

SASTT TECHNICAL STANDARD

Trenchless construction works

Part TT1: Sliplining of pipelines

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SASTT-TS-TT1:2013

Edition 1

Table of changes

Change No.	Date	Scope

Acknowledgement

SMEC South Africa (Pty) Ltd was appointed by the Southern African Society for Trenchless Technology (SASTT) to prepare this standard for the sliplining of pipelines.

Foreword

This SASTT technical standard was approved by the Board of SASTT on 19 March 2013.

This document was published on 19 March 2013.

SASTT-TS standards consist of a number of parts in various stages of preparation, under the general title *Trenchless construction works*.

Annex A forms an integral part of this document. Annex B and Annex C are for information only.

Introduction

The different parts of SASTT-TS each address a specific component of construction works. The prime purpose in the production of these standards is to create a set of standards that are generally applicable to trenchless construction works, and which can be readily modified to make them applicable to particular trenchless works.

The SANS 2001 and SASTT-TS family of standards provides technical descriptions of the standard of materials and workmanship that will be used in the works that are executed or in the performance of the works when completed (or both). These standards do not make reference to the actions of those responsible for executing the works or the parties to a contract, i.e. to the constraints relating to the manner in which contract work is to be performed. Neither do they deal with the commercial arrangements of such contracts. These standards are suitable for use in any "in-house" construction work or in all types of engineering and construction works contracts, for example, design by employer, design and build, develop and construct, construction management or management contracts.

Standard requirements pertaining to the manner in which works are constructed can be found in the SANS 1921 family of standards.

Attention is drawn to the possibility that some of the elements of this document might be the subject of patent rights. SASTT shall not be held responsible for identifying any or all such patent rights.

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Trenchless construction works

Part TT1:

Sliplining of pipelines

1 Scope

This specification covers the insertion, by sliplining, of continuous liner pipes into existing pipelines with minimal disturbance of the surface, traffic disruption or interruption of service.

This technique is typically used for gravity pipelines requiring rehabilitation. The liner pipe is normally pulled into the existing pipeline by cable and winch and the resultant annulus between the host pipeline and the liner pipe is usually filled with grout.

NOTE 1 Annex A provides guidance to those responsible for compiling procurement documents which make reference to this standard.

NOTE 2 Annex B contains items that may need to be considered when preparing the scope of work for a particular project.

NOTE 3 All liner pipes shall be designed to withstand the various loadings to which they will be subject through their design life, without detriment to their function and environment.

NOTE 4 Annex C provides suitable measurement and payment specifications.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies. Information on currently valid national and international standards can be obtained from Standards South Africa.

SANS 1200 *Standardized Specification for Civil Engineering Construction*

SANS 2001, *Construction works*

SANS 4427: *Plastics piping systems - Polyethylene (PE) pipes and fittings for water supply.*

SANS 6269, *Welding of thermoplastics – Test methods for welded joints.*

SANS 10268-1, *Welding of thermo plastics – Welding processes Part 1: Heated-tool welding.*

SANS 10268-10, *Welding of thermo plastics – Welding processes Part 10: Weld defects.*

SANS 10269, *Welding of thermoplastics – Testing and approval of welders.*

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SANS 10270, *Welding of thermoplastics – Approval of welding procedures and welds.*

SANS 10403, *Formatting and compilation of construction procurement documents.*

SANS 50197-1, *Cement – Part 1: Composition, specifications and conformity criteria for common cements.*

3 Definitions

For the purposes of this document, the definitions given in SANS 10403 and the following apply.

3.1

butt welding

is the process for joining HDPE pipes by heating the planed ends of matching surfaces by holding them against a flat heating plate until the HDPE material reaches fusion temperature, quickly removing the heating plate and pushing the two softened ends against one another. Butt welding is also referred to as butt fusion welding and heated-tool butt welding.

3.2

CCTV

Closed Circuit Television used for the internal inspection of pipelines.

3.3

HDPE

High Density Polyethylene, also referred to as PE-HD. Polyethylene materials of designation PE 80 and PE 100 are high density polyethylene materials.

3.4

insertion pit

the excavation that accommodates the entry of the liner pipe into the existing pipeline.

3.5

liner pipe

the continuous length of pipe that is joined together and inserted into an existing (host) pipeline.

3.6

mechanical joint

joint made by assembling a liner pipe to another liner pipe, or any other pipe that generally includes a compression part, to provide for pressure integrity, leaktightness and resistance to end loads.

3.7

point repair

a repair made to an underground pipeline at a particular point by excavating down to the pipeline from the surface to affect the repair.

3.8

specification data

data, provisions and variations that make this standard applicable to a particular contract or works.

3.9

suitable

capable of fulfilling or having fulfilled the intended function or fit for its intended purpose.

3.10

winching point

the location, usually a manhole, at which winching equipment is set up.

4

4 Requirements

4.1 Materials

4.1.1 Liner pipes

Unless otherwise specified in the specification data, liner pipes for sliplining shall:

- a) be High Density Polyethylene (HDPE), as indicated in the specification data, complying with the requirements of SANS 4427.
- b) be butt welded into continuous lengths in accordance with the pipe manufacturer's recommendations and SANS 10268-1. Furthermore:
 - i. A record shall be kept of the welding including date, pipe details, weather, welding conditions, welder, initial bead height, welding times, final position of joint in the ground and a record of inspections of completed welds.
 - ii. The welder shall have a Test Certificate for HS Welding (heated-tool butt welding) issued by a South African Qualifications Authority (SAQA) accredited training facility, in accordance with SANS 10269. (Currently certificates are issued by Plastics SA). The welder's certificate shall not be older than three years for Installation and Fabrication Plastic Pipe Association (IFPA) members and not more than one year old for non-IFPA members.
 - iii. If specified in the specification data, welders shall be IFPA members and shall imprint each weld with his unique IFPA identification stamp displaying the IFPA company number, welder number and IFPA logo, issued in accordance with the Welder Identification System.
 - iv. Unless otherwise specified in the specification data, the welded joints shall conform to the requirements of SANS 10268 Part 10, according to the quality control rating assessment class II (medium requirements for safety or for load carrying capacity or both). (Note that the assessment class rating is dependent on the safety or load-carrying risk posed.)
 - v. If specified in the specification data, welded joints shall be tested in accordance with SANS 6269.
 - vi. If required in the specification data, before any production welding is commenced, the following shall be approved in accordance with SANS 10270 for heated-tool butt welding of pipe joints:
 1. A Welding Procedure Specification (WPS) and
 2. A qualification joint
- c) have the internal and external welding beads removed without leaving notches.
- d) be able to withstand without damage the longitudinal force to be transmitted by winching (and/or pushing) equipment.
- e) not have cuts, gashes, nicks, abrasions, or any such physical damage on the outside of the pipe, which is deeper than 10 percent of the wall thickness. Such pipes shall be removed from site and replaced with undamaged pipes.
- f) shall be connected using mechanical couplings, specified in the specification data, if joints between installed liner pipes cannot be made by butt welding.

4.1.2 Grout

Unless otherwise specified in the specification data, the cementitious grout shall:

- a) be a low strength annulus filler
- b) be of suitable low viscosity to fill the annulus between the host pipeline and the liner pipe, under gravity or minimal pressure.
- c) contain only cement, potable water, and possibly additives such as fly ash, silica fume, chemical dispersants or thixotropic agents to enhance flowability, control set time and reduce segregation.
- d) contain cement that shall comply with the requirements of SANS 50197-1.
- e) have a minimum strength specified in the specification data.

4.2 Construction

4.2.1 General

4.2.1.1 The liner pipe is usually pulled into the host pipeline using a cable and winch. However the liner pipe can be inserted by pushing with an excavator bucket and a choker strap. In certain circumstances it may be advantageous to use both methods in combination.

4.2.1.2 Cables and winches (and/or pushing equipment) shall be suitable for the particular sliplining operation and shall have sufficient pulling (and/or pushing) capacity. Pulleys and any associated framework installed in the winching points shall be capable of withstanding the substantial forces required. Winches shall be equipped with load gauges and controls to avoid overloading and should be of the capstan type to avoid cable damage and have an immediate stopping facility.

4.2.1.3 The pulling head shall be suitable for attaching to the liner pipe securely. It shall be capable of withstanding the winching forces and guiding the liner pipe into and through the host pipeline. It shall have a rotating eye to avoid the liner pipe twisting the cable. The pulling head shall be open-ended to allow at least 50% of the existing pipeline full flow to pass through it. Once the liner pipe has been installed, the pulling head shall be capable of being removed from the host pipeline.

4.2.2 Preliminary

4.2.2.1 The internal diameters and lengths of the existing pipelines to be lined shall be measured and verified on site prior to the liner pipe being ordered.

4.2.2.2 The pipelines to be lined shall be inspected by CCTV to identify any obstructions, protruding connections, defects, infiltration, ovality and any joint offsets, separations and misalignments. All connections onto the existing pipeline shall be measured and noted.

4.2.2.3 The pipelines shall be cleared of any obstructions including silt, debris, roots, foreign objects or encrustations.

4.2.2.4 Any necessary point repairs shall be made to the existing pipeline.

4.2.2.5 The proposed positions, sizes and layout of insertion pits and winching points shall be planned.

4.2.2.6 The storage area, butt welding area and area required to string out the liner pipe ready for insertion shall be planned. The liner pipes shall be stored and transported in a manner to avoid them being damaged.

4.2.3 General preparation

4.2.3.1 The number and location of insertion pits shall be planned to keep them to a minimum and maximise the lengths of individual insertions. Normally more than one manhole length can be lined from one insertion pit, either in one direction or in both directions (upstream and downstream). If possible insertion pits should be located where excavations are to be made for point repairs.

4.2.3.2 All insertion pits, winching points and manholes shall be of suitable size to accommodate the necessary sliplining operations and equipment.

4.2.3.3 All arrangements regarding road closures, traffic deviations and traffic control shall be confirmed in writing.

4.2.3.4 All the necessary safety equipment, safety measures and personnel shall be prepared in accordance with the health and safety plan.

4.2.3.5 The schedules and plans for accommodation of flows and overpumping shall be confirmed and recorded in writing.

4.2.3.6 Property owners affected by any service disruption shall be forewarned in writing.

4.2.3.7 There shall be a contingency plan to remove the liner pipe in the event that it cannot be completely inserted due to unforeseen problems. This should include a means of pulling the liner pipe back out of the host pipeline and a means of cutting the liner pipe off in the insertion pit should it jam in the host pipeline.

4.2.4 Insertion pits

4.2.4.1 The dimensions of the insertion pits shall be the minimum necessary to accommodate the sliplining operations. The insertion pits shall be designed such that the minimum allowable radius of curvature of the liner pipe is not exceeded during insertion. See the specification data.

4.2.4.2 The excavations for the insertion pits shall have the necessary safe side slopes or shoring and dewatering.

4.2.4.3 The excavations shall proceed with care near the existing pipeline, which may be structurally weak, to avoid damaging it.

4.2.4.4 Once exposed, the top half of the existing pipeline shall be removed along the full length of the bottom of the insertion pit, by cutting longitudinally along each springline with an abrasive disc saw.

4.2.4.5 On completion of the insertion, the top half of the existing pipeline shall be replaced and glued in position with epoxy resin and any gaps sealed.

4.2.4.6 The liner pipe shall be built into the walls of the existing manholes and the connections made good to provide watertight joints.

4.2.4.7 Wherever the installed liner pipe is not enclosed by the existing host pipeline it shall be enclosed by a pipe sleeve or part sleeve similar to the host pipe, and the gaps sealed with grout and/or a seal provided for grouting. This may occur in insertion pits, at point repairs or where connections are re-established.

4.2.4.8 The excavation, backfilling and reinstatement shall be in accordance with the relevant requirements of SANS 2001.

4.2.5 Existing pipeline

4.2.5.1 To ensure the bore of the existing pipeline is of adequate size to accommodate the liner pipe, any excessive hard deposits on the pipe walls shall be removed using a pipe scraper, cutter, borer or pig to ream the pipeline.

4.2.5.2 The pulling head with a section of liner pipe of length at least twice the liner pipe diameter or a proving ring shall be pulled through the pipeline to demonstrate that the liner pipe can negotiate the host pipeline. Cables shall be attached to both ends to allow it to be retrieved should it be obstructed.

4.2.5.3 The existing pipeline shall be given a final clean immediately prior to lining to remove any remaining silt or debris.

4.2.5.4 The pipeline shall be inspected by CCTV camera to confirm all debris and silt has been removed.

4.2.6 Sliplining

4.2.6.1 Any accommodation of flows and/or overpumping shall be implemented.

4.2.6.2 Care shall be exercised to avoid overstressing the liner pipe. The maximum allowable winching forces shall be calculated for the liner pipe (limited by the cross-sectional area and maximum safe permissible short term tensile stress of the liner pipe material). The winch load gauge shall be monitored during the winching process.

4.2.6.3 The whole length of liner pipe shall be continuously supported on rollers to minimise friction and avoid damaging the liner pipe. It may be necessary to put guards over the edges of the existing pipe to prevent gouging of the liner pipe during insertion. The liner pipe shall be winched through in one continuous operation. Soil or other material shall be prevented from entering the host pipeline.

4.2.6.4 A lubricant may be used to reduce friction between the liner pipe and the host pipeline during installation. The lubricant shall be a nontoxic, oil-based product that has no detrimental effect on the liner pipe or host pipeline, does not support bacterial growth or affect the general characteristics of the flow.

4.2.6.5 Allowance should be made for the liner pipe stretching during insertion then shortening after completion of the installation. A 24 hour relaxation period should be allowed.

4.2.6.6 If grouting of the annulus is not specified in the specification data, a watertight seal shall be installed in the annular space at the ends of the liner pipe at manholes to prevent the passage of water. The seal shall extend for a distance of at least 0,5 times the diameter of the pipe or 300 mm, whichever is the greater. The seal shall comprise a sealer strip soaked in a chemical sealer in a band to form an effective watertight gasket followed by the placing of a non-shrink grout in the remaining cavity. The seal shall be finished off with a dressing of non-shrink chemical resistant elastomeric grout.

4.2.6.7 Where liner pipes have to be trimmed back in manholes they shall be cut so that the liner pipe extends 100 mm into the manhole and a fillet formed with grout around the liner pipe and manhole wall interface.

4.2.6.8 The benching at manholes shall be reformed to suit the liner pipe by scabbling the existing surface, then trowelling a cement grout to the required thickness and shape. The grout and any reinforcing mesh shall be specified in the specification data.

4.2.6.9 Where the liner pipe passes through a manhole, the liner pipe shall be cut to the shape of the existing benching and the annulus in the invert grouted up.

4.2.7 Grouting the annulus

4.2.7.1 If specified in the specification data the annulus between the liner pipe and the host pipeline shall be grouted up.

4.2.7.2 The grout shall be mixed in a paddle, high shear or colloidal grout mixer to a homogenous consistency.

4.2.7.3 The grout shall be delivered to the injection point at a steady pressure with a suitable grout pump at the mixing tank and suitable grout hoses. The distance the grout travels, whether in the hose or the annulus, should not exceed 100 m. All grout should be used within one hour of being mixed. Means of accurately measuring grout component quantities, pumping pressures and volumes shall be provided. Pressure gauges shall be provided at the grout pump and at the injection point. The pressure gauges shall be equipped with diaphragm seals and shall have a working range between 1,5 and 2,0 times the planned grout pressure with an accuracy of no more than 2% error.

4.2.7.4 A watertight bulkhead shall be installed in the annular space at the ends of the liner pipe at manholes to prevent the passage of water and provide a seal for grouting. The seal shall extend for a distance of at least 1,5 times the diameter of the pipe. Grouting and venting pipes shall be incorporated into the bulkheads.

4.2.7.5 The grout mixture and installation procedures shall be such that the annulus is completely filled. Adequate grouting points shall be used to ensure this. The calculated volume of the annulus and the actual volume of grout used shall be monitored. Should the volume of grout being used exceed the estimated volume, this would be an indication that grout is penetrating through the existing host pipeline and into surrounding cavities.

4.2.7.6 Precautions shall be made to prevent the liner pipe from floating when grouting. To prevent floating the liner pipe should be held down or filled with water and the grouting should take place in stages. Flotation forces may not only float the liner pipe in the host pipeline but may cause the liner pipe to deform or buckle. Design calculations shall be performed to check against flotation.

4.2.7.7 Care shall be exercised to avoid buckling the liner pipe with excessive grouting pressures. The pressure that would cause the liner pipe to buckle shall be calculated. The grouting pressure shall be monitored during the grouting process.

4.2.7.8 Daily records shall be made of the grouting, recording the date, mixer, pump, hose, pipeline length, stage height, flotation prevention, mix materials and proportions, grout test and results, calculated and actual volumes and pressures including maximum at pump and injection point.

4.2.8 Service connections

4.2.8.1 After the liner pipe has been installed the existing connections shall be re-established through the liner pipe. The connections shall be free of sharp edges or protrusions.

4.2.8.2 Connections shall be re-established using either polyethylene heat-fusion saddles or strap-on saddles with neoprene gaskets and stainless steel straps installed in accordance the manufacturer's recommendations, or as specified in the specification data.

5 Compliance with the requirements

5.1 Tolerances

The liner pipe shall be checked to ensure that the requirements of the specifications for tolerance stated in the specification data are met.

5.2 Testing

5.2.1 Grout

5.2.1.1 If specified in the specification data, samples of the grout shall be cured in cubes and tested for compressive strength.

5.2.1.2 It is recommended that a minimum of 3 cubes be taken for each section of pipeline grouted or for every 5 m³ of grout injected.

5.2.1.3 75 mm grout moulds should be used. Any joints in the moulds should be sealed to prevent leakage of the grout. The grout should be poured into the mould taking care not to trap any air bubbles, which can be removed by lightly tapping the mould. The mould should be overfilled and left for 30 – 60 minutes to settle.

5.2.1.4 The excess grout should be struck off with a float and the moulds covered with plastic sheeting or damp hessian.

5.2.1.5 The mould should be stored at a temperature of 20°C ±5°C for a minimum period of 16 – 24 hours or until the grout has attained sufficient strength to allow the cube to be stripped from the mould. This minimum period relates to higher strength grouts, weaker grouts will require at least 48 hours. It is important that the site storage temperature is maintained within the specified limits otherwise the test results will be invalid.

5.2.1.6 After being stripped from the moulds the cubes should be stored in water, at a temperature of 20°C ±1°C until tested.

5.2.1.7 The cubes should be tested at 7 days. The average value of the result should exceed the strength specified in the specification data.

5.2.2 Pressure testing

If specified in the specification data the liner pipe shall be pressure tested. This may include testing prior to insertion and/or after installation.

5.2.3 Inspection

5.2.3.1 The lined pipeline shall be inspected by CCTV and a video recording made.

5.2.3.2 The liner pipe shall be continuous over the entire length lined and shall have no leaks, deformations or defects that will affect the integrity or strength of the lining.

5.2.4 Acceptance

5.2.4.1 All leaks, deformations or defects shall be rectified.

5.2.4.2 The flow may need to be re-established through the pipeline prior to the defects being remedied, in which case the remedial work shall be re-scheduled.

5.2.4.3 The lining may only be accepted once it has passed all tests.

Annex A

(normative)

Preparation of specification data associated with this part of SASTT-TS-TT1 for inclusion in the scope of work

Specification data form an essential part of this part of SASTT-TS-TT1; without such data, requirements are incomplete.

The format for the specification data has been developed to be compatible with the requirements of table D.1 of SANS 10403:2003. The specification data should be incorporated in the scope of work as illustrated in table A.1.

Table A.1 — Incorporating this part of SASTT-TS-TT1 in the scope of work

1	2	3		
Topic	Aspect	Text		
CONSTRUCTION				
Works specifications	Applicable part(s) of SASTT-TS	The following parts of SASTT-TS and associated specification data are applicable: 1) SASTT-TS ... 2) SASTT-TS ... The associated specification data are as follows: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 2px;">Specification data pertaining to SASTT-TS ...</td> <td style="width: 50%; padding: 2px;"> Essential Data: The requirements for are The requirements for are Variations: 1)..... 2)..... Additional clauses: 1)..... </td> </tr> </table>	Specification data pertaining to SASTT-TS ...	Essential Data: The requirements for are The requirements for are Variations: 1)..... 2)..... Additional clauses: 1).....
	Specification data pertaining to SASTT-TS ...	Essential Data: The requirements for are The requirements for are Variations: 1)..... 2)..... Additional clauses: 1).....		
	Applicable national and international standards			
Particular/generic specifications				

Develop the specification data based on the contents of table A.2.

Table A.2 — Specification data associated with this part of SASTT-TS-TT1

1	2	
Specification data associated with this part of SASTT-TS-TT1	Guidance notes.	
	Clause number	Consideration
Essential Data		
Pipes shall	4.1.1	State requirements for continuous liner pipes if other than High Density Polyethylene (HDPE). The incremental sliplining of discrete liner pipe lengths by pulling or pushing (jacking) from the insertion pit may be specified. Other close fit trenchless rehabilitation techniques that are based on sliplining such as diameter reduction (rolldown and swagelining) and fold and form methods may be specified.
The liner pipe shall be a solid wall High Density Polyethylene (HDPE) PE pipe colour of mm nominal outside diameter and SDR (..... mm nominal pipe wall thickness) (Pressure rating PN.....).	4.1.1 a)	
Welders shall be IFPA members and shall imprint each weld with their unique IFPA identification stamp displaying the IFPA company number, welder number and IFPA logo, issued in accordance with the Welder Identification System.	4.1.1 b) iii	Specify if welders are to be IFPA members and must stamp welds.
The welded joints shall conform to the requirements of SANS 10268 Part 10, according to the quality control rating assessment class(.....).	4.1.1 b) iv	State assessment class if other than class II. (Medium requirements for safety or for load carrying capacity or both) (Note that the assessment class rating is dependent on the safety or load-carrying risk posed.)
Welded joints shall be tested in accordance with SANS 6269.	4.1.1 b) v	Specify if welded joints are to be tested.
Before any production welding is commenced, the following shall be approved in accordance with SANS 10270 for heated-tool butt welding of pipes: 1. A Welding Procedure Specification (WPS) and 2. A qualification joint	4.1.1 b) vi	Specify if welding procedures and test weld required.
Mechanical couplings for joining pipes shall conform to the following specification	4.1.1 f)	
The grout shall be	4.1.2	Details of specific grout if required, particularly if it is to be structural component.

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The grout shall have a 28 day compressive strength of	4.1.2 e)	
Generally for continuous butt welded HDPE liner pipes the insertion pit should be at least 12 times the liner pipe diameter long with the pit end sloped up to ground level at 1 in 2,5 or flatter.	4.2.4.1	
The grout used to reform manhole benching shall be re-inforced with wire mesh.	4.2.6.8	
The annulus shall/shall not be grouted up.	4.2.7.1	
Connections shall be re-established onto the liner pipe using	4.2.8.2	
The liner pipe shall be subject to the following specifications for tolerance	5.1	
The grout shall be cured in cubes and tested for 7 day compressive strength of	5.2.1.1	
The liner pipe shall be pressure tested to the following specifications	5.2.2	
Additional clauses: 1 2		<i>State additional requirements, if any.</i>
Variations: 1 Replace ... with the following: 2 The provisions of ... do not apply.		<i>State variations, as applicable.</i>

Annex B

(informative)

Items which may need to be considered when preparing the scope of work for a particular project

B.1 The following may have to be addressed in the construction and management section of the scope of work when compiling that section for a particular project (refer to annex D of SANS 10403: 2003).

- 1) Specific requirements for equipment.
- 2) Arrangements made with the controlling authorities for sliplining under their facilities and services and the conditions under which permission is granted.
- 3) Requirements relating to the lighting of the works.
- 4) Requirements for detailed design calculations and working drawings showing methods of installation.
- 5) Requirements for the examination of structures and services at risk before commencing the work.
- 6) Safety requirements.

It should be noted that SANS 1921-1 Construction and Management Requirements: General contains general requirements in respect of most of the abovementioned considerations.

B.2 Unless full information is made available to tenderers, it is not possible for tenderers to make cost-effective and accurate assessments of the techniques required and to properly assess the risks associated with carrying out the work. Information on the layout of the pipelines to be lined, the original and existing condition of the pipelines, and characteristics of the soils likely to be encountered together with details of the water table should be communicated to tenderers.

B.3 The following information should be communicated to tenderers:

- a) Layout of the pipelines to be lined:
 - 1) sizes;
 - 2) lengths;
 - 3) gradients;
 - 4) depths;
 - 5) position of manholes;
 - 6) location of connections;
 - 7) location of roads and other services.

This information is best presented with layout plans and longitudinal sections.

At the tender site inspection each manhole should be opened for tenderers to be able to inspect the conditions inside the manhole.

- b) Original condition of the pipelines to be lined:
 - 1) pipe material;
 - 2) pipe class;

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- 3) structural reinforcement;
- 4) sacrificial layer;
- 5) original internal diameter;
- 6) type of joints,
- 7) pipe bedding, concrete haunching or encasement;
- 8) type of manhole construction.

c) Existing condition of the pipelines to be lined:

- 1) history of collapses;
- 2) history of blockages;
- 3) history of repairs and/or rehabilitation;
- 4) CCTV inspection footage;
- 5) inspection reports;
- 6) condition assessments;
- 7) report on proposed rehabilitation by sliplining including recommendation on minimum outside diameter of liner pipe.

This information is best presented in a design report.

d) Pipe flows that can be expected:

- 1) typical 24 hour flow levels;
- 2) gravity catchments and pumped flows;
- 3) available time windows with pumps stopped;
- 4) pipe full capacity;
- 5) affect of wet weather;
- 6) necessity to overpump;
- 7) stipulated overpumping capacity.

e) Characteristics of the soils likely to be encountered:

- 1) backfill material on alignment of pipeline;
- 2) virgin material outside existing pipeline;
- 3) details of the water table.

Annex C

(informative)

Items that might be needed to cover measurement and payment

The following may have to be addressed in the Pricing Data section of the project document when compiling that section for a particular project (refer to annex D of SANS 10403: 2003).

At present the SANS 2001 series of standards is being prepared to replace the existing SANS 1200 series of specifications.

It is planned that for measurement and payment SANS 2001 will adopt the Third Edition of the Civil Engineering Standard Method of Measurement (CESMM3) published by the UK Institution of Civil Engineers (ICE) or a South African version thereof.

Until SANS 2001 is fully completed and introduced, it will be necessary to refer back to the SANS 1200 measurement and payment clauses and/or the following particular measurement and payment clauses. This also applies to the SASTT-TS series of standards.

The following are measurement and payment clauses that would be suitable for such reference:

1 MEASUREMENT AND PAYMENT

1.1	<u>Pay Item</u>	<u>Unit</u>
	Supply and install by sliplining solid wall High Density Polyethylene (HDPE) liner pipes Type PE Colour	
	Standard Dimension Ratio (SDR)	
	Outside Diameter mm	
	between manholes and	m

The lined pipeline shall be measured between manhole centres.

The price tendered and paid shall include full compensation for the cost of manufacturing, supply and installing the liner, butt welding, testing of welds, pipe fittings, joints and couplings, liner pipe supports, accommodation of flows, final cleaning of pipelines, CCTV inspections, sealing at the manholes, reforming manhole benchings, watertight seals, bulkheads, grouting the annulus *<if specified and not measured separately>*, testing, safety measures, all supervision, labour, materials, transport, equipment and incidentals required to reline the host pipeline.

Insertion pits, grouting the annulus *<if measured separately>* and service reconnection shall be measured and paid for separately.

1.2	<u>Pay Item</u>	<u>Unit</u>
	Service Reconnection	No

The service reconnections shall be paid for each pipe connection that is re-established. Pay items may be itemised according to pipe sizes and types.

The price tendered and paid shall include full compensation for the cost of excavations, installing pipe junctions and making good.

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1.3	<u>Pay Item</u>	<u>Unit</u>
	Construct pit for insertion of liner between manholes and	Sum

The unit of measurement shall be a sum per manhole length. The insertion pit shall be priced according to the requirements of the Contractor which shall be determined by his specific proposal for the insertion of the pipeline. The Contractor shall ensure that the proposed insertion pit is suitable.

The price tendered and paid shall include full compensation for clearing, excavation, shoring on all sides, safety measures, dewatering, removal of the top of the pipeline, maintenance whilst open, closure and sealing the existing pipeline, backfilling, removal of shoring, the full reinstatement of the surface finishes and all supervision, labour, materials, transport, equipment and incidentals required for the insertion pit.

1.4	<u>Pay Item</u>	<u>Unit</u>
	Grouting of annulus	m ³

Grouting of the annulus shall be measured per cubic metre of grout placed.

The price tendered and paid shall include full compensation for installing bulkheads, accommodation of flows, mixing and pumping of materials, testing, safety measures, all supervision, labour, materials, transport, equipment and incidentals required to grout the annular space between the liner pipe and the host pipeline including any grout that penetrates through the host pipeline and fills any surrounding cavities.