



SS 209 Lining Repairs of Non Man-Entry Oviform Sewers

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Revision details

Version No.	Description of revision
2	Transferred standard content to latest brand template
1	Revision and renaming of EPS 207 issued in March 2009

Introduction

This Specification is for lining repairs of Non Man-Entry Oviform Sewers for Sydney Water assets.

Sydney Water makes no warranties, express or implied, that compliance with the contents of this Specification shall be sufficient to ensure safe systems or work or operation.

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General Terms & Definitions

Term	Definition
Defect	Any discontinuity, imperfection or inclusion arising from substandard materials, improper pipe preparation, or faulty manufacture, installation or workmanship which affects the required performance of the lining in terms of structural or hydraulic performance and water tightness
Inherent defect	A defect which commonly occurs with the lining system where it is neither possible nor commercially practicable to take action for their elimination because of the inherent nature of the system
Intact pipe condition	The existing sewer is in good condition and is capable carrying the externally imposed earth pressure loading. The liner is designed for hydrostatic loading caused by a water table located above the sewer.
Nominal thickness	The proposed finished wall thickness for the lining system when properly installed

Units of measurement

Term	Definition	Unit
E_b	Initial Ring bending modulus of elasticity of lining material	MPa
E_{bL}	Long term ring bending modulus of elasticity of lining material	MPa
H	Depth of cover, vertical distance between the top of the pipe and the existing surface level	m
t	Lining material thickness	m
t_{min}	Minimum allowable lining material thickness	m
Δ_{all}	Allowable long term deflection of oviform lining over critical length	m
σ_L	Maximum allowable long term bending stress	MPa
L_{crit}	Oviform liner critical length	m
R	Critical length shape factor	-
O_W	Maximum internal width of existing oviform sewer	m
O_H	Maximum internal height of existing oviform sewer	m

References

Document Number	Title
AS/NZS 2566.1	Buried Flexible Pipelines – Part 1: Structural Design
AS 3571	Glass Filament Reinforced Thermosetting Plastic (GRP) Pipes Polyester Based – Water Supply, Sewerage and Drainage Applications
AS 3572	Plastics – Glass Filament Reinforced Plastics (GRP) Methods of Test
ASTM D543	Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
ASTM D638	Standard Test Method for Tensile Properties of Plastics
ASTM D790	Test Methods for Flexural Properties of Reinforced Plastics and Electrical Insulating Material
ASTM D2412	Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
ASTM D2583	Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
ASTM F1216	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin Impregnated Tube
ASTM F1743	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)
ASTM F2019	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP)
BS 1881	Testing Concrete Part 102: Method of determination of compressive strength of concrete cubes
BS 2782	Methods of Testing Plastics Method 335A: Determination of flexural properties of rigid plastics Method 1003: Determination of tensile properties.
WIS 4-34-04	Specification for Renovation of Gravity Sewers by Lining with Cured-in-Place Pipes
WRC SRM	Water Research Centre, Sewerage Rehabilitation Manual
WSA 01-2004	WSAA Polyethylene Pipe Code
EPS 206	Sydney Water Specification for Lining of Lateral Connections
EPS 207	Sydney Water Specification for Junction Sealing for Circular Non-Man Entry Sewer Pipe
-	Sydney Water – Technical Specification, Part 1, Civil Works, Version 4
-	A Guide to the Pickle Jar Test – Version September 18, 2009 issued by Bureau of Engineering, City of Los Angeles

1. General

1.1 Introduction

The intent of this specification is to define requirements for rehabilitation of non man- entry oviform sewers by lining. This work may be required to protect internal concrete surfaces or mortar from deterioration, restore structural integrity and/or hydraulic capacity, or prevent infiltration of groundwater and exfiltration of sewage.

1.2 Scope

This specification defines requirements for design, manufacture, installation, workmanship and testing of lining systems to be used for rehabilitation of non-man-entry oviform gravity sewers.

The scope of this specification is limited to non-man-entry linings to be installed in INTACT oviform sewers that do not rely on any bond with the existing sewer for their structural capacity.

This specification is not applicable to linings that act solely as a protective coating or those installed using spray techniques.

1.3 General Requirement

The liner must seal the sewer effectively to prevent infiltration of ground water into the sewer and exfiltration of sewage into the surrounding ground.

Details shall be provided for sealing of entries to the un-bonded interface between the liner and the sewer conduit at entry and exit points in access chambers, laterals, junctions and branches.

The Contractor shall consider and make allowances for the difficulty of the liner achieving a good fit at the invert of oviform sewers due to the relatively small bending radius required. The Contractor shall confirm the capability of the proposed liner in achieving a neat fit to the host sewer as defined in Clause 2.4.

2. Product

2.1 Material

The minimum required service life of the installed lining material is fifty [50] years.

The material shall be demonstrated to have adequate resistance to various chemicals that may present in the sewer, which include:

- a) 20% Sulphuric acid
- b) 5% Sodium hydroxide
- c) 5% Ammonium hydroxide
- d) 1% Nitric acid
- e) 1% Ferric chloride
- f) 1% Sodium hypochlorite
- g) 0.1% Soap
- h) 0.1% Detergent (linear alkyl benzyl sulfonate)
- i) Bacteriological (BOD @ 700 ppm or greater)

The method of testing shall be in accordance with the current (version: September 18, 2009) of "A Guide to the Pickle Jar Test" developed by the Bureau of Engineering, City Of Los Angeles, USA.

The lining shall also be resistant to external exposure to soil bacteria and any chemical attack that may be due to residues remaining on the conduit wall or materials in the surrounding ground.

If requested by the Principal, the Contractor shall forward technical data confirming the chemical resistance of the lining material.

The lining shall be comprised of materials that will not be subject to excessive shrinkage, thermal contraction, recovery or reversion affecting the shape or dimensions on the lining following installation.

The lining material shall have satisfactory abrasion resistance to the migration of silt, sand and debris along the conduit. It shall be sufficiently robust not to be damaged by conduit cleaning equipment, which may be required to remove any future blockage following installation of the lining.

2.2 Design

2.2.1 Condition of Existing Pipe

The condition of existing sewers to be lined at the end of the service life of the lining has been classified for design purposes as INTACT.

Prior to lining, the Contractor shall assess the INTACT condition classification of the existing sewer. Where the condition is not considered INTACT, the Contractor shall notify and provide evidence to the Principal. In such cases, the Contractor shall not undertake lining until directed by the Principal.

2.2.2 Material

Where material properties under load vary with time, material properties of the lining at the end of the fifty (50) year service life shall be used in design calculations. The exception to this is design of the lining for loads applied only during installation, which may be based on short term material properties.

The material properties used in the design shall be consistent with the composition of the lining material. These shall be the same values as those nominated by the Contractor in the Schedule of Technical Data.

If requested by the Principal, the Contractor shall submit test data in accordance with Clause 3.8 to substantiate the values for material properties nominated by the Contractor in the Schedule of Technical Data.

2.2.3 Design Loads

Each lining shall be designed to resist hydrostatic pressures from a water table located at the surface, unless nominated otherwise by the Principal. Where approved by the Principal, the Contractor may undertake a geotechnical investigation to determine the actual suitable long term ground water level for design purposes.

2.2.4 Design Criteria

The lining shall be designed to satisfy the performance criteria of strength, deflection and minimum liner thickness.

For the purpose of structural design, it shall be assumed that in the long term there will be no bond between the original pipe and the lining.

The lining shall be checked for strength and deflection based on the procedure set out in the WRC Sewer Rehabilitation Manual 2001 (Fourth Edition) Volume II, Chapter 5 for non-circular linings.

Calculations shall be carried out to ensure long term bending stresses and strains are less than the maximum permissible values for the lining. The liner critical length (L_{crit}) shall be defined as the greater of O_w or $2/3 \cdot O_H$. The maximum allowable deflection of the liner (Δ_{all}) shall not exceed 3% of L_{crit} . The critical length shape factor (R) shall be 0.5.

2.2.5 Design Calculations

The Contractor shall supply full details of design calculations during tender and/or commencement of work. Review of the Contractor's design calculations shall not be construed as acceptance of the calculations. If requested, the Contractor shall also provide a copy of the calculations for short term design checks required by Clause **Error! Reference source not found.**

Responsibility of the design shall remain with the Contractor.

2.2.6 Short Term Design Checks

Short term design checks shall be carried out for the lining material, either in its final or one of its intermediate states, to ensure the lining is stable and will not be overstressed during the installation and/or curing of the particular system.

Short term materials properties may be used to verify the suitability of installation and curing methods.

2.2.7 Minimum Liner Thickness

Notwithstanding of the lining thickness determined in Clauses **Error! Reference source not found.** and **Error! Reference source not found.** above, the minimum allowable liner thickness (t_{min}) shall be as indicated below.

Lining material with long term flexural modulus (E_{bL}) > 3000 MPa, $t_{min} = 5\text{mm}$

Lining material with long term flexural modulus (E_{bL}) \leq 3000 MPa, $t_{min} = 10\text{mm}$

2.3 Hydraulic Requirements

The lining system shall not reduce the existing cross sectional area of the oviform sewer by more than 5%.

There shall be no reduction in overall hydraulic capacity following lining of the sewer when calculated in accordance with the Manning equation. The lining material shall be such that any reduction in the sewer's cross sectional area is offset by reduced surface roughness.

Account shall be taken of the build-up of slime and any defects, which may affect hydraulic performance. The lining system shall not reduce the diameter of the existing pipe by more than 10% in lines 500mm and smaller, or more than 5% in lines greater than 500mm diameter.

The lining material shall be such that the reduction in the sewer's cross sectional area, is compensated by the reduction in flow resistance of the lining (i.e. improved surface smoothness) when calculated in accordance with Water Research Centre, Sewer Rehabilitation Manual 2001 (4th edition), Volume I, Appendix C

2.4 Degree of Fit

The lining shall be designed and fabricated in a manner that, when installed, will neatly fit the internal wall and length of the conduit being lined. Where lining technology requires, suitable allowance shall be provided for longitudinal and circumferential stretching of the lining during installation.

The Contractor shall conduct laser profiling in accordance with Clause 3.8.5 to determine appropriate liner dimensions and ensure an acceptable degree of fit.

A lining shall be considered to neatly fit if the annulus between the host pipe and the liner mean difference between the inside of the conduit and outside of the lining (annulus) is less than or equal to 1 mm.

Where the annulus is greater than 1mm, the contractor shall grout the annulus in accordance with Clause 3.6.

2.5 Retention of Structural Condition of Existing Sewer

No activity of the Contractor during preparation of the sewer section and installation of the liner shall adversely affect existing structural integrity of the sewer, unless otherwise agreed to by the Principal.

2.6 Manufacture of Lining

The manufacture of the lining shall be carried out in accordance with a specification purpose written for the particular system. This specification shall detail all labour, materials and equipment required to combine the various constituents to produce the lining ready for delivery to site.

The purpose written specification shall also include testing and inspection work carried out to verify the dimensions and quality of the manufactured lining. The Contractor upon request by the Principal shall provide a copy of this specification.

The Contractor shall be responsible for measuring the dimensions of the existing sewer prior to fabrication, to ensure that proper fit is achieved. This shall include measurement of the horizontal and vertical alignment at changes in direction and bends.

All work involved in the measurement, inspection and testing of the lining during manufacture shall be included in the Contractor's Quality Assurance System.

3. Execution

3.1 Preparation of Conduit

The Contractor shall clean the pipelines as specified elsewhere in the Contract Specifications to ensure precise closed circuit television (CCTV) inspections and installation of the lining system.

CCTV inspection shall be required prior to installation of liners to establish that the pipe is clean and ready to receive the liner.

The CCTV shall be run opposite to flow direction to ensure full view of any connection/lateral/junction/branch/house service line (HSL) joining-in at an acute angle.

3.1.1 House Service Lines (Location and Survey)

The Contractor shall test and confirm before lining which junctions are live. Dyed water shall be run into the house service line and the running dyed water shall be evident on the pre-installation CCTV inspection.

The location of all live and dead junctions shall be recorded as part of the Contractor's quality assurance system.

Before installing the liner, the Contractor shall clear the junction at the property branch line and Principal's sewer of any roots, debris, silt etc. up as far as the branch of the junction to leave it clean and smooth edged and free of any obstruction.

3.2 Access Chambers

This clause only covers requirements associated with the adjustment of access chambers to facilitate lining and the sealing of the lining at the entry or exit points for the main line sewer. Requirements for repair of access chambers including grouting to reduce infiltration are covered elsewhere in the technical specifications.

Where an access chamber has to be altered by the Contractor, as part of these works, the Contractor shall notify the Principal of the change, prior to the work.

The Contractor shall reinstate all access chambers, to the satisfaction of the Principal, such that installed liners do not form irregularities around the edges of the liners at the access chambers. After installation of liners, the Contractor shall provide a channel in the access chamber free from any irregularities or differences in level which may cause accumulation of solids (i.e. debris, silt, rags, etc.) in the sewer or access chamber channel.

Where liners have been installed to one side of the access chamber, the access chamber channel shall be rendered to form smooth slope to the liner to prevent accumulation near the liner edge.

The Contractor shall seal the ends of the lining once they have been trimmed to match the face of the access chamber. The materials used and the method of sealing shall be determined by the Contractor.

The minimum requirements of the seal are as follows:

- Material requirements in accordance with Clause **Error! Reference source not found.**
- Compatibility with composition of lining and access chamber
- Provide a permanent watertight seal against infiltration and exfiltration

If requested by the Principal, the Contractor shall provide information such as chemical resistance data, method to ensure adequate curing of all sealing products and materials, particularly where the sealing shall be installed under water/live flow, accelerated aging tests, bond tests, full scale trials or hydrostatic testing to demonstrate the suitability of sealing system.

3.3 Delivery and Installation of Liner

The length to be lined shall generally be restricted to a single length between access chambers. Any lining installed over more than one length requires the prior approval of the Principal.

The Contractor shall clean the sewers immediately prior to lining. Flow in House Service Lines (HSLs) and the Principal's sewers should be isolated during the lining operation to ensure that no debris enters which may get trapped between the liner and the original pipe.

The Contractor shall make arrangements to ensure that HSLs are not in use during the lining operation.

Where the Contractor is also required to install a lateral lining in any house service lines off the Principal's sewer, lining work shall be sequenced to ensure the linings can be finished and sealed at lateral connections to satisfy the requirements of Clause 3.4. Lateral linings shall comply with EPS 206 "Standard Specification for Lining of Lateral Connections".

The Contractor shall install the lining in a continuous operation. The Contractor is solely responsible for the details of execution and suitability of methods and procedures used to satisfy the peculiar conditions of each segment. The installation procedure shall be executed to prevent both infiltration into, and migration through the annular space between the existing pipe and the lining.

In case of heat curing, the Contractor shall ensure that the liner is heated at the prescribed temperature throughout its length for the required period. Temperature shall be monitored by installing temperature sensors along the length of the liner and recorded throughout the curing period. For UV cured system the light train shall be run at the centroid, to ensure uniform curing throughout its perimeter.

The Contractor shall ensure there are no residual stresses in the liner following installation.

The ends of liners within in access chambers shall be prepared to allow monitoring of longitudinal movements in accordance with Clause 3.8.4.

A closed circuit television (CCTV) inspection shall be carried out after installation to establish that the lining has been installed in the desired manner and that all live laterals have been reconnected properly. The CCTV inspection shall be carried out as per the relevant specifications.

3.4 Reinstatement of Connections

The Contractor shall reinstate live junctions only. All cut-outs at junctions (connections) shall be sealed in accordance with EPS 207.

The Contractor shall allow sufficient time for any movement of the installed lining relative to the host pipe before finishing the cut outs. This shall include movements caused by shrinkage, thermal contraction, stress recovery, mechanical adjustment in material properties during curing, or any other action.

The cutting equipment shall be capable of reinstating the opening into the Principal's sewer for slope or square connections. The cutting tool shall leave a smooth bevelled edge free of any protrusions. The cut shall be flush with the inside surface of the branch sewer line.

There shall be no discontinuity between the lining material at the cut hole and the branch sewer line. Each required opening shall have initial rough cut on the day of lining and be 100% completed after the lining has reached its final dimensions in terms of length and diameter.

The Contractor shall ensure that each hole cut by this equipment, or otherwise reinstated, will not inhibit flow into the Principal's sewer from the junction, cause any constrictions or be such that it will catch solid material and cause a blockage.

If a lateral lining is to be installed in the house service line, the Contractor shall follow the specification EPS 206.

3.5 Finish (Hydraulic Acceptability)

The installed lining shall be continuous over its length and shall be free of any defect which is likely to affect the satisfactory hydraulic performance of the lined pipe or cause accumulation of solids. Where the Contractor has nominated inherent defects which are likely to affect hydraulic performance, these defects shall satisfy the accepted criteria negotiated with the Principal.

The finished lining shall be free of any leakage from the lined section of pipe to the surrounding ground or from the ground to the inside of the lined pipe.

3.6 Grouting

Where required by Clause **Error! Reference source not found.**, the Contractor shall fill the annulus between the existing oviform sewer and the liner with a cementitious based grout. The grouting method shall ensure the complete filling of the annulus to provide uniform support to the liner and shall be subject to approval by the Principal.

The Contractor shall submit, during tender and/or prior to commencement of work, a work method statement detailing the proposed grouting procedures and grout composition.

The grout composition shall also ensure that the following properties are attained:

- the grout shall not undergo any shrinkage
- the grout shall remain structurally sound over the long-term (minimum 50 year period)
- the grout composition shall have no adverse effect on the liner

The Contractor shall ensure that the liner is not subjected to any hydrostatic pressure from the grout and/or water table during the grouting phase that cannot be withstood by the liner. Short term design checks shall be carried out by the Contractor in accordance with Clause **Error! Reference source not found.**

The Contractor shall maintain records of all grouting operations, which shall include (but not be limited to) the location of all grout injection points, volume of grout pumped, grouting pressures, commencement and completion times, and grout composition details. The Contractor shall submit one copy of this record to the Principal at the completion of each access chamber length.

3.7 Defects

The finished lining shall be free of all defects which affect hydraulic performance or structural adequacy. This shall include defects arising from substandard materials, faulty or inaccurate manufacture, inadequate pipe preparation, faulty installation or workmanship, or inadequate curing. The only exception is inherent defects, as defined in Clause **Error! Reference source not found.**, which shall satisfy the requirements of this clause.

For the Contractor's lining system, inherent defects shall be those nominated by the Contractor in the Schedule of Technical Data. The acceptance limit for each defect shall be those negotiated and/or agreed with the Principal.

If during the execution of the contract it becomes apparent that there are further inherent defects which have not been nominated by the Contractor, then, provided the Contractor can substantiate such defects satisfy the definition of "inherent defects" these may be accepted as such by the Principal. In this instance the Principal may nominate the acceptance limit for the defects in terms of its frequency and dimensions and this shall be binding on the Contractor.

Defects which are considered unacceptable in all liners include, but are not limited to the following:

- under strength finished lining materials
- foreign inclusions
- irregularity in lining caused by inadequate pipe preparation
- leakage through the lining
- inadequate material curing
- inadequate resin impregnation
- excessive resin loss during installation
- dry spots, bubbles, cracks or delamination
- pinholes
- leakage through welded, glued or mechanical locked joints
- poor quality cut outs
- inadequate seals at access chambers or laterals
- any other defect not nominated as inherent to the lining system
- non-compliance to Clause **Error! Reference source not found.**

The following will be considered as unacceptable defects if they exceed the limits given in brackets below:

- inadequate lining thickness (finished thickness <90% of nominal lining thickness)
- excessive variation in thickness around the circumference of the lining (variation in minimum or maximum thickness > 20% of mean lining thickness)
- excessive longitudinal or circumferential variation in dimensions after completion of the cutouts, at access chambers or at cutouts (variation < 1mm in every 2m or 0.05% measured 14 days after installation) refer Clause 3.8.4 and 3.8.5
- excessive longitudinal wrinkling of the lining in straight, non-defective portions of the host pipe (wrinkling > 2.0% of the O_H).

Defects which may be nominated as inherent for the proposed lining system may include, although not necessarily be limited to the following:

- bulges
- longitudinal or circumferential wrinkling
- excessive reduction in cross sectional area
- longitudinal or circumferential shrinkage

3.8 Testing

3.8.1 General

The Contractor shall carry out testing on the lining material and its constituents.

The Contractor shall give the Principal seven (7) days prior notice of the date, time and place of all the testings.

All work on the testing of the lining constituents, manufacture of the lining, during and after installation shall be included in the Contractor's quality assurance system.

3.8.2 Pre-Installation Testing

If the Contractor is relying on local or overseas test data to justify the suitability of the lining system in terms of its physical and chemical properties, the Principal may request copies of such test results. These results shall be forwarded to the Principal prior to commencement of lining manufacture. Any property which cannot be verified by such test data shall be retested prior to installation.

Where the lining system is manufactured by a combination of a number of constituents which can be varied to suit the requirements of the Contract, the testing program shall include the testing of three prepared samples for the same series of tests (excluding leak tests) to those required for the installed liner.

All tests on the constituents of lining material and manufacture of the liners shall be in accordance with the relevant Australian or overseas standards.

3.8.3 Post Installation Testing

This clause lists the minimum requirements for testing which shall be carried out on installed lining. Each of the listed tests shall be carried out once for every twenty (20) linings installed.

Alternative overseas or Australian standards to those listed may be accepted by the Principal for testing purposes providing the Contractor can demonstrate that the test method provides an accurate measure of the required physical property or aspect of installation quality.

- Gravity Pipe Leakage Test in accordance with ASTM F1216 carried out prior to cutting of laterals.
- Hardness in accordance with ASTM D2583
- Short Term Tensile Strength in accordance with ASTM D638 or BS 2782: Method 1003 (3 samples for each line being tested).
- Short Term Flexural Strength and Flexural Modulus in accordance with ASTM D790 or BS 2782: Method 335A (3 samples for each lining length) OR Short Term Ring Stiffness in accordance with AS 3572.10.

Samples for testing may be prepared using the procedure given in Appendix B of WIS 4-34-04.

3.8.4 Monitoring of Longitudinal Shortening

Monitoring of longitudinal shortening shall be carried out and reported for nominated lining lengths installed. A minimum of one (1) out of every twenty (20) liner installed shall be checked.

Monitoring shall comprise the measurement of the longitudinal movement of both ends of the installed lining relative to a fixed point on the adjacent access chamber wall. Linings shall be cut with 100mm of additional length protruding into the access chamber. Fixed marks shall be placed on the liner and access chamber wall for measurement purposes.

Three series of measurements shall be made by the Contractor as follows:

- At completion of cutouts, or after 24 hours of installation for linings without cutouts.
- Fourteen days.
- Ninety days.

Interim results of the monitoring shall be forwarded to the Principal after the fourteen day readings.

On acceptance of the longitudinal monitoring results by the Principal, the lining shall be cut to its final length and resealed at the ends, if necessary.

3.8.5 Monitoring of Internal Diameter

A laser profiling measurement survey shall be carried out on existing sewers following cleaning, and prior to lining, to confirm internal dimensions of the ovoid sewer. A post lining installation survey shall also be carried out to aid in assessment of degree of fit in accordance with Clause **Error! Reference source not found.** Post lining surveys shall be carried after cut-out and junction seals are installed, as applicable.

The Contractor may propose other survey methods where it can be demonstrated that measurement accuracy is at least equivalent to laser profiling.

3.8.6 Failure during Post Installation Testing

A test result shall be deemed to have failed if the minimum values nominated by the Contractor in the "Schedule of Technical Data" are not achieved.

If only one sample has been extracted from a length of lining then failure of the sample shall be interpreted as indicating that the lining in question is defective.

In the event of failed test(s), the Contractor shall repeat the tests on representative samples collected from the same lining length. These samples may be obtained by excavation and extraction from within the lined section of pipe or alternatively from spare samples prepared during lining installation. The lining will be accepted if the test results of two of the three samples extracted, and the average of the three results, exceed the nominated minimum values. Otherwise the lining shall be considered as defective. The Principal will direct the Contractor to undertake further testing of other lines to ensure compliance.

If three samples are extracted from a length of lining, testing will indicate the lining is acceptable when two of the three results and the average of the three results exceed the nominated minimum values.

The Principal, at his discretion, may take account of any reserve structural capacity of the lining under design loading, when assessing the acceptability of a lining with a test result(s) deemed to have failed.

3.8.7 Test Records

Results of all tests shall be entered into a book and initialled as correct by the Contractor or his Representative present when the tests were made. This book shall be kept at the works and be open to inspection by the Principal or his nominated Representative.

References

Document type	Title	Document Reference (Section, clause)
Policies and procedures	Asset Creation Policy	
Other documents	SS207 Junction sealing for circular non-man entry sewer pipes	

Ownership

Ownership

Role	Title
Group	Asset Lifecycle
Owner	Engineering Manager, Engineering
Author	Robert Loncar, Specialist Engineering, Lead Civil Engineer

Change history

Version No.	Prepared by	Date	Approved by	Issue date
3	Robert Loncar, Specialist Engineering, Lead Civil Engineer	23/02/2022	Norbert Schaeper, Engineering Manager	23/02/2022
2	Jerry Sunarho, Lead Networks Project Engineer	25/06/2012	Peter Gillman – Manager, E2S	25/06/2012
1	Sudipta Basu	1/03/2009	Jerry Sunarho	1/03/2009