | 1283 | 36 | M45 | 48 | 5 | 25 | 100 | 14 | - | 70 | 65 | - | - | - | - | - | 1050 ₄ |
| 1200 | 1330 | 1530 | 1380 | 1441 | 40 | M45 | 48 | 5 | 25 | 100 | 15 | - | 75 | 70 | - | - | - | - | - | 1200 |

NOTES: 1 For use with water pressures up to 3.5 MPa.
 2 Bolts shall be grade 8.8 (high tensile). See also Clause 3.2.2(11).
 3 Bolts to be tightened in accordance with Section 10.
 4 The 1050 flange is to be phased out. This flange should not be used except to match existing 42" flanges.