Appendix A - Acceptable Pipe and Fitting Materials
(Informative)

Table A1 and Table A2 give information on acceptable pipe and fitting materials. The information is sourced with permission from the Water Services Association of Australia. Refer also to WSA 02 (Sewerage Code of Australia) and WSA 03 (Water Supply Code of Australia) for further information.

For ALL PE pipes dimensions shall be provided for Outside Diameter (OD), Inside Diameter (ID) and Nominal Diameter (ND).

Table A1 – Acceptable pipe materials and Standards

Note: PVC only used if specifically agreed with TA

NOTE – Refer also to WSA 02 (Sewerage Code of Australia) and WSA 03 (Water Supply Code of Australia)

Pipe materials	Standard applicable	Stormwater (Gravity)	Wastewater (Pressure sewer/ rising main)	Wastewater (Gravity)	Water supply (Pressure)	Notes
PVC-U	AS/NZS 1260 (Class SN 4, 8, or 16 as required by TA)	✓	–	✓	–	Gravity applications only. Well established methods of repair. Suitable for aggressive groundwater, anaerobic conditions and tidal zones. Can be used for trenchless installation with suitable end load resistant joints.
PVC-U	AS/NZS 1254 (Class SN 4, or 8, as required by TA)	✓	–	–	–	Gravity stormwater applications only.
PVC-O	AS/NZS 4441 (Series 1 or Series 2, as required by the TA)	–	✓	–	✓	Improved fracture toughness compared with PVC-U. Improved fatigue resistance compared with PVC-U and PVC-M. NOTE – Use only DI fittings in pumped mains to achieve full fatigue resistance. Has increased hydraulic capacity compared with PVC-U and PVC-M. Suitable for aggressive groundwater, anaerobic conditions, and tidal zones. Specific design for dynamic stresses (fatigue) required for pressure sewer applications.
PVC-U	AS/NZS 1477 (Series 1 or Series 2, as required by the TA)	–	✓	–	✓	Well established methods of repair. Alternative installation techniques possible, for example slip lining. Suitable for aggressive groundwater, anaerobic conditions, and tidal zones. Can be used for trenchless installation with suitable end load resistant joints. Specific design for dynamic stresses (fatigue) required for pressure sewer applications.

Table A1 – Acceptable pipe materials and Standards (continued)

Note: PVC only used if specifically agreed with TA

Pipe materials	Standard applicable	Stormwater (Gravity)	Wastewater (Pressure sewer/ rising main)	Wastewater (Gravity)	Water supply (Pressure)	Notes
PVC-M	AS/NZS 4765 (Series 1 or Series 2, as required by the TA)	–	✓	–	✓	Improved fracture toughness compared with PVC-U. Has increased hydraulic capacity compared with PVC-U. Inferior fatigue resistance compared with PVC-U and PVC-O. Suitable for aggressive groundwater, anaerobic conditions and tidal zones. Specific design for dynamic stresses (fatigue) required for pressure sewer applications.
PE (PE 80B or PE 100 as required by the TA)	AS/NZS 4130	–	✓	–	✓	Generally for pressure applications. Can be easily curved to eliminate the need for bends. Alternative installation techniques possible, for example pipe cracking, direction drilling, and slip lining. Can be welded to form an end load resistant system. Compression couplings and end load resistant fittings are available in smaller diameters. Pipe longitudinal flexibility accommodates large differential ground settlement. Fusion jointing requires skilled installers and special equipment. Retrospective installation of fittings/repair complicated. Specific design for dynamic stresses (fatigue) required for pressure sewer applications. ≤ DN 125 available in long coiled lengths for fewer joints. Suitable for aggressive groundwater, anaerobic conditions or tidal zones. Suitable for ground with high subsidence potential, for example fill or mining areas.

Table A1 – Acceptable pipe materials and Standards (continued)

Note: PVC only used if specifically agreed with TA

Pipe materials	Standard applicable	Stormwater (Gravity)	Wastewater (Pressure sewer/ rising main)	Wastewater (Gravity)	Water supply (Pressure)	Notes
PE (Stiffness Class SN 4, 8, 10, or 16 as required by the TA)	AS/NZS 5065	✓	–	✓	–	Only for gravity applications. Can be easily curved. Alternative installation techniques possible, for example pipe cracking and slip lining. Can be welded to form an end load resistant system. Fusion jointing requires skilled installers and special equipment. Retrospective installation of fittings/repair complicated. Smaller diameters available in long coiled lengths for fewer joints. Suitable for aggressive groundwater, anaerobic conditions, or tidal zones.
PP (Stiffness Class SN 4, 8, 10, or 16 as required by the TA)	AS/NZS 5065	✓	–	✓	–	Only for gravity applications.
GRP	AS 3571.1	✓	✓	✓	–	Alternative installation techniques possible, for example slip lining. UV resistant (special product). Custom made fittings can be manufactured. Suitable for use without additional corrosion protection in areas where stray electrical currents occur. Low impact resistance and ease of damage to thermosetting resin, makes GRP susceptible to damage during transportation, and installation, in above ground installations, from vandalism, or when damaged as a consequence of nearby excavation. Suitable for aggressive groundwater, anaerobic conditions or tidal zones.

Table A1 – Acceptable pipe materials and Standards (continued)

Note: PVC only used if specifically agreed with TA

Pipe materials	Standard applicable	Stormwater (Gravity)	Wastewater (Pressure sewer/ rising main)	Wastewater (Gravity)	Water supply (Pressure)	Notes
GRP	AS 3571.2	–	–	–	✓	Alternative installation techniques possible, for example slip lining. UV resistant (special product). Custom made fittings can be manufactured. Suitable for use without additional corrosion protection in areas where stray electrical currents occur. Low impact resistance and ease of damage to thermosetting resin, makes GRP susceptible to damage during transportation, and installation, in above ground installations, from vandalism, or when damaged as a consequence of nearby excavation. Suitable for aggressive groundwater, anaerobic conditions, or tidal zones.
VC	BS EN 295	✓	–	✓	–	Gravity applications only. Has benefits for particularly aggressive industrial wastes. Not recommended for active seismic (earthquake) zones, or unstable ground.
RRRC (rubber ring joint reinforced concrete)	AS/NZS 4058	✓	–	✓	–	Requires protection from hydrogen sulphide attack in sewer applications, by plastic lining or selection of appropriate cement additives.

Table A1 – Acceptable pipe materials and Standards (continued)

Note: PVC only used if specifically agreed with TA

Pipe materials	Standard applicable	Stormwater (Gravity)	Wastewater (Pressure sewer/ rising main)	Wastewater (Gravity)	Water supply (Pressure)	Notes
CLS (SCL) (concrete lined welded steel)	NZS 4442 AS 1579	–	✓	–	✓	Cement mortar lined, PE coating below ground or heavy duty coating above ground High mechanical strength and toughness. Available in long lengths. RRJ and welded joints available. Custom made, specially configured steel fittings can be made to order. Can be welded to form a system that will resist end load and joint permeation. UV resistant/vandal proof/impact resistant (where PE coated). Cathodic protection (CP) can be applied to electrically continuous pipelines to provide enhanced corrosion protection. PE lined and coated – RRJ As above for CLS (SCL). Suitable for conveying soft water. Corrosion resistant under all conditions. General notes Standard Portland cement mortar not resistant to H2S attack, at any high points or discharge points in the main. High alumina cement has improved resistance. Welded joints require skilled installers and special equipment. Welded joints require reinstatement of protection systems on site. Special design required for welded installations parallel, and adjacent to high voltage (> 66 kV) transmission lines. Cathodic protection requires regular monitoring and maintenance. Seal coating may be required over cement mortar linings, when conveying soft water, or in low flow extremities of reticulation mains, to prevent potentially high PH. Suitable for high load applications such as railway crossings and major roads. Large diameters are available. Suitable for aerial or suspended pipeline applications.

Table A1 – Acceptable pipe materials and Standards (continued)

Note: PVC only used if specifically agreed with TA

Pipe materials	Standard applicable	Stormwater (Gravity)	Wastewater (Pressure sewer/ rising main)	Wastewater (Gravity)	Water supply (Pressure)	Notes
DI (ductile iron pipe)	AS/NZS 2280 AS 3681	–	✓	–	✓	Fatigue analysis not normally required (pressure sewer applications). High mechanical strength and toughness. Ease of jointing. UV resistant/vandal proof/impact resistant. Well established methods of repair. Suitable for high pressure and above ground pipelines. Restrained joint systems available. Sufficient ring stiffness to not rely on side support, for structural adequacy for the usual water supply installation depths. Elevated PH may occur when conveying soft water, or in low flow extremities of reticulation mains. PE sleeving is required, and must be carefully applied and repaired when damaged. Standard Portland cement mortar not resistant to H2S attack, at any high points or discharge points in the main. (Wastewater applications. High alumina cement has improved resistance.) Not suitable for aggressive groundwater, anaerobic conditions, or tidal zones.
Corrugated aluminium pipe	AS/NZS 2041	✓	–	–	–	Generally of short length (for culverts and so on). Joints need consideration in fine soils with high water tables. Invert may need lining to extend life.
Corrugated steel pipe	AS/NZS 2041 NZS 4405 NZS 4406	✓	–	–	–	Generally only for short length (culverts and so on). Joints need consideration in fine soils and high water tables. Invert may need lining to extend life.
ABS	AS/NZS 3518 AS/NZS 3690 AS/NZS 3879	–	✓	–	✓	Specific design for dynamic stresses (fatigue required for pressure sewer applications).

Pipe materials	Standard applicable	Stormwater (Gravity)	Wastewater (Pressure sewer/ rising main)	Wastewater (Gravity)	Water supply (Pressure)	Notes
PVC-U	AS/NZS 1260	✓	–	✓	–	Gravity applications only.
PVC-U	AS/NZS 1254	✓	–	–	–	Gravity stormwater applications only.

Table A2 – Acceptable fitting materials and Standards

Fittings Materials	Standard applicable	Stormwater (Gravity)	Wastewater (Pressure sewer/ rising main	Wastewater (Gravity)	Water supply (Pressure)	Notes
PVC-U	AS/NZS 1254	✓	–	–	–	Gravity stormwater applications only.
PE	AS/NZS 4129	✓	✓	✓	✓	PE pressure fittings, including mechanical compression, butt fusion or electrofusion, as approved by the TA.
Access covers and grates	AS 3996	✓	–	✓	–	
Ductile iron	AS/NZS 2280	–	✓	–	✓	Generally for pressure applications. Shall be coated with a polymeric coating, applied in accordance with AS/NZS 4158.
Ductile iron unrestrained mechanical couplings	AS/NZS 4998	–	✓	–	✓	Generally for pressure applications. Shall be coated with a polymeric coating, applied in accordance with AS/NZS 4158.
Plastic or metallic tapping bands	AS/NZS 4793	–	✓	–	✓	Generally for pressure applications. Tapping bands used on flexible pipes shall be AS/NZS 4793 Type F – that is, 'full circle design'. Ductile iron tapping bands shall be coated with a polymeric coating, applied in accordance with AS/NZS 4158.
Fire hydrants	NZS/BS 750	–	✓	–	✓	Generally pressure applications.
Resilient seated gate valves	AS 2638.2	–	✓	–	✓	Generally pressure applications.
PE (Stiffness Class SN 4, 8, 10 or 16 as required by the TA)	AS/NZS 5065	✓	–	✓	–	Gravity applications only.
PP (Stiffness Class SN 4, 8, 10 or 16 as required by the TA)	AS/NZS 5065	✓	–	✓	–	Gravity applications only.