EX Liner (PVC Fold and Form) - Technical information

Overview

This system involves the expansion of a continuous coil of specially formulated PVC pipe to form a tight fitting liner within the existing host pipe. **EX Liner** is classified as a 'fold and form' type lining product in that it is pulled into the sewer in a "folded" shape and then reshaped ('formed") into a circular pipe by the application of heat and pressure The end product is a solid wall liner which is tight fitting to the existing pipe and joint free for the entire length. The system also has no annulus spaces. Reline NZ has installed EX Liner for more than 10 years with more than 100km of liner installed throughout NZ.

Standards

EX liners are designed in accordance with ASTM1504-10, Standard Specification for folded PVC Pipe and AS/NZS 2566 "Buried Flexible Pipes" to provide a stand alone structural liner where the contribution from the host pipe is ignored. EX Liners are installed to the ASTM1947-10, Standard Practice of Installation for Folded PVC. EX Pipe is manufactured in Australia from a modified PVC material with characteristics similar to standard SEH grade sewer pipe. PVC is the material of choice for new sewer pipes and the EX method simply provides the same strength and durability of a new PVC pipe without the need for excavation.

Characteristics

Flow Capacity

EX liners improve the flow capacity of a lined pipe because:

- The lining is installed to be in intimate contact with the existing pipe wall and so loss of cross section is minimal
- The liner is joint free for the entire length and there are now smooth transitions at offsets, bends and protrusions
- The smooth inside surface of the PVC liner has low friction characteristics
- Hydraulic performance is further improved by the reduction in deposits and the prevention of root intrusions through existing pipe joints

Flow calculations before and after lining show that for a 150mm diameter aged concrete pipe there is an improvement of more than 10% in flow capacity after lining with EX.

Maximum Length

The maximum length of lining is shown in table below. Nominal maximum lengths are shown. Exact length will depend on site and conduit configurations.

Diameter	Maximum Nominal Length	Liner Thickness
150mm	135m	4.00mm
225mm	125m	6.00mm
300mm	100m	7.00mm

Access requirements to manholes

No special access requirements. EX pipe is easily installed via existing manholes.

Displaced Joints

Displaced joints up to 10% of diameter are easily able to be lined using this process.

Bends

Bends of up to 22 degrees depending on radius are able to be negotiated.

Changes in Grade

Changes in grade are not a concern.

Variation in Alignment

Variation in alignment up to 10% of cross section is possible.

Material Properties

The following table summarises the minimum values for the following material properties of the lining.

Material Property	Details
Short term tensile strength (MPa)	40
Short term flexural strength (MPa)	60
Short term flexural modulus (MPa)	2800
Long term flexural strength (MPa)	30
Long term flexural modulus (MPa)	1232
Maximum allowable long term strain (%)	1%
Poison's ratio	0.38
Hardness	35 Barcol
Coefficient of thermal expansion	6×10^{-5}
Shrinkage (%) • Radial • Longitudinal	 0.2 0.2
Hydraulic Properties (Manning's n value) • As new • In Service	 0.009 0.009 to 0.013

Water Tightness

EX Pipe Liners have been used for over 25 years to date and have proven to be a water tight solution to pipeline rehabilitation. Every EX Pipe is in effect tested for water tightness during the installation process as it is required to be inflated to pressure with steam for installation and ambient air for the cooling process.

Warranty & Testing

The EX Method lining system provides a high stiffness rehabilitation solution which can be designed to be either a stand alone structural liner (i.e. where the contribution of the host pipe is ignored) or as a composite where the liner and the host pipe act together to resist external loadings. Design calculations are undertaken for each project, generally in accordance with ASTM1504-10 and ASTM F1947-10.

Material quality testing is undertaken by Gurit (IANZ accredited) to comply with ASTM F1504-10, ASTMD790.

Quality Manufacture

All EX liner pipes are manufactured by Vinidex Pty Ltd at their Sydney Plant which is certified to ISO 9001:2000. Vinidex warrants the production to comply with the requirements of their in-house "*Specification for the Production of EX pipe – August 1996".* This confidential specification has been developed to ensure that the liner quality conforms to the requirements of our Head Licence, is sufficient to enable trouble free installations and will provide a quality, long term result for the client.
Installation is undertaken in conformance with our AS/NZS 9001:2000 certification.

HydroTech Ltd – Reline NZ Ltd warrants that each EX Pipe liner installation will provide a joint free, chemical and corrosive resistant lining with a long term structural capacity in accordance with the design calculations.

HydroTech Ltd – Reline NZ will guarantee the EX lining against faulty materials and workmanship for the standard 12 months defects liability period. The pipe is manufactured for a 50 year design life as required under AS 2566.1 - assuming normal operating conditions.