



Standard Specification: SS 202 Specification for Localised Sewer Repairs from Inside

Table of Contents

Revision details.....	3
Introduction	3
Copyright.....	3
Acronyms	3
General Terms & Definitions	4
1. General.....	5
1.1 Introduction	5
2. Specification in detail	6
2.1 References.....	6
3. Product	7
3.1 Repair Material	7
3.2 Length of Repair	8
3.3 Finish.....	8
3.4 Hydraulic Requirements	8
3.5 Retention of existing sewer condition.....	8
4. Execution.....	9
4.1 General.....	9
4.2 Skilled Operators	9
4.3 Grinding	9
4.4 Access Chambers.....	9
4.5 Cleaning.....	9
4.6 Bypass Pumping.....	10
4.7 Filling.....	10
4.8 Infiltration	10
4.9 Finish.....	10
4.10 Television Survey and Reporting.....	11
4.11 Defects	11
5. Testing	12
5.1 General.....	12
5.2 Testing	12
5.3 Monitoring During Installation.....	12
5.4 Post Installation Testing	12
6. Ownership	14
Ownership	14
Change history.....	14

Revision details

Version No.	Clause	Description of revision
1	-	Original Document issue
2	All Sections	Standard review and changes to the text, Minor edits, Format and references

Introduction

This Specification is for the design, supply and construction 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.

It is the user's sole responsibility to ensure that the copy of the Specification is the current version as in use by Sydney Water.

Sydney Water accepts no liability whatsoever in relation to the use of this Specification by any party, and Sydney Water excludes any liability which arises in any manner by the use of this Specification.

For the purpose of this Specification "Sydney Water" is the nominated person or organisation that has written authority to act on Sydney Water's behalf.

This document is uncontrolled once printed or downloaded.

Copyright

The information in this document is protected by Copyright and no part of this document may be reproduced, altered, stored or transmitted by any person without the prior consent of Sydney Water.

Acronyms

Acronym	Definition
AS	AUSTRALIAN STANDARD
ASTM	AMERICAN SOCIETY OF TESTING AND MATERIALS
CIPP	CLOSED IN PLACE PIPE
GRP	GLASS REINFORCED PLASTIC

General Terms & Definitions

Term	Definition
Remote Controlled Devices	Remotely operated equipment that enter the pipe via access holes and that are operated by trained technicians.
Localised Repairs	Repairs that re-instate the condition of the pipe in the local area (spot) where the damage has occurred.
Patch Liner	Liner used to repair a localised section of pipe between access chambers
Lateral Liner	A liner inserted in a house service line to rehabilitate a section of an incoming pipe upstream of the junction
Cured-in-Place Pipe Liner (CIPP)	A resin-saturated felt tube made of polyester, fiberglass cloth suitable for resin impregnation, is inserted or pulled into a damaged pipe
Folded and Formed Liner	Liner inserted into the existing pipe with a temporarily reduced diameter which are subsequently reverted in-situ to their finished diameter (often called Reverted Slip Liner)
Segmental liner	Liner installed with a series short length which are joined in situ to form a continuous liner inside the original pipe
Neat Fit	A neat fit is where any gap formed between the liner and the pipe is subsequently grouted
Nominal Thickness	The proposed finished wall thickness for the liner system when properly Installed
Ovality	The difference between the mean outside diameter and minimum outside diameter in the same cross section of the liner
UV Light Curing	Ultra-violet light trains used to cure special CIPP liner with UV setting resins.
Laser Profiling	A method used to measure the dimension of the pipe or lined pipe by using laser technology

1. General

1.1 Introduction

This specification defines the requirements for the repairs of the localised sewer from inside of pipes. This work may be required to protect the internal surfaces from deterioration, restore structural integrity and hydraulic capacity, or prevent infiltration of groundwater and exfiltration of sewage.

1.2 Scope

This specification covers the requirements for the localised internal repair of the Principal's sewer, junctions and house service lines using remote controlled devices i.e. robotic. The repair work may include repairs to axial or longitudinal cracks, joints, permanent capping of junctions, restoration of junctions, removal of obstructions inside pipes including tree roots, and sealing of water infiltration.

2. Specification in detail

2.1 References

Standard No.	Document Title
ASTM D3583	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 C-580	Method for flexural strength and modulus of elasticity for chemical resistant mortars, grouts and monolithic coatings
ASTM C-579	Method for compressive strength of chemical resistant mortars, grouts and monolithic surfacing
WRC SRM	Water Research Centre – Sewerage Rehabilitation Manual
WEF	Water Environment Federation, Alexandria Virginia USA, Existing Sewer Evaluation & Rehabilitation 1994
SS 207	Junction Sealing for Circular Non-Man Entry Sewer Pipe

3. Product

3.1 Repair Material

The repair material shall be specially formulated to retain the same bond strength and non-sag properties, regardless of the type of pipe material or whether the surfaces are wet or dry.

The fully cured material shall have the following minimum physical properties:

Properties	Minimum Value
Compressive strength	50 MPa
Flexural strength	20 MPa
Modulus of elasticity	1,700 MPa
Bond strength to moist concrete	2.5 MPa

The repair material used by the Contractor shall be that nominated by the Contractor in the Schedule of Technical Data unless an alternative product has been approved by the Principal.

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

The rehab shall be comprised of materials which are chemically and biologically resistant to sewage, sewage related gases and mild concentrations of industrial effluent for the service life of the liner. The material shall be tested in accordance with the following method to demonstrate its resistance properties.

The test method is a modified ASTM D543 with a total exposure period of 112 days at $25\pm 3^{\circ}\text{C}$. Specimens shall be prepared for assessment of weight, hardness and tensile strength changes.

Weight and hardness change specimens shall be 50 mm in diameter. Thickness of the specimens shall be the minimum thickness available for the liner system or as per the agreement with Sydney Water. The weight and hardness specimens shall be initially conditioned in a mechanical convection oven for 7 days at $43\pm 3^{\circ}\text{C}$, then cooled in a desiccator for 3 hours at $25\pm 3^{\circ}\text{C}$, measured, and then immersed in a chemical solution of 20% sulphuric acid.

At every 28-day intervals selected specimens shall be removed, washed, surface dried and measured. The same weight and hardness change specimens shall be reconditioned in a mechanical convection oven for 7 days at $43\pm 3^{\circ}\text{C}$, then cooled in a desiccator for 3 hours at $25\pm 3^{\circ}\text{C}$ and measured again. No re-measuring is required for the tensile strength samples.

If any specimen fails to meet the requirements specified below, the material will be deemed unsatisfactory. A satisfactory chemical resistance is defined as having a maximum of:

- a) 2% variation from the initial weight
- b) 5% variation from the initial material shore D hardness
- c) 10% reduction from the initial tensile strength

Furthermore, the liner shall be comprised of materials which will not be subject to excessive shrinkage, thermal contraction, recovery or reversion affecting the shape or dimensions on the liner following installation. Residual stresses shall be released during the installation process.

The liner material shall have satisfactory abrasion resistance to the migration of silt, sand and debris along the pipe. It shall be sufficiently robust not to be damaged by pipe cleaning equipment or cleaning process which may be required to remove any future blockage (debris, roots, etc.) following installation of the liner.

The Contractor shall provide evidence that the material will not be damaged because of normal cleaning and jetting processes.

3.2 Length of Repair

Each repair shall extend for the full length of the localised damage, irrespective of continuous or discrete damages with an additional length as required by the repair system included to transition the repair smoothly into sections of the sound original pipe.

All repairs in a 1200 mm length measured along the pipe axis shall be considered as one repair.

3.3 Finish

The repaired sewer shall be free of defects which may affect the structural or service performance or life of the repaired section. The repaired segment shall be watertight.

3.4 Hydraulic Requirements

Generally, the repair shall not reduce the internal diameter of the existing pipe by more than 10% in pipes 500 mm and smaller, nor more than 5 % in pipes greater than 500 mm in diameter.

3.5 Retention of existing sewer condition

No activity of the Contractor during the execution of the repair shall adversely affect the existing structural integrity of the sewer, unless otherwise agreed to by the Project Engineer.

4. Execution

4.1 General

Remote control devices shall be positioned, and all work functions executed remotely by the operator in the control unit of the system at ground level.

The operator shall always have adequate visibility of the work area via CCTV camera equipment either inbuilt with the device or working as a separate unit which works in conjunction with the device.

4.2 Skilled Operators

The remote-control device equipment shall be operated by adequately trained Technical Operators.

If requested by the Superintendent, the Contractor shall provide details of the Training Programme of the Operators.

4.3 Grinding

The defective area in the pipe, pipe joints, axial and longitudinal cracking, protruding and recessed junctions etc. shall be ground smooth at a controlled rate to avoid damage or the propagation of cracks into the surrounding pipe segments.

The defective areas shall be milled out to expose virgin original pipe material. The repair shall have a width of 25 to 35mm and to a depth of approximately 60% of the pipe wall.

4.4 Access Chambers

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

On completion of the repair work, the Contractor shall fully reinstate the access chamber to the satisfaction of the Project Engineer.

4.5 Cleaning

Each area of the prepared defect shall be free of any impurities in the sewer pipe so that adequate adhesion of the filling material can be achieved. High pressure air, steam or water cleaning, with or without approved cleaning agents shall be used to clean the inside of the existing pipe wall.

Cleaning shall include the removal all fine residue in the prepared area.

The cleaning shall extend for the entire pipe length to be repaired and include all root removal.

4.6 Bypass Pumping

The Contractor shall ensure that the sewerage system remains operable at all times and as such shall be responsible for the provision of adequate bypass facilities to prevent overflows of the Principal's sewers and/or house service lines.

Unless approved otherwise by the Superintendent, flow in house service lines and the Principal sewers should be isolated during high pressure cleaning and placement of the repair material.

4.7 Filling

Each prepared area shall be filled using the prescribed repair material. The repair material shall be pre-mixed using methods which will ensure correct volumes of mixing of components. The repair material shall be delivered to the repair site within the batching time and with a consistency such that it can be impregnated, worked and finished to complete the repair. The Contractor shall not allow any spillage of raw materials into the sewer.

All work on the measurement determination of batch times, mixing, sampling and testing of the repair material shall be included in the Contractor's Quality Assurance System.

4.8 Infiltration

The Contractor shall be responsible for the control of infiltration using chemical grouting or other approved methods to ensure incoming groundwater does not reduce the quality of the repair material or wash in through prepared areas reducing the strength of the bond between the repair material and existing pipe.

4.9 Finish

The installed repair shall be continuous over the area of repair. It shall be free of any defect which is likely to affect the satisfactory performance of the pipe or cause accumulation of solids.

For repairs of incoming laterals, openings shall be reinstated to leave a smooth bevelled edge free of any protrusion. The finished cut out shall be flush with the inside surface of the repair.

The finished repair shall be free of any leakage to the surrounding ground or from the ground to the repaired section of pipe.

4.10 Television Survey and Reporting

Each defect that is repaired shall be televised and recorded on a permanent tape along with a written description of the repair achieved. This includes televising work before the repair, during the repair and upon completion of the work.

The CCTV inspection shall be carried out in accordance with the Principal's specification for CCTV work.

4.11 Defects

The finished repair shall be free of all defects which affect the hydraulic or structural performance or the quality of the repair. This shall include defects arising from substandard materials, faulty or inaccurate manufacture, inadequate pipe preparation, faulty installation or workmanship or inadequate curing.

- Defects which are considered unacceptable include, but are not necessarily limited to the following:
- foreign inclusions
- inadequate pipe preparation
- leakage through repairs
- bubbles or voids
- inadequate material curing
- poor finishing
- inadequate bond
- shrinkage

5. Testing

5.1 General

The Contractor shall carry out testing on the repair material and its constituents. All work on testing shall be included in the Contractor's Quality Assurance System.

5.2 Testing

Where the proportioning of the constituents is varied to suit atmospheric conditions such as temperature and humidity, a testing program on three prepared samples shall be carried out prior to commencement of repairs.

Testing shall confirm properties given by the Contractor in the Schedule of Technical Data.

All tests on the constituents of the repair material and following their combination shall be in accordance with the relevant Australian or equivalent overseas standards.

5.3 Monitoring During Installation

The Contractor shall keep records of the mixing of each batch of repair material. Unless agreed otherwise by the Superintendent, the Contractor shall for each batch mixed, record the following:

- Air temperature
- Humidity
- Proportion of mix

Time of mixing, commencement of application and completion of finishing (trowelling).

5.4 Post Installation Testing

Unless agreed otherwise by the Superintendent, the following tests shall be carried out on samples taken from material batched for the repair material.

- Hardness in accordance with ASTM-D-2583 of a frequency of one per batch of repair material.
- compressive strength in accordance with ASTM C-579 at a frequency of 1 per 10
- localised repairs, with a minimum of one per contract.
- Modulus of elasticity in accordance with ASTM C-580 at same frequency as for compressive strength testing.

If requested by the Superintendent, the Contractor shall also carry out an air pressure test in accordance with ASTM F1216 on each localised repair nominated by the Superintendent to confirm water tightness.

Alternative overseas or Australian Standards to those listed may be accepted by the Superintendent for testing purposes, providing the test method provides an accurate measure of the required physical property or aspect of installation quality.

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. The Superintendent may reject any repair which is deemed to have failed and request its removal and replacement by the Contractor.

6. Ownership

Ownership

Role	Title
Group	Asset Lifecycle, Engineering and Technical Support
Owner	Norbert Schaeper, Engineering Manager
Author	Amer Mohammed, Engineer
Document Reviewer	Robert Loncar, Lead Engineer

Change history

Version No.	Prepared by	Date	Approved by	Issue date
2	Amer Mohammed	25/02/2021	Norbert Schaeper	4/03/2021
1	Sudipta Basu	20/06/2012	Peter Gillman	27/06/2012