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Assessment of the SPR PE Lining System for Gravity Pipes

1. Scope

1.1 This schedule sets down the requirements for assessing the SPR PE lining system for use in 900mm to 3000mm nominal diameter gravity pipes.

1.2 SPR PE is a no-dig solution for the renovation of gravity pipes using a factory extruded grey or black high density polyethylene (HDPE) profile strip with steel reinforcement which is fed from a spool down into an access chamber and into a patented hydraulically driven winding machine at the base of the manhole. The winding machine spirally winds the plastic/steel composite into a liner directly into the deteriorated pipe.

1.3 There is a special coiling method so that the steel reinforced profile can be wound onto a spool for delivery to site. The winding process incorporates an extruder that welds successive wraps of profile together, thereby making a fully welded pipe without mechanical joints.

1.4 High liner stiffness is achieved through vertical strips of steel reinforcement on the outer surface of the profile which are embedded within HDPE. A number of profile and steel configurations are available so that pipe stiffness can be tailored to specific applications.

1.5 The liner is wound at a fixed diameter, leaving an annular space between the liner and host pipe wall which is filled with cementitious grout.

1.6 Lateral connections can be made into the SPR PE system.

1.7 The SPR PE system installs a reinforced thermoplastic lining which can be used as a partially or fully deteriorated structural lining.

1.8 The ends of the SPR PE lining are sealed against the host pipe by installing an end seal between the liner and existing pipe with a sealing material that is compatible with the liner pipe material.

1.9 The specification for the SPR PE system is provided in the SPR PE Installation Manual[(1)]. Key items manufactured by SEKISUI Rib Loc Australia Pty Limited include:

i. Winding machine.
ii. HDPE profile strip with encapsulated steel strip.
iii. HDPE weld material.

1.10 This assessment covers the following:

i. Materials quality audit.
ii. Review of the quality systems for the manufacture, supply, materials handling and storage.
iii. Testing of the product against performance requirements.
iv. Structural design of the lining.
v. Audit of installation instructions and witnessing of installation on site.

Approval exclusions:
i. The installation or reconnection of the laterals.
ii. The liner end seals.

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Product claims: evidence which are claimed include:

- High quality control, low risk: use of factory extruded profiles, no mixing of chemicals or curing required on site.
- Fully structural renovation technique: capable of withstanding external hydrostatic pressure and, if required, soil and live loads.
- Minimal environmental disruption: quiet hydraulically driven winding machine, trenchless (minimum excavation) technique.

2. Materials Quality Audit

2.1 The HDPE profile is manufactured from PE63 material, Marlex HXM50100 from Chevron Philips, cell classification 334433C (or E) or higher in accordance with ASTM F894[2].

2.2 The HDPE weld material is manufactured from Marlex HXM50100 with a 2.5% Clariant Remafin White L1071 masterbatch.

2.3 The steel reinforcing bands are formed from a cold rolled formable CA3SN-G grade.

2.4 Quality management system certification for the materials supply and strip manufacture shall be audited.

3. Performance Testing

3.1 Performance testing is listed below which is in accordance with relevant standards, including ASTM F894[2] and ASTM F1741[3].

General Characteristics

3.2 Appearance – the internal surface of the lining shall be smooth, clean and free from scoring, cavities, wrinkling and other surface defects that would prevent the SPR PE liner from meeting the general fitness for purpose requirement.

Mechanical Characteristics Testing

3.3 Short term ring stiffness testing shall be carried out in accordance with BS EN ISO 9969[4].

3.4 The 50 year creep ratio shall be determined in accordance with BS EN ISO 9967[5].

3.5 Joint tightness testing, both internal pressure and vacuum, shall be carried out in accordance with ASTM F1697[6].

3.6 Tensile testing of the welded seam shall be undertaken in accordance with DIN EN 1979[7].

3.7 Jetting resistance testing shall be carried out in accordance with the Sewer Jetting Code of Practice[8].

4. Lining structural design

4.1 The lining is structurally designed in accordance with the principles presented within ASTM F1741[3].

5. Review of Installation Procedures

5.1 Audit the installation instructions in the SPR PE Installation Manual[1] and witness two on-site installations to check for compliance with instructions.

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5.2 At least one of the site installations shall be man-entry size to allow internal inspection.

6. Reference Documents

1. SPR PE Installation Manual, Issue: RevO.1, 17th January 2005.

2. ASTM F894-98a, Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe, 1998.

3. ASTM F1741-07, Standard Practice for Installation of Machine Spiral Wound Poly (Vinyl Chloride) (PVC) Liner Pipe for Rehabilitation of Existing Sewers and Conduits, 2007.

4. BS EN ISO 9969:2007, Thermoplastics pipes. Determination of ring stiffness.

5. BS EN ISO 9967 Thermoplastics pipes. Determination of creep ratio, 2007.

6. ASTM F1697-07, Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Strip for Machine Spiral-Wound Liner Pipe Rehabilitation of Existing Sewers and Conduit, 2007.

7. DIN EN 1979, Plastics piping and ducting - Thermoplastics spirally-formed structured-wall pipes - Determination of the tensile strength of a seam.

8. Sewer Jetting Code of Practice, Second Edition, WRc, 2005.

