

WSA PS – 287 STRUCTURAL ADHESIVE FOR JOINING PVC-U DWV FITTING AT THE INLETS AND RISERS OF THE BASE UNITS OF PE MAINTENANCE SHAFTS, MAINTENANCE CHAMBERS OR MAINTENANCE HOLES INTENDED FOR USE IN NON-PRESSURE BURIED APPLICATIONS - SEWERAGE

287.1 SCOPE

This specification covers structural adhesive for joining a moulded PVC-U DWV fitting {Socket-Spigot adaptor (SWJ or RRJ)} to PE socket inlets, outlet or riser of a PE maintenance shaft, maintenance chamber or maintenance hole base units intended for non-pressure buried sewer applications.

287.2 REQUIREMENTS

287.2.1 Application

- (a) The application of structural adhesives is limited to joining:
- (i) moulded PVC-U DWV fitting {Socket-Spigot adaptor (SWJ or RRJ)} to a PE socket inlets, outlet or riser of a PE maintenance shaft, maintenance chamber or maintenance hole base units,
 - (ii) nominal diameters from DN 150 to DN 375. That is nominal diameters DN 150, 225, 300 and 375 with outside diameters (OD) 160, 250, 315 and 400 mm.
 - (iii) materials specified in WSA PS 287.2.2 intended for non-pressure, buried applications.
- (b) Structural adhesive PE/PVC joints shall be formed within a controlled manufacturing environment. They shall not be prepared in the field.

287.2.2 Materials

- (a) The material for the PE MS, MC, MH base units shall comply with WSA 137¹:2019 Clause 2.2.2.1 or Clause 2.2.2.2.
- (b) The material for the PE riser, cone and inlet connectors shall comply with WSA 137¹:2019 Clause 2.2.3.1 or Clause 2.2.3.2.
- (c) The moulded PVC-U DWV fittings {Socket-Spigot adaptor (SWJ or RRJ)} shall comply with AS/NZS 1260²
- (d) Refer to Appendix WSA PS 287A for requirements for structural adhesives.

287.2.3 Performance requirements

This Section specifies the minimum performance requirements applicable to PE, MS, MC and MH assemblies that include one or more PE to PVC structural adhesive joints.

- (a) Structural integrity test - To be performed on Maintenance Structure (MS, MC, MH) assembly with adhesive bonded PE to PVC joints. [1,000 h test at 20 - 25 °C] in accordance with Clause 3.2 and Appendix C, WSA 137¹:2019.
- (b) Base to Pipe PE to PVC joints subjected to water tightness tests (low positive pressure; high positive pressure; negative pressure in accordance with Clauses 3.7.2 of WSA 137¹:2019).

- (c) Base to Riser PE to PVC joints subjected to water tightness tests (low positive pressure; high positive pressure; negative pressure in accordance with Clauses 3.7.3 of WSA 1371:2019).
- (d) To verify the sealing properties of the structural adhesive PE to PVC joints they shall not leak when tested in an assembly in accordance with Figure C1, AS 3879⁴:2011 as follows:
- (i) Using free (unrestrained) endcaps apply an internal pressure of 85 kPa to an assembly with free (i.e., unrestrained) endcaps at ambient temperature for 3,000 h.

Note: Under internal pressure the unrestrained endcaps generate a longitudinal stress on the joint so both the shear strength and resistance to leakage are tested simultaneously. For example, a pressure of 85 kPa generates a longitudinal load of approximately 170 kg force on a DN150 DWV assembly.

- (e) Determine the shear strength of structural adhesive PE to PVC joints by performing a lap shear test using the principles in ASTM D1002³ (for adhesively bonded metal specimens). The test may be performed on curved specimens cut from a formed PE to PVC joint.

Note: Shear strength can then be related to the surface area of the joints to determine the short-term strength of the adhesive joints.

- (f) Chemical resistance testing to simulated conditions during long-term usage.
- (i) Chemical resistance tests shall be performed on PE to PVC structural adhesive joints using four different liquids. These being tap water, water pH 12, water pH 2 and a mixture of water, vegetable oil/detergent and a surfactant. The four pressure test assemblies shall have unrestrained endcaps and each be filled with one of the test solutions. An internal pressure of ≥ 85 kPa shall be applied for not less than 3,000 hours at a temperature of 20 - 25°C. The joints shall not leak.
- (ii) At the completion of the pressure tests, a lap shear test shall be performed in accordance with the principles described in ASTM D1002³. The shear strength results to be compared with those of the reference joint of the same age but not exposed to any liquid.

Note: Pressure tests may be performed with apparatus as described in AS/NZS 1462.6⁵ or ASTM D1598⁶.

- (g) Accelerated testing of resistance to long-term ageing.
- (i) An assembly, including a structural adhesive PE to PVC joint, shall be filled with water and exposed to a temperature of 60°C for $\geq 4,380$ hours. At the completion of the exposure to 60°C, the assembly shall be pressure tested at 80 - 85 kPa and a temperature of 20 – 25°C, in accordance with Appendix C of AS 3879⁴:2011 The adhesive joint shall not leak.

Note Six months exposure of an adhesive joint at 60°C is intended to simulate extended service life.

287.3 QUALITY ASSURANCE

- (a) Structural adhesive shall have product certification (ISO Type 5) to WSA PS 287. The ISO Type 5 Product Certification Scheme shall meet the criteria described in WSA TN-08⁷
- (b) PVC-U non-pressure fittings shall have product certification (ISO Type 5) to AS/NZS 1260²:. The ISO Type 5 Product Certification Scheme shall meet the criteria described in WSA TN-08⁷.
- (c) All products shall be marked in accordance with the conformity assessment body’s requirements.

287.4 AGENCY OR PROJECT SPECIFIC REQUIREMENTS

- 1 WSA 137:2019 Industry standard for Un-plasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and Polyethylene (PE) maintenance shafts, maintenance chambers and maintenance holes for sewerage Version 3.3
- 2 AS/NZS 1260:2017 PVC-U pipes and fittings for drain, waste and vent applications
- 3 ASTM D1002 - 10(2019) Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal)
- 4 AS/NZS 3879:2011 Solvent cements and priming fluids for PVC (PVC-U and PVC-M) and ABS and ASA pipes and fittings
- 5 AS/NZS 1462.6:2008 Methods of test for plastics pipes and fittings Thermoplastics pipes, fittings and assemblies for the transport of fluids under pressure - Resistance to internal pressure
- 6 ASTM D1598-21 Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
- 7 Water Services Association of Australia Technical Note (WSA-TN-08) sets out additional product conformity assessment requirements that are associated with demonstration of conformity to WSA PS 287.

APPENDIX WSA PS -287A REQUIREMENTS FOR STRUCTURAL ADHESIVES

(Normative)

The supplier shall provide a data sheet defining the:

- (a) mixing ratios and methods,
- (b) preparation and service temperatures,
- (c) working life of the prepared adhesive, and
- (d) the curing time.

NOTES

The use of the adhesive to form joints should be restricted to a controlled manufacturing environment

The long-term service temperature of the adhesive should be above 60°C to allow for the accelerated testing described in 287.2.3 (g)