TABLE 103-A: ACCEPTABLE PIPE SYSTEMS

NOMINAL DIAMETER	100 [E.A]	150	225	300	350	375	400	450	500	525	600	675	700	750	800	900	1000
MINIMUM GRADE (%) [I]	1.7	0.55	0.33	0.25	0.20	0.17	0.16	0.14	0.13	0.12	0.10	0.08	0.08	REFER NOTE I.			
MINIMUM GRADE [I] 1 in	60	180	300	400	500	590	625	715	770	830	1000	1180	1250	REFER NOTE I.			
PVC OUTSIDE DIAMETER (OD)	110	160	250	315		400											
PVC PLAIN WALL INSIDE DIAMETER (ID)	102 [E.B]	150 [E.B]	234 [E.B]	294 [E.B]		353											
PVC SANDWICH WALL INSIDE DIAMETER (ID)	98	150	215	285		356 [E.C]											
PVC SOLVENT CEMENT JOINTED PIPE ACCEPTABLE	✓	✓	✓														
PVC RUBBER RING JOINTS ACCEPTABLE		✓	✓	✓		✓											
PP OUTSIDE DIAMETER (OD)			259	344		428		514		600	682						
PP (ID)			225	300		373		447		522	596						
PE (PN8, SDR21) OUTSIDE DIAMETER (OD) [F]	110	160	250	315	400		450	500	560								
PE (PN8, SDR21) INSIDE DIAMETER (ID) [F]	99	145	226	285	362		407	452	506								
GRP (AS3571- Table 5 Amended) OUTSIDE DIAMETER (OD) [G]				345		426		507		587	667	747		826		923	1025
GRP (AS3571- Table 5 Amended) SN10 INSIDE DIAMETER (ID) [G]				328		409		487		564	641	718		794		887	985
GRP (ISO10467- Table 5 & 6) OUTSIDE DIAMETER (OD) [G]				324	376		427		530		616		718		820	924	1026
GRP (ISO10467- Table 5 & 6) SN10 INSIDE DIAMETER (ID) [G]				308	358		407		505		587		685		783	882	980

NOTES Regarding Table103-A:

A. All sewer systems tabulated above are suitable for residential, commercial & industrial sewage collection.
B. All sewer systems tabulated above can be considered to have a roughness co-efficient (Ks) of 1.5mm.
C. Standard lengths for sewer gravity pipe is 3m or 6m.
D. Minimum SN classes:
   D.A. DN100 gravity sewer pipe SN (min) = SN 10,000 (N/m/m) which is equivalent to SN 10 (kN/m/m).
   D.B. > DN100 gravity sewer pipe SN (min) = 8,000 (N/m/m) which is equivalent to SN 8 (kN/m/m).
   D.C. PN8 SDR21 PE100 pipe SN (min) = 3,700 (N/m/m) which is equivalent to SN 3.7 (kN/m/m)
E. PVC (Poly Vinyl Chloride) DWV pipelines:
   E.A. DN100 pipelines are only acceptable for use in the construction of property services (refer Table 104-A) or spur branches.
   E.B. Plain wall PVC is generally used for only DN375.
   E.C. Sandwich wall PVC is generally used in sizes DN100, DN150, DN225 & DN300. Plain wall PVC should be specified when a higher degree of toughness is required.
F. PE (Poly ethylene) pipelines:
   F.A. Shall be PE100 or better and plain black.
   F.B. Require Water Agency approval.
   Typically this will only be granted where the advantages of PE are required, eg: where high impact resistance, increased flexibility or long run trenchless construction is required.
   F.C. Where practicable, grade for on grade PE pipe (ie: not including syphons) shall > be 1 in 150.
   Flatter grades require Water Agency approval.
   F.D. All PE sewers shall be butt welded where practicable.
   F.E. Butt weld joints shall be de-beaded internally after welding.
   F.F. Where PE gravity sewer pipe is gouged to > 20% of its wall thickness, it shall be rejected.
   F.G. SN rating of SDR21 PE100 PE pipe shall be calculated as follows:
   $SN = (E_{2y} \times 10^6) / 12(SDR-1)^3$ E_{2y} = 350 MPa (2 year modulus for PE100)
   eg: for PN8 SDR21 PE1000 pipe, SN = 3,700 N/m/m
   Structural limits for pe pipe shall be calculated accordingly.
   F.H. SDR21 PE100 pipe is capable of withstanding significantly less vertical load than other acceptable pipelines.
   F.I. PE lined concrete, vitrified clay, Polycrete, ductile iron and steel sewers require approval of the Water Agency.
G. GRP (Glass Reinforced Polymer) pipelines:
   G.A. Where GRP jacking pipe is proposed. Refer to MRWA-S-208 for guidance on calculating the required SN rating of jacking pipe.
   G.B. Where sewage or the ground is known to contain organic solvents, vinyl ester GRP with Viton or Nitrile rubber ring joints shall be used.
   PVC DWV and PP pipe is generally not suitable in such cases (depending on the concentration & type pf solvent).
H. The maximum grade shall be that for which the velocity of flow is 3.0 m/s at PDWF. (refer MRWA-S-205 for details)
I. Minimum grade depends on flow (number of connections). The minimum grade quoted in Table 103-A assumes a significant number of connections.
Refer to Table 5.6 in the code text for the minimum grade required as it varies with the number of connections.
The minimum grades quoted for > DN300 sewers are indicative only. Shear stress of 1.6 Pa shall be achieved at PDWF.
Where the proposed grade is close to or greater than the minimum grade tabulated in Table 103-A, the minimum grade shall be determined by a hydraulic specialist (degree qualified engineer who has completed open channel hydraulics training) in consultation with the Water Agency.
Hydraulic computations shall be provided to the Water Agency as part of the design submission.

TABLE 103-B: PVC DWV WITNESS MARK & CHAMFER DIMENSIONS

NOMINAL DIAMETER	100	150	225	300	375	450	525	600
PVC-DWV WITNESS MARK (X)	84	96	120	130	140	N / A		
PVC-DWV CHAMFER LENGTH (Y)	11	13	20	20	25	N / A		
POLYPROPYLENE WITNESS MARK (X)	N/A	6TH RIB		TOP OF 5TH RIB				

- Witness mark on polypropylene pipe shall be a white line around the circumference.
- Polypropylene pipe does not require a chamfer on the spigot end.
- Sewerpro PP rubber ring to be located in 1st trough from end of pipe.
- Sewermax PP rubber ring to be located in 2nd trough from end of pipe.
- Pipe spigots shall be inserted until the witness mark is within 5mm of the socket end while remaining visible.

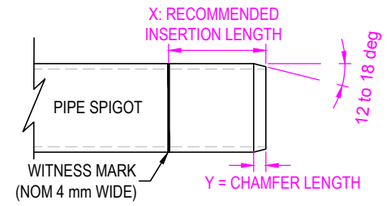

FIGURE 103-A: SOCKET JOINT REQUIREMENTS

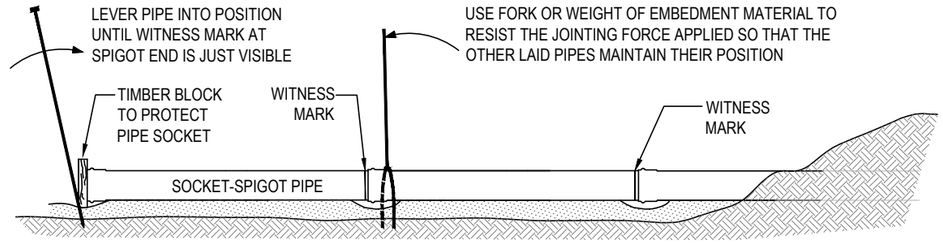

FIGURE 103-B: SOCKET - SPIGOT PIPE INSTALLATION REQUIREMENTS

Pipe Installation:

1. Lay pipes in accordance with the manufacturer's instructions.
2. Undertake trenching as per MRWA-S-201.
3. Refer to the design to establish the required embedment system and determine a suitable approved embedment material (refer MRWA-S-202).
4. Place underlay, ensuring that embedment material is scalloped out from beneath collars so that the pipe can be supported evenly along its entire length.
5. Check roundness of pipe to ensure it is within limits. If out-of roundness is noticeable but minimal, orientate larger pipe diameter in the vertical plane.
   Reject any pipe which is significantly out-of-round.
6. Laid pipes shall be held in position by placing sufficient embedment material over each pipe before inserting the next pipe, or alternatively:
   Use a fork as per Figure 103-B to hold the laid pipe in position while the next pipe is inserted.
7. If rubber ring joint (RRJ) pipe:
   7.1. Prepare any cut spigot end by cutting the pipe square, chamfering and applying a witness mark as per table 103-B and Figure 103-A.
   7.2. Clean the pipe or fitting socket and spigot end making sure that both are free from foreign material and swarf.
   7.3. Fit the rubber ring into / onto the groove if not already done so.
   7.4. Ensure rubber ring is evenly fitted by running fingers around its full circumference.
   7.5. Apply manufacturer approved jointing lubricant liberally inside the socket and end of spigot.
   7.6. Accurately align new pipe length with the installed pipe and insert leading edge of spigot into socket mouth.
   7.7. Apply an even jointing force by thrusting a crow-bar on a timber bridging piece protecting the end of the socket as per Figure 103-B.
   7.8. Push spigot home to witness mark.
8. If solvent cement joint (SCJ):
   8.1. Prepare any cut spigot ends by cutting the pipe square and de-burring inside and outside edges with a knife, file, reamer or sandpaper.
   Apply witness mark as per Table 103-B and Figure 103-A.
   8.2. Clean the pipe or fitting socket and spigot end making sure that both are free from foreign material.
   8.3. Apply priming fluid to contact surfaces with a lint free cotton cloth.
   8.4. Coat socket and then spigot end (to witness mark) with a thin uniform coating of solvent cement.
   Ensure that too much solvent cement is not used such that there will be a pool of cement when joined (this will weaken the pipe).
   8.5. Quickly but accurately align new pipe length with the installed pipe and insert leading edge of spigot into socket mouth.
   8.6. Apply an even jointing force by thrusting a crow-bar on a timber bridging piece protecting the end of the socket as per Figure 103-B.
   8.7. Push spigot home to witness mark and twist a 1/4 turn.
   8.8. Hold pressure for 30 seconds.
   8.9. Wipe off any excess solvent from inside (if possible) and outside of joint.
   8.10. Do not disturb the joint for 5 minutes to avoid breaking the initial bond.
9. Place side support and haunch pipe to ensure that the underside of the pipe is fully supported with compacted embedment material.
   Refer MRWA-S-201 and 202 for details.
10. Place and compact overlay embedment material to the required depth.
11. Backfill trench as per the MRWA backfill specification.

REV	DESCRIPTION	DATE	APPROVED
2	PUBLISHED FIRST ISSUE	01/10/15	CP / JT / KD / RJ
1	PRE-PUBLISHED DRAFT	01/03/15	CP / JT / KD / RJ

ALL DIMENSIONS IN mm UNLESS STATED OTHERWISE

	NAME	DATE
DESIGNED:	R. JAGGER	1 JULY 2015
DRAWN:	R. JAGGER	1 JULY 2015
CHECKED: ☒ CWW	D. MOORE	01/09/15
☒ SEW	C. PAXMAN	01/09/15
☒ YVW	K. DAWSON	01/09/15
APPROVED: ☒ CWW	R. CARRUTHERS	01/09/15
☒ SEW	D. O'DONOVAN	01/09/15
☒ YVW	J. TOMASI	01/09/15

ISSUED 2015 VERSION 1

MELBOURNE RETAIL WATER AGENCIES
City West Water™
South East Water
Yarra Valley Water

MRWA SEWERAGE STANDARDS

PIPE AND JOINT DETAILS

NOT TO SCALE

MRWA-S-103

Planning	Design	Construction
✓	✓ ✓	✓ ✓