SASTT-TS-TT2:2013

Edition 1

SASTT TECHNICAL STANDARD

Trenchless construction works

Part TT2: Pipe bursting

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Southern African Society for Trenchless Technology (SASTT)
P O Box 13981 SINOVILLE 0129
Tel: +27 (012) 567 4026 Cell: 074 416 4811
Email: director@sastt.org.za Website: www.sastt.co.za

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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 trenchless replacement of underground pipelines by means of pipe bursting.

Prior to approval the standard was posted on the SASTT website for comment and the draft was independently reviewed by A Goyns of PIPES. Comments were incorporated in the final document.

Foreword

This SASTT technical standard was approved by the Board of SASTT on 17 September 2013.

This document was published on 17 September 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. Annexes B, C, and D are for information only.

Introduction

The different parts of SASTT-TS each address a specific category of trenchless construction works. The prime purpose of the production of these standards is to create a set of standards that are generally applicable to trenchless construction works, which can be readily modified so that they are applicable to developments in existing techniques or development of new techniques for trenchless works.

The SANS 2001 and SASTT-TS family of standards provides technical descriptions of the standard of materials and workmanship that will be required 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.

Contents

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Trenchless construction works

Part TT2:
Pipe bursting

1 Scope

This pipe bursting specification covers the replacement of underground pipes by pulling a pipe bursting head through an existing (and usually deteriorated) host pipeline to break, split or burst the existing pipes and to displace their fragments into the surrounding soil whilst simultaneously pulling in a new pipe of the same or larger diameter into the void created. A powered pulling device pulls the pipe bursting head and replacement pipe by using rods, cables or chains.

There are three pipe bursting techniques that differ in the way the bursting force is generated and applied to the host pipe:

a) Pneumatic bursting uses a percussive bursting head that applies a horizontal hammering force.
b) Static bursting uses a tapered bursting head and depends solely on the pulling force.
c) Hydraulic bursting uses a head that is expanded at intervals to apply radial forces.

These techniques are typically used for replacing old water and sewer reticulation pipelines. Excavations are limited to a pulling (or winching, exit or reception) pit, an insertion (or launching or entry) pit and re-connection pits, resulting in minimal surface disturbance, traffic disruption or service interruption.

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 Annex C provides suitable measurement and payment specifications.

NOTE 4 Annex D covers the factors that should be considered when selecting the structural requirements of the replacement pipes to ensure that they can handle the loading conditions to which they will be subject during their installation and through their design life, without detriment to their function and the environment.

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.*

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

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

3 Definitions

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

3.1
bursting head
is the metal head that is pulled into a host pipe and by force causes the existing pipe to be broken and displaced into the surrounding soil. The head has a blunt point so that it is guided along the existing pipe alignment. The replacement pipe that is attached to the bursting head follows into the resultant void.

3.2
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, and then 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.

3.3
CCTV
is Closed Circuit Television used for the internal inspection of pipelines.

3.4
continuous insertion method
is pulling a (long) continuous pipeline from the surface via an insertion pit into the host pipeline.

3.5
HDPE
is High Density Polyethylene, also referred to as PE-HD. Polyethylene materials of designation PE 80 and PE 100 are high density polyethylene materials.

3.6
host pipe
is the existing pipe that has to be replaced.

3.7
insertion pit
is the excavation that accommodates the entry of the bursting head and replacement pipe into the host pipeline. Also known as the launching pit or starting pit.

3.8
mechanical joint/coupling
is the joint made by assembling one length of replacement pipe to another that generally includes a compression part, to provide for pressure integrity, leak-tightness and resistance to end loads.

3.9
point repair
is a repair made to an underground pipeline at a particular location by excavating down to the pipeline from the surface to affect the repair.

3.10
pulling device
refers to all machinery, pullers, pushers, winches, pulleys, power plants, racks, equipment, support work, frames and bracing utilised during the pipe bursting operation.

3.11
pulling point
is the location, usually a manhole or pulling pit, where the pulling device is installed. Also known as the reception pit or exit pit.

3.12
replacement pipe
is the length of pipe that is joined together and pulled behind the bursting head to replace the host pipe.

3.13
sectional insertion method
is lowering individual pipes into the insertion pit, joining on and pulling into the host pipe.

3.14
specification data
is data, provisions and variations that make this standard applicable to a particular contract or works.

3.15
suitable
is capable of fulfilling or having fulfilled the intended function or fit for its intended purpose.

4 Requirements

4.1 Materials

4.1.1 Replacement pipes

The replacement pipe material is partly determined by the method chosen for pipe bursting i.e. continuous insertion method or sectional insertion method. The replacement pipes and types of joints or couplings shall be detailed in the specification data. All pipe materials shall, where such mark has been awarded, bear the SABS mark. All materials supplied and installed shall be guaranteed to be free of defects arising from the manufacture, transportation, installation or any other process or factors. Further to this, the replacement pipe shall:

a) resist the load of tensile and bending forces as well as frictional forces resulting from the pipe bursting process,

b) resist point loads and scratches caused by the host pipe fragments and,

c) meet the structural requirements described in Annex D.

4.1.1.1 Replacement pipes with welded joints

Butt welded HDPE pipes shall:

a) comply with the requirements of SANS 4427 as indicated in the specification data.

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 required by 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 where applicable, without leaving notches. If required by the specification data, the removed beads shall be retained for inspection.

d) be able to withstand, without damage, the longitudinal force to be transmitted by the pulling equipment.

e) not have cuts, gashes, nicks, abrasions, or any such physical damage on the outside of the pipe, which is deeper than 10% of the wall thickness. Such pipes shall be removed from site and replaced with undamaged pipes.

The welding together of other types of pipe shall be detailed in the specification data.

4.1.1.2 Replacement pipes with mechanical joints

Pipes not joined by welding shall be joined by using industry tested and approved mechanical joints or couplings and be joined in accordance with the manufacturer's specifications.

The pipes and couplings shall be certified as being able to withstand without damage, deformation or separation, the forces transmitted by the particular pipe bursting technique and method, using pulling equipment.

4.2 Construction

4.2.1 General

4.2.1.1 Pipe bursting techniques

There are three pipe bursting techniques in use that are differentiated by the way in which the bursting force is generated and applied to the host pipe to break it and displace into the surrounding soil:

a) Pneumatic bursting uses a percussive bursting head that is pulled through the host pipe. The head applies a horizontal hammering force.

b) Static bursting uses a tapered bursting head that is pulled through the host pipe with force.

c) Hydraulic bursting uses a head that is pulled through the host pipe and expanded at intervals to apply radial forces. (Less common).

The pipe bursting technique (pneumatic, static or hydraulic) to be used may be prescribed in the specification data.

4.2.1.2 Pipe insertion methods

Generally there are two distinct methods of inserting the pipes:

a) The continuous insertion method whereby a (long) continuous pipeline is pulled into the host

pipe. The replacement pipeline is prepared and welded or joined on the surface in advance of the pipe bursting, ready for installation via an insertion pit in a continuous operation.

b) The sectional insertion method, whereby single pipes are lowered into the insertion pit, joined onto the existing pipeline behind the bursting head and pulled into the host pipe in an incremental manner.

4.2.1.3 Potential surface movement

The potential for the surface heaving and the potential for damage of nearby services and structures by the pipe bursting operations shall be assessed and any necessary precautionary measures shall be taken. Care shall be exercised to protect existing surfaces, structures and services in the planning and execution of the work. Any surfaces, structures or services that may be subject to damage shall have their condition inspected and recorded prior to commencing with construction work. During the pipe bursting operations all surfaces, structures and services shall be monitored for settlement, heaving or movement. Should any such settlement, heaving or movement occur the pipe bursting operations must cease until suitable actions have been taken to rectify the situation.

4.2.1.4 Pulling equipment

Cables, rods and winches shall be suitable for the particular pipe bursting operation and shall have sufficient pulling capacity. Pulleys and any associated framework installed in the pulling points shall be capable of withstanding the substantial forces that may be applied. Pulling equipment shall be equipped with load gauges and controls to avoid overloading.

4.2.1.5 The bursting head

The bursting head shall be suitable for attaching to the replacement pipe securely. It shall be capable of withstanding the pulling forces and guiding the replacement pipe into and through the host pipeline. It shall have a rotating eye to avoid the replacement pipe twisting the cable. Once the replacement pipe has been installed, the pulling head shall be capable of being easily removed from the host pipeline.

4.2.2 Preliminary

4.2.2.1 Measurements of existing pipelines

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

4.2.2.2 Condition of existing pipelines

The condition of the existing pipeline to be replaced shall be inspected with CCTV equipment and its condition assessed before the pipe bursting operation commences. All defects in the existing pipeline such as sagging, misaligned joints, protruding connections, excessive silting, unexpected turns or bends, collapsed pipes or any other defect that will cause undue stress on the pulling operation shall be identified. This information shall be used in planning the positions of the insertion pits and any pulling pits.

4.2.2.3 Pipe bursting feasibility

All defects that have been identified shall be assessed to determine the feasibility of pipe bursting and shall be corrected by means of point repairs if necessary to ensure a successful pipe bursting operation.

4.2.2.4 Planning of insertion pits

The proposed positions, sizes and layout of insertion pits and pulling points shall be planned and shall include the information gathered from an analysis of the pre-bursting CCTV inspection.

4.2.2.5 Work areas

The areas required for storage, butt welding and stringing the replacement pipe ready for insertion shall be pre-planned and demarcated. The replacement pipes shall be stored and transported in a manner to avoid any damage to the pipes.

4.2.3 General preparation

4.2.3.1 Location of insertion pits
The number and location of insertion pits shall be planned to keep them to a minimum and maximise the lengths of individual insertions. If possible, insertion pits and any pulling pits shall be located where excavations are to be made for point repairs.

4.2.3.2 Sizing of insertion pits
All insertion pits, pulling points and manholes shall be of suitable size to accommodate the necessary pipe bursting operations.

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

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

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

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

4.2.3.7 Existing services
All existing services in the vicinity of the pipelines to be burst shall be located and where necessary protected against damage that might occur during the pipe bursting operation. This includes all services that cross over the path of the pipeline and that are within three times its diameter above it. These services shall be exposed and protected.

4.2.3.8 Contingency plan
There shall be a contingency plan for the removal of the bursting head and any other equipment in the event that the bursting head becomes stuck for whatever reason and where no further pipe bursting is possible.

4.2.3.9 Checking of replacement pipe
Immediately before the installation of the replacement pipe, the components shall be checked for damage and flaws including:

a) pipes and fittings for gouges, cracks, holes, flattening and indentations,

b) rubber rings for tears or other flaws before making each joint.

4.2.4 Insertion pits

4.2.4.1 Dimensions
The dimensions of the insertion pits and any pulling pits shall be the minimum necessary to accommodate the pipe bursting operations. The insertion pits shall be designed and constructed so that the radius of curvature of the replacement pipe is not less than the minimum allowable during insertion. The minimum allowable radius of curvature may be stipulated in the specification data.

4.2.4.2 Excavation
The excavations for the insertion pits and any pulling pits shall have the necessary shoring and dewatering according to the relevant requirements of SANS 2001.

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

4.2.4.3 Replacement pipe installation
Once all the movement has taken place the replacement pipe shall be built into the walls of the existing manholes and chambers, and the connections made good to provide watertight joints. (See 4.2.6.5)

4.2.4.4 Excavation, backfilling and reinstatement
The excavation, backfilling and reinstatement of the insertion pits and any pulling pits shall be in accordance with the relevant requirements of SANS 2001.

4.2.5 Existing pipeline and structures

4.2.5.1 Debris in existing pipeline
All debris shall be cleared out of the existing pipeline prior to the commencement of pipe bursting.

4.2.5.2 Benching in existing manholes
All benching shall be broken out of existing manholes to ensure accommodation of the replacement pipe without causing any damage to the replacement pipe.

4.2.6 Pipe bursting

4.2.6.1 Flows and/or over-pumping
Any accommodation of flows and/or over-pumping shall be implemented.

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

4.2.6.3 Replacement pipe support
The whole length of replacement pipe shall be continuously supported on rollers before entry into the insertion pit to minimise friction and avoid damaging it during the pipe bursting operation. It may be necessary to put guards over the edges of the existing pipe to prevent gouging of the replacement pipe during insertion. The replacement pipe shall be pulled through in one continuous operation.

4.2.6.4 Use of lubricant
A lubricant may be used to reduce friction between the replacement pipe and the host pipeline during installation. The lubricant shall be a non-toxic product that has no detrimental effect on the environment, the replacement pipe or the existing pipeline, and does not support bacterial growth or affect the general characteristics of the flow in the replacement pipe.

4.2.6.5 Relaxation period of the replacement pipe
Allowance should be made for the replacement pipe stretching during insertion and then shortening after the completion of the installation. The manufacturer's specifications shall be followed in this regard. A 24-hour relaxation period should be allowed for but under no circumstances should this be less than 4 hours.

4.2.6.6 Trimming of replacement pipes in manholes

Where replacement pipes have to be trimmed back in manholes they shall be cut so that the replacement pipe extends 100 mm into the manhole and that a grout fillet is formed to fill the gap between the replacement pipe and manhole wall.

4.2.6.7 Manhole benching reinstatement

The benching at manholes shall be reformed to suit the replacement 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 detailed in the specification data.

4.2.6.8 Replacement pipes passing through manholes

Where the replacement pipe passes through a manhole, the replacement pipe shall be cut to the shape of the existing benching.

4.2.7 Service connections

4.2.7.1 Reinstatement of service connections

After the successful installation of the replacement pipe the existing connections shall be re-established onto it. The connections shall be free of sharp edges or protrusions.

4.2.7.2 Gravity pipe connections

Gravity pipe 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 with the manufacturer's recommendations, or as stipulated in the specification data.

5 Compliance with the requirements

5.1 Tolerances

The replacement pipe shall be checked to ensure that the tolerance requirements as stated in the specification data are met.

5.2 Testing

5.2.1 Pressure testing

If required by the specification data the replacement pipe shall be pressure tested. This may include testing prior to insertion and/or after installation.

5.2.2 Inspection

5.2.2.1 CCTV Inspection

Immediately after installation the replacement pipeline shall be inspected by using CCTV equipment and a video recording shall be made.

5.2.2.2 CCTV Inspection assessment

The replacement pipe shall be continuous over the entire length replaced and shall have no leaks, deformations or defects that will affect the integrity or strength of the pipe. In the case of segmented replacement, all joints shall be flush and sealed as per the manufacturer's specifications.

5.2.3 Acceptance

5.2.3.1 Leaks, deformations or defects
All leaks, deformations or defects shall be rectified.

5.2.3.2 Re-establishment of flow
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.

5.2.3.3 Approval of replaced pipe
The section of pipeline that has been replaced by pipe bursting may only be accepted once it has passed all the required tests and the CCTV inspection assessment has been accepted.

Annex A
(normative)

Preparation of specification data associated with this part of SASTT-TS-TT2 for inclusion in the scope of work

Specification data form an essential part of this part of SASTT-TS-TT2; 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-TT2 in the scope of work

<table>
<tr><td>1</td><td>2</td><td>3</td></tr>
<tr><td>Topic</td><td>Aspect</td><td>Text</td></tr>
<tr><td colspan="3">CONSTRUCTION</td></tr>
<tr><td rowspan="3">Works specifications</td><td>Applicable part(s) of SASTT-TS</td><td>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><tr><td rowspan="3">Specification data pertaining to SASTT-TS - ……</td><td>Essential Data:
The requirements for ……. are …….
The requirements for ……. are …….</td></tr><tr><td>Variations:
1)……
2)……..</td></tr><tr><td>Additional clauses:
1)…….</td></tr></table></td></tr>
<tr><td>Applicable national and international standards</td><td></td></tr>
<tr><td>Particular/generic specifications</td><td></td></tr>
</table>

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

Table A.2 — Specification data associated with this part of SASTT-TS-TT2

1	2	
Specification data associated with this part of SASTT-TS	**Guidance notes.**	
	Clause number	**Consideration**
Essential Data		
Pipes shall …….	4.1.1	State requirements for replacement pipes and types of joints or couplings if other than butt welded High Density Polyethylene (HDPE). The welding of pipes if other than HDPE.
The replacement 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……..).	4.1.1.1 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.	4.1.1.1 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 .....(.....).	4.1.1.1 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.	4.1.1.1 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	4.1.1.1 b) vi	Specify if welding procedures and test weld required.
The removed beads from each joint shall be retained in separate labelled transparent bags and handed to ……	4.1.1.1 c)	The beads may be inspected for quality purposes.
The pipe bursting shall be performed using the ……. technique.	4.2.1.1	The method of pipe bursting (pneumatic, static or hydraulic) may be specified.
The pipe insertion method shall be ……..	4.2.1.2	The continuous or sectional insertion method may be specified.

1	2	
Specification data associated with this part of SASTT-TS	**Guidance notes.**	
	Clause number	**Consideration**
Generally for continuous butt welded HDPE replacement pipes the insertion pit should have a length at least 12 times the replacement pipe diameter with the pit end sloped up to ground level at 1 in 2,5 or flatter. The minimum allowable radius of curvature for the replacement pipe shall be ……	4.2.4.1	The minimum allowable radius of curvature for the replacement pipe may be specified or reference made to the manufacturers recommendations.
The grout used to reform manhole benching shall be ..... reinforced with ..... wire mesh.	4.2.6.7	
Connections shall be re-established onto the replacement pipe using	4.2.7	
The replacement pipe shall be subject to the following specifications for tolerance	5.1	
The replacement pipe shall be pressure tested to the following specifications	5.2.1	
Additional clauses: 1 …… 2 ……		*State additional requirements, if any.*
Variations: 1 Replace … with the following: 2 The provisions of … do not apply.		*State variations, as applicable.*

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, particularly the suitable pipe bursting techniques and insertion methods. In particular a description of the existing pipe sizes, depths and soil conditions as well as the required degree of upsizing if any and the lengths of pipe bursts expected.

2) Arrangements made with the controlling authorities for pipe bursting 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 surfaces, 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 replaced, 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 replaced:

1) sizes;
2) degree of upsizing;
3) lengths;
4) gradients;
5) depths;
6) position of manholes, chambers, valves, hydrants, bends, tees etc.
7) location of connections;
8) location of roads and other services.

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

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

b) Original condition of the pipelines to be replaced:

1) pipe material;
2) pipe class;
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, hydrant, valve etc. construction.

c) Existing condition of the pipelines to be replaced:

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 pipe bursting including recommendation on the diameter of the replacement 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 over-pump;
7) stipulated over-pumping capacity.

e) Characteristics of the soils likely to be encountered:

1) backfill material on alignment of pipeline;
2) virgin material around the 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 are 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 **Pay Item** **Unit**

Supply and install by pipe bursting solid wall High Density Polyethylene (HDPE) replacement pipes
Type PE ..... Colour ……
Standard Dimension Ratio (SDR) .....
Outside Diameter ……..... mm
between manholes ..... and ..... m

The pipeline to be pipe-burst shall be measured between manhole centres.

The price tendered and paid shall include full compensation for the cost of manufacturing, supply and installing the replacement pipe, butt welding, testing of welds, pipe fittings, joints and couplings, replacement pipe supports, accommodation of flows, final cleaning of pipelines, CCTV inspections, sealing at the manholes, reforming manhole benching, watertight seals, bulkheads, testing, safety measures, all supervision, labour, materials, transport, equipment and incidentals required to replace the host pipeline by pipe bursting.

Insertion pits, any pulling pits and service reconnection shall be measured and paid for separately.

1.2 **Pay Item** **Unit**

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.

1.3	**Pay Item**	**Unit**
	Construct pit for insertion/pulling of replacement pipe between manholes .. and...	Sum

The unit of measurement shall be a sum per manhole length. The insertion/pulling 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/pulling 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/pulling pit.

Annex D
(informative)

Items that need to be considered when selecting the structural requirements of the replacement pipe

Selecting the structural properties of the replacement pipe is beyond the scope of this standard. It should be done by a competent engineer of technologist taking into account:

1) material and condition of the host pipeline.
2) material to be used for the replacement pipe.
3) actual pipe bursting technique to be used.
4) pipe insertion method to be used.
5) physical dimensions such as burst length and pipe diameters.
6) surrounding soil conditions and properties.
7) depth of installation.
8) traffic loading.
9) external ground water pressure.
10) loads on replacement pipes not protected by host pipe (insertion and pulling pits).