

TABLE 306B- A: CLASS 16 (PN16) FLANGE & FASTENING DATA

PIPE NOMINAL SIZE	100	150	225	300	375	450	600	750
FLANGE OUTSIDE DIAMETER	215	280	370	455	550	640	825	995
PITCH CIRCLE DIAMETER	178	235	324	406	495	584	756	927
GASKET INTERNAL DIAMETER	108	161	241	325	406	485	641	796
NUMBER OF HOLES / BOLTS	4	8	8	12	12	12	16	20
DIAMETER OF HOLES	18	18	18	22	26	26	30	33
BOLT SIZE	M16	M16	M16	M20	M24	M24	M27	M30
LENGTH OF BOLTS (mm)	75	75	75	100	100	120	130	130
BOLT TENSION (kN)	20	20	25	35	50	55	70	80
TORQUE (LIGHTLY OILED GAL)- Nm	70	70	90	160	270	290	420	530
TORQUE (WELL LUBRICATED)	50	50	60	110	180	200	290	380
TORQUE (PTFE or INSULATED)- Nm	40	40	50	80	145	160	230	290
DI FLANGE THICKNESS (mm)	20	23	24	30	33	33	42	47
STEEL FLANGE THICKNESS (mm)	11	11	15	23	30	30	48	48

UNLESS PROVEN TO BE OTHERWISE, ASSUME GREY COATED NUTS FALL UNDER "WELL LUBRICATED". TORQUES QUOTED ARE MINIMUMS. MAXIMUM TORQUE ALLOWABLE SHALL BE 1.5 x THE MINIMUM.

TABLE 306B- B: CLASS 35 (PN35) FLANGE & FASTENING DATA

PIPE NOMINAL SIZE	100	150	225	300	375	450	600	750
FLANGE OUTSIDE DIAMETER	230	305	405	490	580	675	850	1015
PITCH CIRCLE DIAMETER	191	260	356	438	521	610	781	940
GASKET INTERNAL DIAMETER	108	161	241	325	406	485	641	796
NUMBER OF HOLES / BOLTS	8	12	12	16	16	20	24	28
DIAMETER OF HOLES	18	22	26	26	26	33	36	36
BOLT SIZE	M16	M20	M24	M24	M24	M30	M33	M33
LENGTH OF BOLTS (mm)	90	90	120	120	130	150	180	180
BOLT TENSION (kN)	50	80	115	115	150	180	230	230
TORQUE (LIGHTLY OILED GAL)- Nm	180	350	610	610	900	1190	1670	1670
TORQUE (WELL LUBRICATED)	120	240	420	420	610	810	1140	1140
TORQUE (PTFE or INSULATED)- Nm	96	190	330	330	430	520	745	830
DI FLANGE THICKNESS (mm)	22	27	34	38	42	46	54	59
STEEL FLANGE THICKNESS (mm)	24	31	38	38	48	58	68	-

NOTES on Tables 306B- A & B:

- A. The flange and fastening details provided in these tables are based on AS/NZS 4087:2011 and WSA standard WSA 109-2011. In AS/NZS 4087, figure B5 covers PN16 and figure B6 covers PN35.
- B. All flanges shall be raised face type.
- C. "lightly oiled" refers to the application of a good quality lubricating oil and is the usual as received condition of fasteners. A torque K factor of 0.22 has been used to calculate the torque values in Tables 306B- A & B in this case.
- D. "well lubricated" refers to the application of molybdenum disulfide grease, or equivalent antiseize compound, eg: nickel graphite lubricant such as loctite 771. A torque K factor of 0.15 has been used to calculate the torque values in tables 1 & 2 in this case. Unless proven to be otherwise, assume grey coated nuts fall under "well lubricated".
- E. "PTFE / Insulated" refers to the application of a PTFE coating or the use of insulating polymeric top hats or washers / with well lubricated fasteners. A torque K factor of 0.12 has been used to calculate the torque values in tables 1 & 2 in this case.
- F. Torques quoted are minimums. Maximum torque allowable shall be 1.5 x the minimum.
- G. The bolt lengths described assume Di to Di flanges. Insulated flanges may require longer bolts.
- H. The nominated gasket internal diameter is the inside diameter of flange class ductile iron pipe, excluding the cement lining. While PN35 class Di pipe has a larger ID than flange class, the nominated gasket inside diameters are larger than pipe cement lining inside diameters (ie: the gasket will not protrude into water flow of any Di pipe).

NOTES Regarding Gasket and Fastener Material Requirements:

- a. CWW only permits 316 stainless steel fasteners in buried applications. Galvanized fasteners are allowed where the fasteners are exposed to the open air rather than soil.
- b. Class 16 flange gaskets shall be full face, solid 3mm thick EPDM rubber (seal-16).
- c. Class 16 galvanised steel studs (bolts), nuts and washers shall be grade 4.6.
- d. Class 16 stainless steel studs (bolts), nuts (pffe coated) and washers shall be 316 stainless steel (A4), class 50.
- e. Class 35 flange gaskets shall be full face, 1.5mm thick compressed fibre, Teadit style na1000, which contains Aramid fibres, woven wire mesh reinforcement, a nitr rubber matrix and graphited surface on both sides.
- f. Class 35 galvanised steel studs (bolts), nuts and washers shall be grade 8.8.
- g. Class 35 stainless steel studs (bolts), nuts (pffe coated) and washers shall be 316 stainless steel (A4), class 70 .
- h. Flange gaskets shall conform to WSA industry standard WSA 109, which includes compliance to AS4020 for potable water contact.
- i. All stainless steel fasteners shall include the use of PTFE (teflon) or Molybdenum Sulphide (MoS₂) coated nuts to reduce seizing, galling and the tightening friction of the nut on the washer (thus reducing the tightening torque required).

Flanged Joint Installation Guidelines:

1. Do not allow gasket materials to be exposed to temperatures above 50 deg C or exposed to contaminants.
2. Thoroughly clean the flange faces to be jointed, ensuring there is no dirt, particles of foreign matter, protrusions or coating build-up on the mating surfaces. Use a scraper or wire brush to remove any irregularities.
3. Ensure that the mating threads of all nuts and bolts are clean and in good condition.
4. If galvanised fasteners are to be used, evenly apply a suitable lubricant (eg: molybdenum sulphide) to all mating threads, including the nut load bearing face.
5. Align the flanges to be joined and ensure that the components are satisfactorily supported to avoid bending stress on the flanged joint during and after assembly.
6. Insert four bolts (with insulators if required) in locations 1 to 4 as indicated in Figure 306B- A, positioning the gasket in between the flange mating faces. Take care not to damage the gasket surfaces.

7. Tighten the nuts to finger tight and check the alignment of the flange faces and gasket.
8. Insert the remaining bolts (with insulators if required) and tighten nuts to finger tight.
9. Determine the correct tightening torque from the above tables.
10. Tighten nuts to 30% of this torque using the star pattern detailed in the figure below.
10. Tighten nuts to 60% of this torque using the star pattern detailed in the figure below.
10. Tighten nuts to 100% of this torque using the star pattern detailed in the figure below.
11. Finish with one final pass, torquing in a clockwise direction.
12. Re-torque fasteners 30 minutes after the initial tightening sequence (to cater for relaxation of the gasket).
13. If galvanised fasteners are to be used, apply corrosion protection measures as detailed in MRWA-W-306A.

Torque wrenches used must provide torques to an accuracy of +/- 25%, which is typical. In critical applications where torques are substantial (ie: > 200 Nm), a more accurate hydraulic tensioner shall be used.

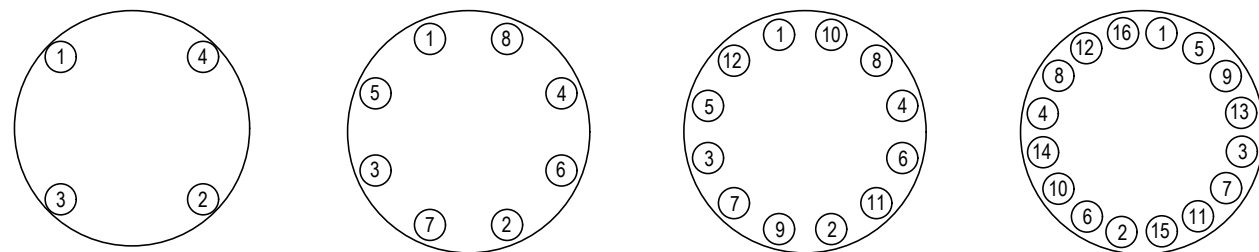


FIGURE 306B- A: BOLT TIGHTENING SEQUENCE

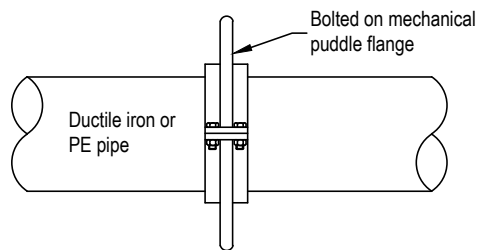


FIGURE 306B-B: MECHANICAL PUDDLE FLANGE CONNECTION

NOTES Regarding Mechanical Flange Attachment:

- Mechanical puddle flanges shall not be applied to PVC pipe.
- Clean mechanical puddle flanges (ie: bolted) fixed to metallic pipe shall be fitted to a clean pipe with a 2 pack epoxy resin liberally applied to the pipe and puddle flange mating surfaces.
- Install as per manufacturer's instructions. Where fastening torque is not specified:
- Firmly fasten the puddle flange bolts to a torque equivalent to that specified for lightly oiled galvanised flange bolts in Table 306B-A (PN16) or Table 306B- B (PN35).

GENERAL NOTES:

- Where test pressures are < 1600 kPa, class 16 flanges and gaskets are typically screwed onto flange class pipe (which is typically thicker than class 35 ductile iron pipe).
- Where there are more than 16 bolts, the same principle as applied in the 16 bolt flange pattern should be utilised.

TABLE 306B-C: PE MAIN CONNECTION TO CLASS 16 FLANGES (PN16)

NOM DI FITTING SIZE	PE STUB SIZE	PE BACKING RING SIZE	FLANGE			PE ADAPTOR	PE EQUIVALENT DNPE SIZE(S) ^
			ID	OD	PCD		
100	125	110	128	215	178	NOT REQUIRED	125
150	180	180	195	280	235	NOT REQUIRED	180
225	225	SPECIAL ORDER	370	324	225 to 280, or 225 to 315		280 or 315
250 *	280	280	300	405	356	NOT REQUIRED	N/A
300 #	315	315	345	455	406	315 to 355, or 315 to 400	355 or 400
375	SPECIAL ORDER	STUB FLANGE + BACKING RING + ADAPTOR REQUIRED					400 or 500
450	450	450	480	640	584	450 to 560, or 450 to 630	560 or 630

Notes Regarding Table 306B-C:

- ^ Equivalent size means that these sizes have the most similar hydraulic capacity.
- * Flange size 250 is included to enable DN280 PE mains to directly connect to DN250 valves / hydrant tees etc (ie: no adaptor would be required). Socket spigot mains shall not be constructed in DN250 size.
- # If preferred, DN315PE pipe may directly connect to a DN300 valve for convenience (no adaptor would be required), although the valve in this case would be larger than required. Refer to Figure 306B- B.
- all PE adaptors shall be moulded fittings and butt weld fused to pipes / stubs.

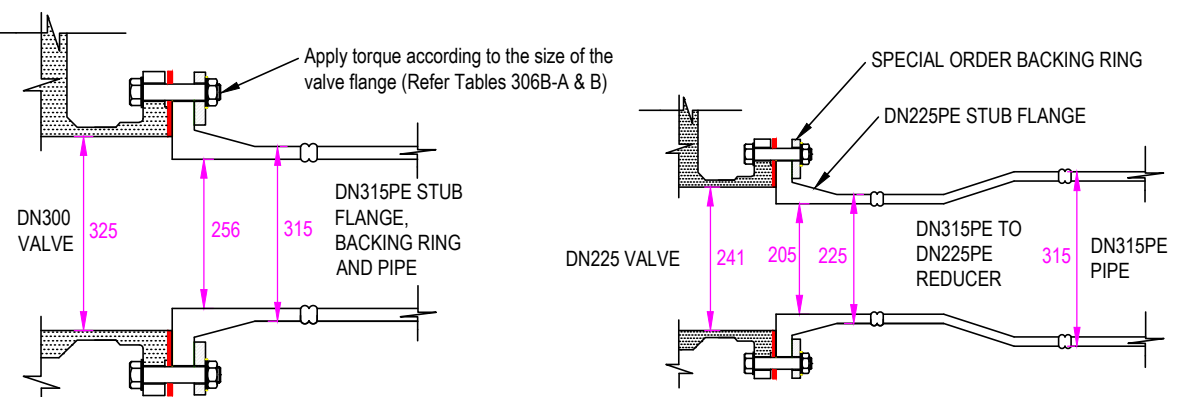


FIGURE 306B-C: ALTERNATIVE DN315PE VALVE ARRANGEMENTS

REV	DESCRIPTION	DATE	APPROVED	DESIGNED	DATE	CHECKED	DATE	APPROVED	DATE
3	PE PUDDLE FLANGES, TORQUE AMENDMENTS	01/12/16	RJ / CP / JT	K. DAWSON	11/03/2011	R. JAGGER	11/03/2011		
2	PUBLISHED FIRST ISSUE	04/04/12	K.DAWSON	R. JAGGER	04/04/12	C. W. W.	04/04/12	R. CARRUTHERS	04/04/12
1	PRE PUBLISHED DRAFT FOR COMMENT	12/07/11	K.DAWSON	C. PAXMAN	04/04/12	SEWL	04/04/12	G. REYNOLDS	04/04/12
				S. TAN	04/04/12	YVW	04/04/12	A. COSHAM	04/04/12

MELBOURNE RETAIL WATER AGENCIES



MRWA WATER SUPPLY STANDARDS

FLANGE DETAILS AND FLANGE FASTENING REQUIREMENTS

NOT TO SCALE

MRWA-W-306B

ISSUED 2012 REVISION NO. 3