

SPECIFICATION AM : ACCOMMODATION OF TRAFFIC

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SPECIFICATION AM : ACCOMMODATION OF TRAFFIC

1. SCOPE

This Specification covers the construction and maintenance of the necessary detours and bypasses, including the supply and erection of barricades and signs, and everything necessary for the safe and easy passage of all public traffic during the construction period and also the obliteration of bypasses and removal of barricades and signs as they become redundant.

Interpretations and variations of this Specification are set out in the Specification Data.

2. NORMATIVE REFERENCES

2.1 Supporting specifications

Where this Specification is required for a project, the following specifications shall, inter alia, form part of the Contract Document:

- a) Specification Data;
- b) SANS 1200 Series of Standardized Specifications;
 - i) SANS 1200 A;
 - ii) SANS 1200 D;
 - iii) SANS 1200 DM;
 - iv) SANS 1200 M;
- c) Standards listed in Appendix A; and
- d) in addition to the above, one or more of the following specifications may be required:
 - i) SANS 1200 ME;
 - ii) SANS 1200 MG;
 - iii) SANS 1200 MM;
 - iv) Specification WB, Fencing.

3. DEFINITIONS AND ABBREVIATIONS

For the purpose of this Specification the definitions and abbreviations given in the applicable specifications listed in 2.1 and the following abbreviation shall apply:

SADC : Southern African Development Community.

4. REQUIREMENTS

4.1. Materials

4.1.1 Roadworks

4.1.1.1 Selected subgrade

The provisions of SANS 1200 DM shall apply.

4.1.1.2 Wearing course gravel

The provisions of SANS 1200 ME shall apply.

4.1.1.3 Base for bitumen surfaced bypasses

The provisions of SANS 1200 ME for subbase shall apply.

4.1.1.4 Bituminous surfacing

The provisions of SANS 1200 MG shall apply.

4.1.2 Temporary traffic signs, barriers and flashing lights**4.1.2.1 Temporary road signs, delineators and barricades**

Temporary road signs shall include all road signs in the regulatory, warning, information and guidance series in SADC Road Traffic Signs Manual.

The road signs shall be made of 1,4 mm thick steel sheets, 1,4 mm thick chromadek or any other material approved by the Engineer. The background, letter and symbols of all signs shall be of engineering-grade retro-reflective material.

Road signs shall either be mounted on poles planted in the ground or on stands to facilitate ease of movement. The stands provided shall have a base on which ballast can be placed such that the signs are not affected by wind or passing traffic.

Barricades shall be mounted on stands and shall be either a TR15 and DTG106 combination or a TR17 and DTG106 combination.

4.1.2.2 Mounting of signs

Signs may either be mounted on wooden posts fixed firmly in the ground or mounted on suitable stands in order to facilitate removal and replacement.

4.1.2.3 Channelization devices

Channelization devices shall include delineators and traffic cones. Delineators shall be mounted such that they are not blown over by wind or the movement of passing traffic. Delineators shall comply with the requirements of SANS 1555.

4.1.2.4 Flashing lights

Flashing lights shall be bi-directional, amber warning lights of the Zenon type with a lens diameter not less than 170 mm and a flashing frequency of 75 to 95 flashes per minute.

4.1.3 Temporary fencing

Except that good quality used materials will be permitted, fencing materials shall be in accordance with Specification WB.

4.2 Plant

The relevant requirements of Clause 4 of SANS 1200 D shall apply.

4.3. Methods and processes**4.3.1 General obligations**

The Contractor shall be responsible for the safe and easy passage of public traffic past and/or over sections of roads of which he has occupation. The Contractor shall take the necessary care at all times in all his operations and use of his equipment to protect the public and to facilitate the flow of traffic.

The failure or refusal of the Contractor to construct and/or to maintain bypasses at the proper time, or to take the necessary precautions for the safety and convenience of public traffic as required by statutory authorities or as ordered by the Engineer, shall be sufficient cause for the suspension of payments under this Contract until all provisions prescribed have been complied with to the satisfaction of the Engineer.

4.3.2 Provision of bypasses

4.3.2.1 General

Except where the existing road is to remain in use by through traffic, the Contractor shall provide, construct or put in order such bypasses as may be required to deviate traffic from such portions of the road as are handed over to him.

The bypasses provided by the Contractor shall include the construction of temporary gates, grid gates, fences, drainage works, and other incidentals considered necessary by the Engineer.

4.3.2.2 Property and survey beacons

Where possible, bypasses shall be constructed so as not to damage or displace property or trigonometrical survey beacons. In exceptional cases where this is not possible the Contractor shall notify the Engineer in good time so that he may arrange to have these suitably referenced before they are displaced.

4.3.2.3 Access to properties

The Contractor shall provide and allow access to persons whose properties fall within or adjoin the area over which he is working. If, for any reason, such access has to be closed for certain periods of construction, the persons affected shall be given reasonable notice in writing of each such period of closure.

4.3.2.4 Approval of bypasses

The need for and details concerning all bypasses shall be proposed by the Contractor for approval by the Engineer which approval shall have been obtained before construction commences and the Contractor will be held to have satisfied himself before tendering that he can arrange for bypasses as may be necessary for the safe and convenient passage of traffic.

4.3.2.5 Public services

Unless otherwise provided in the Specification Data, the Contractor shall arrange for the moving of all public services such as power lines, telephone lines, water mains, etc., where this is required for the construction of bypasses and he shall solely be responsible for the safety of such services. Where no moving of services is required the Contractor shall clearly indicate where such services cross the bypass so that these points are clearly visible to his operating staff.

4.3.2.6 Width and clearances for bypasses

Unless otherwise specified in the Specification Data or shown on the Drawings, the usable width of bypasses accommodating two-way traffic shall not be less than 8 m. Where bypasses consist of two separate one-way lanes the minimum usable width of each lane shall not be less than 5 m. The minimum vertical clearance over any portion of a bypass shall be 5,0 m.

4.3.3 Existing roads used as bypasses

Where existing roads are to be used as bypasses the Contractor shall carry out any repairs, alterations or additions to such roads needed to bring them to a condition which, in the opinion of the Engineer, is suitable for the greater traffic use.

4.3.4 The Contractor's use of bypasses and existing roads

The Contractor shall have the right to use public roads including bypasses open to public traffic, but where his own traffic causes excessive damage or wear to such roads or constitutes a hazardous condition to public traffic, the Engineer shall have the right to regulate the Contractor's use of such bypasses and require the Contractor to provide such maintenance, including wearing course gravel and watering, as in the Engineer's opinion is necessary in addition to what would be required to properly maintain the bypasses when not used by the Contractor's construction traffic. Where regulation of the Contractor's traffic does not alleviate the traffic hazard satisfactorily or the maintenance of the bypasses cannot be or is not properly executed, the Contractor shall, where conditions permit, divert his traffic over construction roads provided and maintained by the Contractor.

4.3.5 Accommodation of traffic where the road is constructed in half-widths

Where by reason of difficult terrain, or for any other reason, the construction of bypasses is not feasible, the Contractor shall, upon the written instruction of the Engineer, construct the road in half widths, allowing traffic to use that half of the road not under construction at the time. The lengths of the half width construction shall be kept to a minimum, with provision for traffic travelling in opposite directions to pass at frequent intervals.

The Contractor shall so arrange his work that the traffic will at all times have free one-way access to at least half the width of the roadway during the construction period. He shall maintain that half of the road which is being used for traffic for the time being, free of corrugations to the satisfaction of the Engineer's Representative.

Whenever possible, the Contractor shall ensure that the whole road width shall be open at night and shall be left, at the end of each day's work, in a good and safe trafficable condition to the satisfaction of the Engineer's Representative.

Should the road not be in a safe trafficable condition for two-way traffic over the whole width at the end of each day's work, the Contractor shall supply adequate flagmen, signs, barriers, lights and necessary staff at his own cost to ensure a reasonable free flow of traffic alternately in each direction throughout the whole period that the roadway is open to one-way traffic only.

4.3.6 Earthworks for bypasses

The Contractor shall shape and grade the bypasses making full use of all material that can be obtained from alongside the bypasses, from side cut or from the immediate vicinity. If sufficient material cannot be obtained in this manner, he shall import material from other sources.

Where necessary, cuttings shall be made to obtain a satisfactory vertical alignment. The Contractor shall also perform the necessary clearing and grubbing including the removal of all trees and stumps. Where the subgrade is not sufficiently dense in its natural condition, it shall be compacted to at least 90% of modified AASHTO max. density prior to the construction of the earthworks.

All material shall be watered, mixed and compacted with suitable compaction equipment to give sufficient density to the material that it will be capable of carrying traffic without undue wear or distress. This density shall not be less than 90% of modified AASHTO max. density.

Any fills which may be necessary for any reason, e.g. for the construction of drifts, shall be constructed and compacted by the Contractor as described above. Wherever possible drifts shall be constructed of rockfill or coarse material so as to limit as far as possible damage due to flood waters. The Contractor shall construct cuttings where required.

4.3.7 Gravel wearing course for bypasses or existing roads used as bypasses

When the earthworks for bypasses have been completed, those portions of the bypasses and of existing gravel roads used as bypasses indicated by the Engineer, shall be provided with a wearing course gravel.

The Contractor shall provide, spread, water, mix and compact such material to a density where it can carry traffic without undue wear and tear. This density shall not be less than 93% of modified AASHTO max. density.

4.3.8 Selected layers and roadmarking for bituminous surfaced bypasses

When specified in the Specification Data or required by the Engineer, layers of selected subgrade or subbase quality material, bituminous surfacing and roadmarking shall be constructed by the Contractor in accordance with the requirements of the relevant Specifications and the Engineer's instructions.

4.3.8.1 Selected subgrade

Where the use of a selected subgrade layer is ordered by the Engineer the provision of SANS 1200 DM shall apply.

4.3.8.2 Base

The provisions of SANS 1200 ME for subbase shall apply.

4.3.8.3 Bituminous surfacing

The provisions of SANS 1200 MG for a single surface treatment using 6,7 mm stone shall apply.

4.3.8.4 Roadmarking

The provisions of SANS 1200 MM shall apply.

4.3.9 Temporary drainage works

The Contractor shall construct the necessary temporary drainage works to deal adequately with any surface run-off, such as side drains, catchwater mounds or channels, mitre drains, culverts, etc.

Temporary culverts shall be installed on existing drainage channels wherever required by the Engineer and of sizes and types ordered by him. Any suitable metal or precast concrete culverts salvaged from an existing road or abandoned bypass may be re-used if in a good condition and approved by the Engineer.

Any damage caused to bypasses due to the inability of temporary culverts, installed in accordance with the Engineer's instructions, to cope with floods, shall be repaired by the Contractor.

4.3.10 Temporary fencing, gates and grid gates

Where temporary fences, gates or grid gates are ordered by the Engineer or specified in the Specification Data or shown on the Drawings, the Contractor shall make his own arrangements for providing either new or used fencing and gates or moving existing fencing and gates in accordance with the drawings and Specifications, or in the absence thereof, to standards acceptable to the property owners concerned.

Fencing and gates shall be removed when no longer required and existing fencing and gates temporarily moved shall be reinstated to at least their original condition.

Temporary grid gates shall be constructed in accordance with the drawings and subsequently demolished and removed, if so required.

4.3.11 Barricades and traffic signs

The Contractor shall provide, erect and maintain barricades, traffic signs and warning boards at the positions and of the sizes and dimensions prescribed in the SADC Road Traffic Signs Manual and Chapter 13 thereof¹. All traffic signs shall be of the sizes specified for the design speed and class of road stated in the Specification Data or as directed by the Engineer.

Warning lights and a sufficient number of flagmen shall be provided by the Contractor and he shall take all necessary further precautions for the protection of the Works and for the safety of the travelling public.

Where specified in the Specification Data, traffic lights shall be provided at the locations directed by the Engineer. The Contractor shall make all arrangements for the provision and installation of traffic lights and shall co-operate with the responsible road authority in each particular case.

Drums shall be placed at the locations directed by the Engineer. They shall generally be placed at 5 m intervals.

4.3.12 Maintenance of gravel bypasses and existing roads used as bypasses

All gravel bypasses and existing gravel roads used as bypasses shall be maintained by the Contractor in a safe trafficable condition. Whenever required by the Engineer, the roads and bypasses shall be bladed by means of self-propelled graders to provide a smooth riding surface free of corrugations. All potholes shall be promptly repaired.

The Engineer may instruct the Contractor to water the bypasses to keep down dust or in order to facilitate the proper blading of the surface. All drainage works shall be maintained in good working order.

4.3.13 Maintenance of temporary bituminous surfaced bypasses and existing bituminous surfaced roads used as bypasses

All bitumen-surfaced roads used by public traffic bypassing construction shall be maintained in a good and safe trafficable condition for the whole time during which such roads are used. Maintenance shall include the patching and repair of the bitumen surfacing, the clearing of shoulders, the clearing of all drains including culvert inlet and outlet drains, and other incidentals and unless otherwise specified in the Specification Data, the care and maintenance of all roadmarking, guide posts and guardrails.

4.3.14 Obliteration of bypasses

When traffic is routed permanently onto the new road following the completion of construction and the bypasses are no longer required, such sections of obsolete roads and markings as instructed by the Engineer shall be obliterated.

Temporary bypasses shall, as far as practicable, be levelled off with the original ground. Surfaces shall be scarified and broken up to a depth of 150 mm in order to promote plant growth.

¹ See Appendix A

Where required by the Engineer, for prevention of soil erosion, banks, dykes or ditches shall be constructed over the old road or haul road, of such dimensions as ordered by the Engineer.

All roads and temporary bypasses treated as above, shall be left in a neat and tidy state.

5. COMPLIANCE WITH REQUIREMENTS

5.1. Testing

If any testing is required by the Engineer during the construction of bypasses the provisions of Clause 7 of SANS 1200 DM shall apply.

6. Void

7. Void

8. MEASUREMENT AND PAYMENT

8.1 Basic principles

8.1.1 Access to properties

Except where accesses to properties and facilities specified in Clause 4.3.2.3 of Specification AM, extend beyond the road reserve, no separate payment will be made for such accesses and facilities.

8.1.2 Public services

No payment will be made for any additional expenses caused by delays in the moving of services as specified in Clause 4.3.2.5 of Specification AM.

8.1.3 Contractor's bypasses and haul roads and use of bypasses and existing roads

Bypasses and haul or construction roads constructed at the Contractor's own initiative for accommodating construction traffic shall be constructed, maintained and subsequently obliterated and the surface properly reinstated when no longer required at his own cost and only in accordance with details previously agreed upon in writing with the Engineer.

Where the Engineer regulates the Contractor's use of bypasses and/or requires the Contractor to provide maintenance, including wearing course gravel and watering in terms of Clause 4.3.4 of Specification AM, such regulated use and/or work shall be at the Contractor's own cost. Where the Contractor is required to divert his traffic over construction roads in terms of Clause 4.3.4 of Specification AM, such diversion shall be at the Contractor's own cost.

8.1.4 Temporary drainage works

Payment for the construction of temporary culverts will be made under the applicable items provided but payment for the construction of the other drainage works covered by Clause 4.3.9 of Specification AM and for the maintenance of all drainage works shall be covered by the prices tendered for "Accommodation of traffic and maintenance of bypasses".

The cost of the repair of damage caused to bypasses due to the inability of temporary culverts installed in accordance with the Engineer's instructions, to cope with floods will be paid for at applicable rates or where no such rates exist, in accordance with the provisions of the clause in the General Conditions of Contract dealing with the determination of new rates.

8.1.5 Blading of bypasses

Except as specified in 8.1.3, blading of surfaces of bypasses, the application of gravel and water and repairs to bituminous surfacing will be measured and paid for separately, but the cost of all other maintenance shall be covered by the price tendered for "Accommodation of traffic and maintenance of bypasses".

8.2 Rates of application

The nominal rate of application of a spray grade emulsion shall be 1,2 ℓ/m^2 and that for MC-3000 cutback bitumen shall be 0,9 ℓ/m^2 . The nominal spread rate of the 6,7 mm aggregate shall be 180 m^2/m^3 .

8.3 Billed items**8.3.1 Accommodation of traffic and maintenance of bypasses**

Unit: kilometre (km)

Measurement of accommodation of traffic and maintenance of bypasses will be the kilometre, measured along the centreline of the road to be constructed, where public traffic has to be accommodated by means of temporary bypasses, existing roads used as bypasses or construction in half widths. Sections along which the traffic is diverted onto existing roads and where the Contractor is not responsible for the maintenance of such existing roads will not be measured.

The tendered rate for the accommodation of traffic and maintenance of bypasses shall cover the cost of all general obligations and incidental items necessary for the accommodation of traffic and construction and maintenance of bypasses, including existing roads used as bypasses, during the construction period where such items of cost are not specifically covered by the other items provided under this Specification. It shall also include for the cost of the provision of flagmen, and where necessary, communications equipment required to regulate traffic, for the provision and maintenance of temporary drainage, arranging for the moving of services, attending to traffic problems, complying with the requirements of the relevant authorities and for providing temporary access to private property.

Payment will be made in two equal instalments in respect of each section. The first instalment will be made when suitable bypasses have been approved for use or when traffic is taken over half width construction. The second instalment will be made when the traffic can be accommodated on the new road, all bypasses have been obliterated and all general obligations of the Contractor have been complied with, all to the satisfaction of the Engineer.

8.3.2 Existing roads used as bypasses

Unit: Provisional Sum

Except where the exact nature of the work can be determined beforehand and provision has been made in the Specification Data or Pricing Instructions and the Bill for suitable rates to be tendered, a Provisional Sum will be allowed to cover the cost of work ordered by the Engineer in terms of Clause 4.3.3 of Specification AM. This sum will be expended in accordance with the provisions of Clause 45 of General Conditions of Contract 2004.

8.3.3 Accommodation of traffic where the road is constructed in half-widths

Unit: kilometre (km)

Measurement of accommodation of traffic where the road is constructed in half widths will be by the kilometre measured along the centreline of road over which the road is constructed in half widths on the written instructions of the Engineer.

The tendered rate shall cover the cost of the supply of all plant, equipment, tools, transport, labour, supervision, flagmen, guards, signs, lights, barriers and all other incidentals necessary for the proper and safe handling of traffic as specified and shall include for the cost of all additional work resulting from constructing the road in half widths.

8.3.4 Earthworks for bypasses

8.3.4.1 Shaping of bypasses

Unit:kilometre (km)

Measurement of shaping of bypasses will be by the kilometre of bypasses shaped, compacted and constructed in accordance with the provisions of Clause 4.3.2 of Specification AM. Where the Contractor has to provide access roads to private property the length of such access roads outside the road reserve will be included in the quantity measured.

The tendered rate shall cover the cost of clearing and grubbing where necessary, the removal of small trees and stumps, for shaping and grading, watering, mixing and compacting the material and for all cuts and fills constructed from material obtained from alongside the bypasses or side cut, but including only such portions of the fills which are less than 0,5 m in height.

8.3.4.2 Cut and borrow to fill

Unit:cubic metre (m³)

Measurement of cut and borrow to fill will be by the cubic metre of fill measured in situ from levelled cross sections taken before and after construction where such material is either imported from a source more than 100 m from point of use or is utilised in a portion of a fill which is more than 0,5 m above the original ground level.

Where measurements by cross sections is impractical the volume will be measured by taking 70% of the loose volume measured in the hauling vehicles, in the case of soil and gravel material, and 50% of the loose volume in the hauling vehicles, in the case of hard material consisting predominantly of particles 100 mm and more maximum dimension.

The rate tendered shall cover the cost of procuring, furnishing and placing all classes of material, including transportation within freehaul distance.

8.3.4.3 Cut to spoil

Unit:cubic metre (m³)

Measurement of cut to spoil will be by the cubic metre of authorised excavation taken from cut in bypasses or removed from fill in redundant bypasses and carted to spoil on the instructions of the Engineer, all measured in situ before excavation by means of levelled cross sections.

The tendered rates shall cover the cost of excavating in all materials, loading, transporting within freehaul distance, offloading, shaping and levelling the spoil material.

8.3.5 Gravel wearing course to bypasses

Unit:cubic metre (m³)

Measurement of gravel wearing course to bypasses will be by the cubic metre of gravel provided as wearing course for the surfacing of bypasses computed from the dimensions of the layer as actually constructed in place, in accordance with the Engineer's instructions.

Where measurement by the above method is not considered practicable by the Engineer, the volume may be computed by taking 70% of the loose volume of the gravel as measured in the hauling vehicles.

The tendered rates shall cover the cost of procuring, furnishing, transportation within a freehaul distance and placing the gravel wearing course.

8.3.6 Bituminous surface treatment of bypasses

Unit:square metre (m²)

Measurement of bituminous surface treatment of bypasses will be by the square metre of completed bitumen-surfaced area. Where any other type, other than the standard surfacing specified in Clause 4.3.8.3 of Specification AM is ordered, measurement will be made as provided in the relevant specification or as provided for in the Specification Data.

The tendered rate shall cover the cost of procuring, furnishing, transporting regardless of distance, and placing all materials and completing the surfacing as specified.

8.3.7 Overhaul

- a) Limited overhaul Unit:cubic metre (m³)
b) Long overhaul Unit:cubic metre.kilometre (m³.km)

The measurement and payment provisions of Subclause 8.3.6 of SANS 1200 D shall apply to the haul of subgrade and gravel wearing course for bypasses.

8.3.8 Temporary culverts

8.3.8.1 Supply and lay temporary prefabricated culverts complete

(State type, size and class of bedding)

Unit: metre (m)

The tendered rate shall cover the cost of procuring and furnishing new culverts, excavation, bedding, laying and backfilling and the eventual removal of the culverts including excavation, loading, transporting off Site and reinstating of surfaces.

8.3.8.2 Re-use of prefabricated culverts complete

(State type, size and class of bedding)

Unit: metre (m)

The tendered rate shall cover the cost of taking up of the culverts in the positions originally installed in bypasses and installing the culverts in a new position, including all excavation, backfilling and bedding, the loading, offloading, transporting of the culverts, the eventual removal of the culverts, including excavation, loading, transporting, offloading and stacking at a suitable site, and the reinstatement of surfaces.

8.3.9 Temporary fencing, gates and grid gates

8.3.9.1 Temporary fencing

Unit:kilometre (km)

The tendered rate shall cover the cost of procuring, furnishing and erecting fencing and subsequently dismantling and removing it from site.

8.3.9.2 Temporary gates

Unit:number (No)

The tendered rate shall cover the cost of procuring, furnishing and erecting gates and subsequently removing them from site.

8.3.9.3 Temporary grid gates

Unit:number (No)

The tendered rate shall cover the cost of erecting the grid gates in accordance with the drawings and, if required, demolishing and removing the grid gates.

8.3.10 Supply, first use and final removal of barricades, traffic signs and flashing lights

- a) Barricades
Unit:number (No)
- b) Traffic signs
Unit:number (No)
- c) Traffic signs
Unit:square metre (m²)
- d) Flashing lights
Unit:number (No)

Measurement will be the number of each of the above items actually provided in accordance with the Engineer's instructions and the Specifications. Separate items will be scheduled, as applicable, for delineators, barricades, and for TR, TW, DTG and TG series road signs. DTG and TG series signs will be scheduled according to sign area.

Separate items will be scheduled for signs mounted in the ground and those mounted on stands.

The tendered rates shall cover the cost of procuring, furnishing, erection, first use, all maintenance and later removal of these items when no longer required. 75% of the tendered rate will be paid when these items are installed and the remaining 25% when they are no longer required and have been removed. The rates tendered for traffic signs shall include for the cost of supply, erection and subsequent dismantling and removal of any supports or supporting framework.

8.3.11 Re-use of barricades, traffic signs and flashing lights

- a) Barricades
Unit:number (No)
- b) Traffic signs
Unit:number (No)
- c) Traffic signs
Unit:square metre (m²)
- d) Flashing lights
Unit:number (No)

Measurement will be by the number of times each item is re-used, excluding its use as originally installed. Measurement will only be made where barricades and signs have to be taken down and re-erected and when drums have to be moved to an entirely different location.

Separate items will be scheduled, as applicable, for delineators, barricades, and for TR, TW, DTG and TG series road signs. DTG and TG series signs will be scheduled according to sign area.

Separate items will be scheduled for signs mounted in the ground and those mounted on stands.

Measurement for the moving of drums will be made only where the drums cannot be efficiently moved without having to be emptied, loaded, transported, off-loaded and re-ballasted.

The tendered rates shall cover the cost of taking down, transporting, offloading and re-erection, in the case of barricades and traffic signs, including any supporting framework, and for emptying, loading, transporting, offloading, repositioning and reballasting, in the case of drums.

- 8.3.12 Operate flashing lights**
Unit: 100 hours

Measurement will be by the number of 100 hours the flashing lights operate.

The tendered rate shall cover the cost of supplying the lamps and adequate electrical power, and for operating and maintaining the lights to the satisfaction of the Engineer.

- 8.3.13 Traffic lights**
Unit: Provisional Sum

The Provisional Sum allowed to cover the cost of providing traffic lights shall be expended in accordance with the provisions of Clause 45 of the General Conditions of Contract 2004.

- 8.3.14 Watering of bypasses**
Unit: kilolitre (kl)

Measurement of watering of bypasses will be by the kilolitre of water applied to the bypasses on written instructions of the Engineer. Water required for the construction of bypasses will not be measured for payment.

The tendered rate shall cover the cost of the supply, transport and application of the water. Overhaul shall not apply to the transportation of water used for the watering of bypasses.

- 8.3.15 Blading of bypasses by motor grader**
Unit: kilometre.pass (km.pass)

Measurement for the use of a motor grader to blade the surface of bypasses will be by the kilometre.pass, that is, each kilometre of full width bypass of which the whole surface has been bladed by one pass of the motor grader. In the case of bypasses constructed as two separate one-way roads, they will be considered as one full width bypass for purposes of measurement.

Only the number of kilometre.passes actually authorised by the Engineer in writing will be measured.

Where the blading and grading of bypasses have not been carried out satisfactorily and the surface has not been improved as much as can reasonably be expected from such an operation, the Contractor shall carry out further grader work at his own expense until a satisfactory result is obtained.

The tendered rate shall cover the cost of the provision of the motor graders and operators, flagmen, guards, barriers, signs and all other costs incidental thereto and for the blading of the bypasses to a smooth surface free of corrugations.

- 8.3.16 Maintenance of surfacing and pavement of temporary bitumen surfaced roads and existing bitumen surfaced roads used as bypasses**
Unit: Provisional Sum

The Provisional Sum allowed to cover the cost of work ordered by the Engineer in terms of Clause 4.3.1 of Specification AM for repairing and maintaining the bituminous surfacing and pavement of existing and temporary bitumen-surfaced roads used as bypasses, will be expended in accordance with the provisions of Clause 45 of the General Conditions of Contract 2004.

8.3.17 Obliteration of bypasses no longer required

Unit: kilometre (km)

The tendered rate shall cover the cost of levelling, scarifying and tidying old roads and bypasses as specified in Clause 4.3.14 of Specification AM.

The construction of any subsequent banks, dykes or ditches will be measured and paid for under SANS 1200 DM.

8.3.18 Reuse of barricades, traffic signs, drums and flashing lights

Unit: month

Notwithstanding Item 8.3.11 reuse of barricades, traffic signs, drums and flashing lights will be measured by the month, separately for each item as billed.

The tendered rates shall cover the cost of taking down, transporting, offloading and re-erection, in the case of barricades, traffic signs, and flashing lights and for emptying, loading, transporting, offloading, repositioning and reballasting, in the case of drums. The rates shall cover the cost of performing these operations as many times as necessary throughout the month.

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APPENDIX A : APPLICABLE STANDARDS

Reference is made to the latest issues of the following standards:

SANS 1555	Road-works Delineators
SADC	Road Traffic Signs Manual ¹
	Chapter 13: Roadworks Signing ¹
Specification WB	Fencing.

¹ Published by the Department of Transport, Pretoria

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SPECIFICATION AO : OCCUPATIONAL HEALTH AND SAFETY

1. SCOPE

This Specification covers the health and safety aspects required of, and that shall be implemented during the construction and/or demolition work and/or plant installation specified in the Specification Data and standard specifications, shown on the drawings and/or billed in the Bill of Quantities. It covers temporary and permanent work.

This Specification does not replace, take precedence over nor detract from the Occupational Health and Safety Act or its Construction Regulations 2003. Nothing in this Specification shall relieve the Contractor of any obligations or responsibilities with regard to health and safety conditions and practices on site.

Interpretations and variations of this Specification are set out in the Specification Data.

2. NORMATIVE REFERENCES

2.1 Supporting specifications

Where this Specification is required for a project, the following specifications and/or documents shall, inter alia, form part of the Contract Document:

- a) Specification Data;
- b) SANS 1200 A or Specification T/AT as applicable;
- c) Occupational Health and Safety Act (Act No. 85 of 1993);
- d) Construction Regulations, 2003, and
- e) in addition to the above, one or more of the following specifications may be required:
 - i) SANS 1200 D;
 - ii) SANS 1200 DM;
 - iii) SANS 1200 DB.¹

3. DEFINITIONS AND ABBREVIATIONS

For the purpose of this Specification the definitions and abbreviations given in the applicable of the specifications listed in 2.1, the definitions given in the Construction Regulations and the following definitions and abbreviations shall apply:

OHS	:	Occupational Health and Safety.
Construction Regulations	:	Construction Regulations, 2003 of the OHS Act (Act No. 85 of 1993).

4. REQUIREMENTS

4.1. Materials

4.1.1 Hazardous substances

4.1.1.1 General

The following commonly used construction materials and substances potentially pose health and safety hazards:

- Substances in pressurized containers,
- Certain cleaning substances,
- Bitumen and tar products,
- Epoxies,
- Petroleum and petroleum products,
- Cement,

¹ See Appendix A
Civ Ver 2.1 04/10

- Lime and other stabilizing agents
- Timber preservatives
- Paints,
- Asbestos products.

Particular materials and substances to be used are specified in the Specifications and/or shown on the Drawings and others may be identified in the Specification Data.

Notwithstanding any requirements regarding specific materials, the Contractor shall take appropriate measures to manage the risks associated with the use of the applicable of the above materials, those listed in the Specification Data and all other hazardous materials required to complete the Works. He shall obtain Material Data Safety Sheets from the supplier of any hazardous substance and take particular notice of, and adhere to any precautionary instructions provided by the manufacturer or supplier regarding the storage, transport, handling, use and disposal of its materials and substances.

The Material Data Safety Sheets shall be available on site.

4.2 Plant

4.2.1 General obligations

In addition to Subclauses 4.1 of SANS 1200 A and 4.3 of SANS 1200 D and/or Subclause 4.1 of Specification T/AT, as applicable, all construction plant, tools and systems shall be in a safe working condition and shall be adequately maintained.

Plant shall be operated with due regard for the safety of those in its proximity.

All operators shall be physically and psychologically fit to operate their respective vehicles, mobile plant and cranes and to operate in their respective environments. They shall be in possession of a medical certificate of fitness.

4.2.2 Protective clothing and equipment

Where appropriate, employees and visitors shall be provided free with the necessary and recommended protective clothing and equipment.

4.2.3 Construction vehicles and mobile plant

(see also Section 21 of the Construction Regulations)

Construction vehicles and mobile plant shall be equipped with an electrically operated acoustic signalling device and a reversing alarm.

A competent person shall be appointed to inspect, on a daily basis, prior to use, construction vehicles and mobile plant and shall record the findings of such inspections in a register.

The Contractor shall ensure that:

- a) no person rides on any construction vehicle or mobile plant other than in a safe place provided thereon for that purpose;
- b) operators and drivers follow demarcated routes and contain their operations within demarcated operating areas.

4.2.4 Formwork and support work

(see also Section 10 of the Construction Regulations)

A competent person shall be appointed in writing to the duty of supervising all formwork and support work operations. All formwork and support work structures shall be adequately designed, erected, supported, braced and maintained so as to support the loads they are to carry.

Formwork and support work equipment shall be examined and checked before use by the aforesaid competent person.

4.2.5 Scaffolding

(see also Section 14 of the Construction Regulations)

A competent person shall be appointed in writing to supervise all scaffolding operations.

All scaffold erectors, team leaders and inspectors shall be competent to carry out their respective tasks and work.

4.2.6 Radioactive sources

The use, care and storage of radioactive materials such as in nucleonic density testing machines shall conform to the requirements of the Hazardous Substances Act No. 15 of 1973 and its regulations. Such devices, except while being actively used by the operator, shall be safely secured.

4.2.7 Other items of plant

Plant not specifically referred to above shall be inspected, operated and maintained in a manner that assures the health and safety of all persons on the site. In particular, the requirements of the Construction Regulations shall be complied with in regard to:

- a) Boatswain's chairs: Section 16
- b) Material hoists: Section 17
- c) Batch plants: Section 18
- d) Explosive powered tools: Section 19
- e) Cranes: Section 20

4.3 Methods and procedures

4.3.1 Method statements

The Contractor shall submit with his health and safety plan, method statements detailing the storage, transport, handling, use and disposal of each hazardous substance to be used or brought on to site, including copies of the Material Data Safety Sheets referred to in 4.1.1.1 above.

The methods set out in these statements shall be implemented on site.

Such method statements shall be available on site.

4.3.2 Storage, stacking and use

4.3.2.1 General

In addition to Subclause 4.2 of SANS 1200 A and/or Subclause 3.8 of Specification T/AT, as applicable, a competent person shall be appointed in writing with the duty of supervising all storage and stacking operations. (See also Section 26 of the Construction Regulations).

Hazardous chemical substance, as defined in the Regulations for Hazardous Chemical Substances, used during construction shall be stored in secondary containers.

Flammable liquids shall be stored, used, and/or applied in a manner that would not cause a fire or explosion hazard. The Contractor shall ensure that in the vicinity of such materials:

- a) no person smokes,
- b) there is no open flame, and
- c) there is nothing that could cause an open spark. (See also Section 23 of the Construction Regulations).

The area in which materials that give off hazardous fumes are stored and/or used shall be effectively ventilated and every employee involved shall be provided with a suitable respirator, mask or breathing apparatus.

4.3.2.2 Explosives

Explosives shall be transported, stored and handled in accordance with the Explosives Regulations. (See also Subclause 5.1.1.3 of SANS 1200 D, if applicable.)

4.3.2.3 Fuels and oils

The Contractor shall demarcate bulk fuel storage and refuelling areas and provide adequate security and control.

4.3.3 Signs

The Contractor shall display warning signs, in English, Afrikaans and the dominant language of the region, as well as any other relevant language used by the workforce, indicating the presence of any hazardous substance and at all storage areas.

4.3.4 Description of the Works

The Works and, if necessary, the temporary work required to construct the Works are described in the Specification Data and/or shown on the Drawings.

4.3.5 Existing conditions

The conditions existing on site are described in the Specification Data and/or shown on the Drawings.

4.3.6 Design information

Design information provided for safety planning purposes, such as design loads for structures, foundation conditions etc, is provided on the Drawings or in the Specification Data.

4.3.7 General obligations

In addition to Subclause 5.7 of SANS 1200 A and/or Subclauses 3.2 and 5.5.1 of Specification T/AT, as applicable. Safety Act (Act No. 85 of 1993) (OHS Act) and in particular with its Construction Regulations, 2003.

All the work included in this Contract shall, for the purpose of complying with the OHS Act and the Construction Regulations, be deemed to be "construction work".

In complying with the OHS Act and its Construction Regulations, the Contractor shall consider all aspects of the Works, necessary temporary work, such as traffic accommodation, and conditions existing on site, such as utility services, ground and foundation conditions, surrounding land use, pedestrian and vehicular traffic and anticipated weather conditions, and take into account the construction methods and materials to be used.

The Contractor shall take full responsibility for the prevention of unhealthy or unsafe working conditions and practices and for the promotion of a healthy and safe site and healthy and safe working practices on site.

The Contractor shall be responsible for the health and safety aspects of his subcontractors and shall have the responsibilities and carry out the duties towards his subcontractors that the Employer has towards the Contractor.

With a few exceptions, the Standard Specifications and the Specification Data are "end result specifications" and not "method specifications". As the methods of construction to be used are generally determined by the Contractor, detailed safety requirements applicable to all the operations to be carried out on Site are not provided in these documents. The Contractor shall apply all relevant safety regulations and requirements to the work methods he chooses and materials to be used.

The failure or refusal of the Contractor to comply with safety requirements or to take the necessary precautions for the health and safety of its employees and others on site as required by statutory authorities or as ordered by the Engineer, shall be sufficient cause for the reduction of payment of the relevant billed item and/or the suspension of payments under this Contract and/or for the Engineer to order a temporary halt of work within the affected areas until the specified or ordered requirement have been complied with to the satisfaction of the Engineer. No extension of time will be granted and any costs associated with such halt in construction or the provision of required or necessary precautions ordered by the Engineer shall be to the Contractor's expense.

4.3.8 Risk assessment

Before the commencement of any construction work and where necessary during construction work, the Contractor shall cause a risk assessment to be performed by a competent person appointed in writing. The risk assessment shall at least:

- a) identify, analyse and evaluate the risks and hazards to which persons may be exposed;
- b) include a plan of safe working procedures;
- c) include a plan for monitoring and review of the implementation of such working procedures and their effectiveness to mitigate, reduce or control the risks and hazards identified and observed during construction; and
- d) determine the need and frequency, if any, of instruction and training of employees during construction.

As far as is reasonably practicable, ergonomic-related hazards shall be addressed in the risk assessment.

The Contractor's risk assessment shall be readily accessible to all persons on the Site at all times.

4.3.9 Health and safety plan

Without limiting his obligations and liabilities in terms of the Construction Regulations, 2003 of the OHS Act, the Contractor, in his health and safety plan to be submitted in terms of the Contract Data, shall inter alia deal with the safety provisions he will set up in respect of the aspects specified below.

After performing the risk assessment, the Contractor shall prepare the health and safety plan for approval by the Employer. The health and safety plan shall include, but not be limited to, the following:

The health and safety management structure including the names of all designated persons such as the Site Agent, the Construction (Health and) Safety Officer and all other specifically appointed persons, listing their knowledge, training experience and qualifications in the work for which they are appointed.

Health and safety method statements and procedures to be adopted to mitigate, reduce or control the risks and hazards that have been identified in the risk assessment and in the Specification Data and to ensure compliance with the OHS Act. Aspects to be dealt with shall include, if applicable:

- Control of the movement of construction vehicles;
- The storage, transport, stacking use and disposal of materials (in particular explosives, flammable liquids and materials that give off hazardous fumes);
- The use of tools, vehicles and plant;
- Public vehicular and pedestrian traffic accommodation measures;
- Security, access control and the exclusion of unauthorised persons;
- Temporary support structures;
- Dealing with working at height, including fall protection;
- Excavation work including potential collapse and slipping of excavated faces;
- Demolition work;
- Workshop activities, manufacture and maintenance work.
- The formation and operation of a health and safety committee on site;
- Medical fitness assessment of drivers and operators;
- Medical facilities and arrangements on site;
- Fire and emergency procedures;
- Commissioning and testing procedures;
- Induction and training of persons on and visiting the site;
- The provision and use of temporary services;
- Compliance with wayleaves, permissions and permits;
- Safety equipment, devices and clothing to be employed;
- General housekeeping, site organisation and layouts to enhance safety;
- Other specific aspects of work such as electrical installations and machinery, tunnelling, structures and working in water environments;
- Emergency procedures (including fire precautions);
- Procedures for reporting incidents, including standard forms for this purpose;
- Provision of welfare facilities;
- The programme and format of inspections;
- Arrangements for monitoring, control and auditing to ensure compliance with the health and safety plan;
- Procedures for addressing non-compliance and remedial measures;
- A periodic review of the health and safety plan.

The Contractor shall discuss the health and safety plan with the Employer or his/her appointed Agent with respect to health and safety matters or the Engineer and amend it as necessary in order to achieve approval.

The approved health and safety plan shall be implemented and maintained on the site for the duration of construction, and shall be readily accessible to all persons at all times.

4.3.10 Site establishment and management

4.3.10.1 Construction Safety Officer and other appointments

The Contractor shall appoint a competent employee in writing as his full-time or part-time Construction (Health and) Safety Officer to assist in the control of all safety related aspects on the site. Where practicable, the Construction (Health and) Safety Officer shall give input into the health and safety plan. Any such input shall be recorded in the health and safety file. The Construction (Health and) Safety Officer shall carry out regular and random checks of all parts of the site where work is taking place.

The Contractor shall appoint such other competent persons to specific roles as required elsewhere in this Specification and/or the Construction Regulations.

4.3.10.2 Safety of the general public

The Contractor shall be responsible for the safe and easy passage of public traffic past and/or over sections of roads and the site of which he has occupation. The Contractor shall take the necessary care at all times in all his operations and use of his equipment to protect the public and to facilitate the flow of pedestrian and vehicular traffic.

4.3.10.3 Barricading etc

Openings and edges where there is a risk of a person falling through or off shall be adequately guarded, fenced or barricaded. (See also Subclause 5.1.1.1 of SANS 1200 D, if applicable.)

Excavations where the safety of persons may be endangered shall be adequately barricaded or fenced and shall be illuminated at night.

4.3.10.4 Signage

Routes followed by site vehicles and plant and operating areas shall be adequately signposted and demarcated.

Notices shall be conspicuously placed at all openings and edges where there is a risk of a person falling through or off same.

Warning signs shall be placed alongside exposed excavations and in which persons are working.

4.3.10.5 Access to the site

The Contractor shall ensure that access to the site is controlled and that all visitors to the site undergo health and safety induction pertaining to the hazards prevalent on the site and are provided with the necessary protective clothing and equipment.

4.3.10.6 Wayleaves, permissions and permits

The Contractor shall abide by the health and safety conditions imposed by any wayleaves, permissions or permits.

4.3.10.7 Reporting of infringements, improvements and incidents

The Contractor shall establish a procedure for the reporting of health and safety infringements and suggested improvements to the Construction (Health and) Safety Officer who shall record all such infringements and suggested improvements.

All incidents shall be reported strictly in accordance with the requirements of Section 24 of the OHS Act and the General Conditions of Contract.

4.3.10.8 Works committee

The Contractor shall establish a health and safety works committee on site. The committee shall comprise:

- a) Construction (Health and) Safety Officer;
- b) representatives of the contractor's supervisory staff;
- c) representatives of the various categories of the Contractor's workforce elected by the workforce.

A member of the Engineer's staff, nominated by the Engineer shall be notified of meetings and shall be free to attend.

The Contractor shall ensure that no loss of pay or benefits apply to any employee elected to the committee.

The functions of the health and safety works committee shall be to, inter alia:

- a) review, consider and report on any health and safety aspect on site, including health and safety procedures and method statements with the purpose of monitoring their effectiveness or shortcomings and to recommend changes where considered necessary;
- b) carry out regular inspections, review results and make recommendations where necessary;
- c) investigate unsafe practices.

The committee shall meet at regular intervals not exceeding one month. Minutes of the meetings shall be kept by the Contractor and copied to the Engineer within 10 days of each meeting.

4.3.10.9 Outbreak of illness

In the event of any outbreak of illness of a highly contagious or epidemic nature, the Contractor shall comply with and carry out such regulations, orders and requirements as may be made by the relevant authorities.

4.3.10.10 First aid

The Contractor shall ensure that the necessary first aid facilities and emergency evacuation equipment is available on Site whenever persons are working on site.

Each foreman or work crew member shall be trained in first aid and shall possess a valid certificate to that effect issued by the Red Cross Society of SA, St Johns Ambulance or equivalent, within 3 months of their appointment.

4.3.10.11 Lighting and power circuits

All lighting and power circuits shall be fitted with earth leakage systems. Such systems shall be tested monthly and any circuit where the earth leakage system is malfunctioning shall be repaired immediately or removed and replaced with a satisfactory unit.

4.3.10.12 Lightning protection equipment

In areas where lightning is considered a hazard, the Contractor shall take precautions by the use of lightning protection equipment and earthing mats, all of which shall be properly designed and installed. Metalwork and conductors shall be properly earthed.

No charging or blasting shall take place if lightning is forecast as being imminent. All charged areas shall be evacuated.

4.3.11 Training

All employees shall be trained in the tasks they are to perform and in use of the tools they are required to use.

All operators shall be trained in the use and operation of the plant they are required to operate.

Before any work commences and thereafter at such times as may be determined in the risk assessment, the Contractor shall ensure that all his employees on site are informed, instructed and trained by a competent person regarding the risks and hazards identified in the risk assessment and their related and other work procedures.

Every employee shall carry proof of his or her health and safety induction training.

Employees required to erect, move or dismantle formwork and support work shall have been adequately trained.

4.3.12 Notification of construction work

Before carrying out any work the Contractor shall issue any applicable notification in terms of Section 3(1) of the Construction Regulations, i.e.:

- Working at a height of greater than 3 m,
- Use of explosives,
- Excavating deeper than 1 m,
- For contracts longer than 30 days or involving more than 300 person days.

4.3.13 Health and safety documentation

The Contractor shall provide and maintain on site a health and safety file. The health and safety file shall be made available upon request. The health and safety file shall contain a copy of:

- The completed notification form, if applicable, in terms of 4.2.4.9 above,
- the risk assessment in terms of 4.2.4.5 above,
- the approved health and safety plan prepared in terms of 4.2.4.6 above (including that of any subcontractors),
- a record of all drawings, designs and materials used etc.

On completion of construction the file shall be handed over to the Employer.

Where applicable, the Contractor shall maintain on site:

- a record of any input to the health and safety plan by the Construction (Health and) Safety Officer,
- a comprehensive and updated list of all subcontractors on site including a copy of their agreements and the type of work being done,
- a register of the issuing and receipt of unspent and spent cartridges,
- a register of inspection of construction vehicles and mobile plant,
- a register of excavation and shoring inspections,
- records of fitness for and training of employees working at elevated positions,
- records of structure inspections by the designer,
- a register of formwork and support work inspections,
- findings of daily inspections of construction vehicles and mobile plant,
- a register of inspections of all temporary electrical installations and machinery,
- minutes of health and safety committee meetings.

4.3.14 Specific aspects of construction

Where applicable, the aspects in the following clauses shall be specifically addressed.

4.3.14.1 Fall protection

(see also Section 8 of the Construction Regulations)

For work where there is a fall risk, the Contractor shall:

- a) designate a competent person responsible for the preparation of a fall protection plan as part of the health and safety plan,
- b) employ on work at elevated positions only those who have been evaluated and shown to be physically and psychologically fit for such work,
- c) erect suitable fall prevention and, if necessary, fall arrest equipment.

4.3.14.2 Structures

(see also Section 9 of the Construction Regulations)

The Contractor shall take all reasonably practical steps to prevent the uncontrolled collapse of any new and existing structure, or part thereof, that may be temporarily weak or unstable due to construction work being carried out.

No structure shall be loaded in a manner that would render it unsafe.

4.3.14.3 Excavation work

(see also Section 11 of the Construction Regulations)

Without limiting his responsibility for the safety of his workers in any excavation, the Contractor shall ensure the safety of his workers in trenches and excavations deeper than 1,0 m in terms of the provisions of the OHS Act. The Contractor may choose to batter excavations to a safe slope if sufficient space is available, or adequately shore the excavations.

A competent person shall be appointed in writing to supervise the carrying out of all excavation work.

Before excavation work begins, the Contractor shall evaluate as far as is reasonably practicable, the stability of the ground.

The Contractor shall not permit or require any person to work in an excavation that has not been adequately shored or braced or the sides of which are not sloped to at least the maximum angle of repose.

Should the Contractor consider that an excavation is in stable material and consequently no shoring is required for that excavation, he shall provide to the Engineer, in terms of Sub-regulation 11(3)(b)(ii)(a) a written statement to that effect signed by the competent person appointed in terms of Sub-regulation 11(1).

Where the stability of an adjoining building, structure or road is likely to be affected by an excavation, the Contractor shall ensure that steps are taken to ensure the safety of the building, structure or road.

Every excavation, including all shoring and bracing, shall be inspected by the above competent person:

- a) daily, prior to each shift,
- b) after every blasting operation,
- c) after an unexpected fall of ground,
- d) after substantial damage to supports, and
- e) after rain.

The results of such inspections shall be recorded in a register.

A person who is competent in the use of explosives for excavation work, shall be appointed to develop a method statement in accordance with the applicable explosives legislation.

4.3.14.4 Demolition work

(see also Section 12 of the Construction Regulations)

A competent person shall be appointed in writing to supervise and control all demolition work.

Prior to any demolition work being carried out a detailed structural engineering survey of the structure to be demolished shall be carried out and the method of demolition shall be ascertained therefrom.

4.3.14.5 Tunnelling
(see Section 13 of the Construction Regulations)

4.3.14.6 Suspended platforms
(see Section 15 of the Construction Regulations)

4.3.14.7 Electrical installations and machinery
(see also Section 22 of the Construction Regulations)

A competent person shall be appointed to and shall inspect and control all temporary electrical installations and machinery.

4.3.14.8 Water environments
(see also Section 24 of the Construction Regulations)

Where construction work is carried out close to or over water, provision shall be made for preventing employees from falling into the water and for rescuing employees in danger of drowning. Employees shall be provided with and shall wear lifejackets.

4.3.14.9 Housekeeping
(see also Section 25 of the Construction Regulations)

4.3.14.10 Fire precautions
(see also Section 27 of the Construction Regulations)

Suitable and sufficient fire-extinguishing equipment shall be placed at strategic locations.

A competent person shall be appointed to and shall inspect at regular intervals, the fire extinguishing equipment.

A sufficient number of employees shall be trained in the use of the fire extinguishing equipment.

Where appropriate signs shall indicate fire escape routes.

4.3.14.11 Welfare provisions
(see also Section 28 of the Construction Regulations)

4.3.14.12 Small diameter shafts and test pits

Work in small diameter shafts and test pits shall comply with the Code of Practice: The Safety of Persons Working in Small Diameter Shafts and Test Pits for Civil Engineering Purposes, available from the South African Institution of Civil Engineers or the South African Association of Engineering Geologists.

4.3.15 Audits by the Employer

The Contractor shall permit the Employer to regularly audit, at an agreed interval, the implementation and maintenance of the approved health and safety plan and shall co-operate and provide all the required documentation, as may be required, in this regard.

As a result of such audits the Employer may order improvements to be made to the health and safety plan.

4.3.16 Variations

Should any variations be ordered or design amendments issued the Engineer will inform the Contractor of all the associated potential hazards to ensure that the health and safety aspects of the work ordered are taken into account.

5. COMPLIANCE WITH REQUIREMENTS**5.1. Testing****5.1.1 Fall protection**

Fall protection equipment shall be tested for adequacy after erection.

5.1.2 Boatswain's chair

Each boatswain's chair shall be performance tested immediately after it has been erected.

5.2. Void**6. Void****7. Void****8. MEASUREMENT AND PAYMENT****8.1 Basic principles****8.1.1 General**

In addition to those aspects covered by 8.2 below, Occupational Health and Safety aspects related to particular items of work will be held to be covered by the tendered sum or rate for that work.

8.2 Billed items**8.2.1 General safety obligations**

Unit:..... Sum

Compliance with the general health and safety obligations will be measured and paid by the sum. This item may be billed as a fixed charge item and a time-related item.

The tendered sum(s) shall cover the cost, not included under the billed work items (see 8.1) nor under items 8.2.2 to 8.2.6 below, of establishing and maintaining, on an on-going basis, the general health safety systems and general compliance with the Act and its construction regulations.

8.2.2 Risk assessment

Unit:..... Sum

Risk assessment will be measured and paid by the sum. This work may be billed as a fixed-charge item only.

The tendered sum shall cover the cost of carrying out a risk assessment required in terms of Clause 4.3.8 of Specification AO at the start of the Contract and any subsequent risk assessment that is proved necessary as the work proceeds, and the inclusion thereof in the health and safety plan.

8.2.3 Health and safety plan

Unit:..... Sum

The health and safety plan will be measured and paid by the sum. This item may be billed as a fixed-charge item and a time-related item.

The tendered sum(s) shall cover the Contractor's cost of the preparation, approval process, maintenance and implementation of an approved health and safety plan required in terms of Clause 4.3.9 of Specification AO.

8.2.4 Construction Safety Officer and other appointments

Unit:..... Sum

The Construction (Health and) Safety Officer and other appointments will be measured and paid by the sum. This item may be billed as a time-related item only.

The tendered sum shall cover the cost of the provision of a Construction (Health and) Safety Officer and such other appointments of competent persons as required on the site in terms of the Act.

8.2.5 Training

Unit:..... Sum

Training, as required by the Construction Regulations will be measured and paid by the sum. Training may be billed as a fixed-charge item only and may, through sub items, distinguish between the various aspects of training.

The tendered sum(s) shall cover the cost of the required training.

8.2.6 Medical assessment of employees

Unit:..... Sum

Medical assessment of employees will be measured and paid by the sum. This work may be billed as a fixed-charge item only.

The tendered sum shall cover the cost of having the Contractor's employees medically assessed with regard to their medical fitness for the work they will be required to perform and/or vehicles or plant they are required to operate and the provision of the appropriate certificate.

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APPENDIX A : APPLICABLE STANDARDS

Reference is made to the latest issues of the following standards:

SANS 1200 A General
SANS 1200 D Earthworks
SANS 1200 DB Earthworks (pipe trenches)
SANS 1200 DM Earthworks (roads, subgrade)

OHS Regulations Construction Regulations 2003.

Specification T/AT General

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SPECIFICATION EMA : ENVIRONMENTAL MANAGEMENT (BASIC)

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SPECIFICATION EMA : ENVIRONMENTAL MANAGEMENT (BASIC)

1. SCOPE

This Specification covers the requirements for controlling the impact of construction activities on the environment. It contains clauses that are generally applicable to the undertaking of civil engineering works in areas where it is necessary to impose pro-active controls on the extent to which the construction activities impact on the environment.

Interpretations and variations of this Specification are set out in the Specification Data.

2. NORMATIVE REFERENCES

2.1 Supporting Specifications

Where this Specification is required for a project the following specifications shall, inter alia, form part of the Contract Document.

- a) Specification Data;
- b) SANS 1200 Series of Standardized Specifications;
 - i) SANS 1200 A or SANS 1200 AA, as applicable;
- c) Specification AO
- d) Construction Regulations, 2003, and
- e) ¹Standards listed in Appendix A..

3. DEFINITIONS

For the purposes of this Specification the definitions and abbreviations given in the applicable specifications listed in 2.1 and the following definitions shall apply:

Environment	:	The surroundings within which humans exist and that are made up of: i) the land, water and atmosphere of the earth; ii) micro-organisms, plant and animal life; iii) any part or combination of i) and ii) and the interrelationships among and between them; and iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.
Potentially hazardous Substance	:	A substance that, in the reasonable opinion of the Engineer, can have a deleterious effect on the environment.
Method Statement	:	A written submission by the Contractor to the Engineer in response to the Specification or a request by the Engineer, setting out the plant, materials, labour and method the Contractor proposes using to carry out an activity, identified by the relevant specification or the Engineer when requesting the Method Statement, in such detail that the Engineer is enabled to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications.

¹ See Appendix A
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The Method Statement shall cover applicable details with regard to:
 construction procedures,
 materials and equipment to be used,
 transportation of equipment/materials to and from site,
 movement of equipment/materials on site,
 storage of materials on site,
 containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur,
 timing and location of activities,
 areas of non-compliance with the Specifications and
 any other information deemed necessary by the Engineer.

- Reasonable** : Unless the context indicates otherwise, reasonable in the opinion of the Engineer after he has consulted with a person, not an employee of the Employer, suitably experienced in "environmental implementation plans" and "environmental management plans" (both as defined in Act No 107,1998).
- Solid waste** : All solid waste, including construction debris, chemical waste, excess cement/ concrete, wrapping materials, timber, tins and cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).
- Contaminated water** : Water contaminated by the Contractor's activities, e.g. concrete water and runoff from plant/ personnel wash areas.

4. REQUIREMENTS

4.1. Materials

4.1.1 Materials handling, use and storage

The Contractor shall ensure that any delivery drivers are informed of all procedures and restrictions (including "no go" areas) required to comply with the Specifications. The Contractor shall ensure that these delivery drivers are supervised during off loading, by someone with an adequate understanding of the requirements of the Specifications.

Materials shall be appropriately secured and covered to ensure safe passage between destinations. The Contractor shall be responsible for any clean-up resulting from the failure by his employees or suppliers to properly secure transported materials.

4.1.2 Hazardous substances

Procedures detailed in the Materials Safety Data Sheets (MSDS) shall be followed in the event of an emergency situation.

Potentially hazardous substances shall be stored, handled and disposed of as prescribed by the Engineer.

4.2 Plant**4.2.1 Ablution facilities**

The Contractor shall ensure that no spillage occurs when the toilets are cleaned or emptied and that the contents are properly stored and removed from Site. Discharge of waste from toilets into the environment and burial of waste is strictly prohibited.

Washing, whether of the person or of personal effects and acts of excretion and urination are strictly prohibited other than at the facilities provided.

4.2.2 Solid waste management

The Contractor shall provide sufficient bins with lids on Site and no on-site burying, dumping or burning of any waste materials, vegetation, litter or refuse shall occur. Bins shall be emptied a minimum of once daily. The waste may be temporarily stored on Site in a central waste area that is weatherproof and scavenger-proof, as approved by the Engineer.

All solid waste shall be disposed of off site at an approved landfill site. The Contractor shall supply the Engineer with a certificate of disposal.

4.2.3 Contaminated water

Contractor shall set up a contaminated water management system, which shall include collection facilities, as well as suitable methods of disposal of contaminated water. The Contractor shall prevent the discharge of water contaminated with any pollutants, into the environment.

The Contractor shall notify the Engineer immediately of any pollution incidents on Site. The Engineer's approval is required prior to the discharge of contaminated water to the Municipal sewer system.

4.2.4 Noise

The Contractor shall limit noise levels (e.g. install and maintain silencers on machinery). The provisions of SANS 1200 A Subclause 4.1 regarding "built-up areas" shall apply to all areas within audible distance of residents whether in urban, peri-urban or rural areas.

Appropriate directional and intensity settings are to be maintained on all hooters and sirens and no amplified music shall be allowed on Site other than in emergency situations.

The Contractor shall restrict any of his operations that may result in undue noise disturbance to the hours of 08:00 to 17:00 on weekdays and Saturdays. Unless otherwise agreed to with the Engineer.

4.2.5 Fuel (petrol and diesel) and oil

Fuel may be stored on site in an area approved by the Engineer. The Contractor shall ensure that all liquid fuels (petrol and diesel) are stored in tanks with lids, which are kept firmly shut or in bowzers. The tanks/ bowzers shall be situated on a smooth impermeable surface (concrete or 250 µm plastic) with an earth bund (plastic must have a 5 cm layer of sand on top to prevent damage and perishing). The impermeable lining shall extend to the crest of the bund and the volume inside the bund shall be 130% of the total capacity of all the storage tanks/ bowzers. Provision shall be made for refuelling at the fuel storage area, by protecting the soil with 250 µm plastic covered with a minimum of a 5 cm layer of sand.

The Contractor shall prevent unauthorised access into the fuel storage area. No smoking shall be allowed within the vicinity of the fuel storage area. The Contractor shall ensure that there is adequate fire-fighting equipment at the fuel stores.

4.2.6 Equipment maintenance and storage

Leaking equipment shall be repaired immediately or removed from the Site. Where practical, maintenance of plant shall not occur on site. Where emergency maintenance is necessary, the Contractor shall ensure that this does not result in contamination of the soil or vegetation.

Drip trays shall be provided in construction areas for stationary and "parked" plant as well as during emergency servicing of vehicles. Drip trays shall be inspected and emptied daily. The contents of drip trays shall be disposed off at an authorised facility. Drip trays shall be closely monitored during rain events to ensure that they do not overflow.

The washing of equipment shall be restricted to urgent or preventative maintenance requirements only. The use of detergents for washing shall be restricted to low phosphate and nitrate containing, low sudsing-type detergents.

4.3 Methods and procedures

4.3.1 Method Statements

Any Method Statement required by this Specification, the Engineer or the Specification Data shall be produced within such reasonable time as is required by this Specification, the Engineer or the Specification Data. The Contractor shall not commence the activity until the Method Statement has been approved. Except in the case of emergency activities, the Contractor shall allow a period of two weeks for approval of the Method Statement by the Engineer. Such approval shall not unreasonably be withheld.

Method Statements in respect of environmental management that shall be provided by the Contractor within 14 days of receipt of the letter of acceptance and prior to the activity covered by the Method Statement being undertaken, include:

- 1) Location and structure of the fuel storage site, including the type and volume of storage container and the design and capacity of the bund.
- 2) Solid waste (refuse) control and removal of waste from the Site, including the number, type and location of rubbish bins, the manner and frequency with which the waste will be removed from site and the disposal site.
- 3) Contaminated water management system, including an indication of the source and volume of contaminated water and how this would be disposed of.
- 4) Emergency procedures for fire, and accidental leaks and spillages of hazardous materials.

4.3.2 Environmental awareness training

Within seven days of the Commencement Date, the Contractor's site staff including foremen and site management staff shall attend an environmental awareness training course, of approximately one-hour duration. The Contractor shall liaise with the Engineer prior to the Commencement Date to fix a date and venue for the course. The Contractor shall provide a suitable venue with facilities as required by the Specification, Data and ensure that the specified employees attend the course.

Any new employees coming on to site after the initial training course and the Contractor's suppliers and subcontractors shall also attend this course. The Contractor shall ensure that all attendees sign an attendance register, and shall provide the Engineer with a copy of the attendance register the day after each course.

4.3.3 Construction personnel information posters

As required by the Specification Data, the Contractor shall erect and maintain information posters for the information of his employees depicting actions to be taken to ensure compliance with aspects of the Specifications. Such posters will be supplied by the Engineer and shall be erected at a location specified by the Engineer.

4.3.4 Site clearance

The Contractor shall ensure that the clearance of vegetation is restricted to that required to facilitate the execution of the Works. Site clearance shall occur in a planned manner, and cleared areas shall be stabilised as soon as possible. The detail of vegetation clearing shall be subject to the Engineer's approval.

Should fauna be encountered during site clearance, earthworks shall cease until such fauna have been safely relocated.

4.3.5 Site division and Site demarcation

The Contractor shall restrict all his activities, materials, equipment and personnel to within the area specified. As required by the Specification Data, the Contractor shall erect and maintain permanent and/ or temporary fences of the type and in the locations directed by the Engineer. Such fences shall, if so specified, be erected before undertaking designated activities.

4.3.6 Access routes/ haul roads

On the Site, and, if so required by the Specification Data, within such distance of the Site as may be stated, the Contractor shall control the movement of all vehicles and plant including that of his suppliers so that they remain on designated routes, are distributed so as not to cause an undue concentration of traffic and that all relevant laws are complied with. In addition such vehicles and plant shall be so routed and operated as to minimise disruption to regular users of the routes not on the Site. On gravel or earth roads on Site and within 500m of the Site, the vehicles of the Contractor and his suppliers shall not exceed a speed of 20km/h.

Mud and sand deposited onto public roads by construction activities shall be cleared on a daily basis.

4.3.7 Cement and concrete batching

Where applicable, the location of the batching plant (including the location of cement stores, sand and aggregate stockpiles) shall be as approved by the Engineer. The concrete/cement batching plant shall be kept neat and clean at all times.

The batching plant shall be located on a smooth impermeable surface (plastic) and shall be bunded and sloped towards a sump to contain spillages of substances.

All wastewater resulting from batching of concrete shall be disposed of via the contaminated water management system and shall not be discharged into the environment.

Empty cement bags shall be stored in temporary weatherproof containers and shall be disposed of on a regular basis via the solid waste management system.

The Contractor shall take all reasonable measures to prevent the spillage of cement/ concrete during batching and construction operations. During pouring, the soil surface shall be protected using plastic and all visible remains of concrete shall be physically removed on completion of the cement/ concrete pour and appropriately disposed of. All spoiled and excess aggregate/ cement/ concrete shall be removed and disposed of via the solid waste management system.

Where "readymix" concrete is used, the Contractor shall ensure that the delivery vehicles do not wash their chutes directly onto the ground. Any spillage resulting from the "readymix" delivery shall be immediately cleared and disposed of via the solid waste management system.

4.3.8 Fire control

No fires may be lit on site. Any fires that occur shall be reported to the Engineer immediately. Smoking shall not be permitted in those areas where it is a fire hazard. In terms of the Atmospheric Pollution Prevention Act (No. 45 of 1965), burning is not permitted as a disposal method.

The Contractor shall ensure that there is basic fire-fighting equipment available on Site at all times. This shall include at least rubber beaters when working in urban open spaces and fynbos areas, and at least one fire extinguisher of the appropriate type when welding or other "hot" activities are undertaken.

4.3.9 Emergency procedures

The Contractor shall ensure that his employees are aware of the procedure to be followed for dealing with spills and leaks, which shall include notifying the Engineer and the relevant authorities. The Contractor shall ensure that the necessary materials and equipment for dealing with spills and leaks is available on Site at all times. Treatment and remediation of the spill areas shall be undertaken to the reasonable satisfaction of the Engineer.

In the event of a hydrocarbon spill, the source of the spillage shall be isolated, and the spillage contained. The area shall be cordoned off and secured. The Contractor shall ensure that there is always a supply of absorbent material readily available to absorb/ breakdown and where possible be designed to encapsulate minor hydrocarbon spillage. The quantity of such materials shall be able to handle a minimum of 200 l of hydrocarbon liquid spill.

4.3.10 Community relations

The Contractor shall record any complaints or queries from the public, as well as the action taken in response, in the site request book. Complaints and associated responses shall be communicated to the Engineer on a weekly basis. The Contractor's contact details shall be posted on the site board to enable the public to telephone should they have any queries or complaints.

4.3.11 Protection of natural features

The Contractor shall not deface, paint, damage or mark any natural features (e.g. rock formations) situated in or around the Site for survey or other purposes unless agreed beforehand with the Engineer. Any features affected by the Contractor in contravention of this clause shall be restored/ rehabilitated to the satisfaction of the Engineer.

The Contractor shall not permit his employees to make use of any natural water sources (e.g. springs, streams, open water bodies) for the purposes of swimming, personal washing and the washing of machinery or clothes.

4.3.12 Protection of flora and fauna

Except to the extent necessary for the carrying out of the Works, flora shall not be removed, damaged or disturbed nor shall any vegetation be planted without authorisation.

Trapping, poisoning and/or shooting of animals is strictly forbidden. No domestic pets or livestock are permitted on Site.

4.3.13 Protection of archaeological and palaeontological remains

The Contractor shall take reasonable precautions to prevent any person from removing or damaging any fossils, coins, articles of value or antiquity and structures and other remains of archaeological interest discovered on the Site, immediately upon discovery thereof and before removal. The Contractor shall inform the Engineer immediately of such a discovery and carry out the Engineer's instructions for dealing therewith. All works within the vicinity of the discovery must cease immediately and the area shall be cordoned off until such time as the Engineer authorises resumption of the works in writing.

4.3.14 Stockpiling

The Engineer will identify suitable sites for stockpiling. Stockpiles shall be convex in shape, shall be no higher than 2 m and shall be located so as to cause minimal disturbance. Where required, appropriate precautions shall be taken to prevent the erosion and limit the compaction of the stockpiles. The Contractor shall ensure that all stockpiles do not cause the damming of water or run off, or is itself washed away.

4.3.15 Dust

The Contractor shall take all reasonable measures to minimise the generation of dust as a result of construction activities to the satisfaction of the Engineer. Appropriate dust suppression measures, e.g. dampening with water, shall be used when dust generation is unavoidable, particularly during prolonged periods of dry weather in summer. Dust suppression measures shall be agreed upon in consultation with the Engineer.

5. COMPLIANCE WITH REQUIREMENTS AND PENALTIES**5.1 Compliance**

Environmental management is concerned not only with the final results of the Contractor's operations to carry out the Works but also with the control of how those operations are carried out. Tolerance with respect to environmental matters applies not only to the finished product but also to the standard of the day-to-day operations required to complete the Works.

It is thus required that the Contractor shall comply with the environmental requirements on an ongoing basis and any failure on his part to do so will entitle the Engineer to certify the imposition of a penalty as detailed below.

5.2 Penalties

Penalties will be issued for certain transgressions. Penalties may be issued per incident at the discretion of the Engineer. Such penalties will be issued in addition to any remedial costs incurred as a result of non-compliance with this Specification. The Engineer will inform the Contractor of the contravention and the amount of the penalty, and shall be entitled to deduct the amount from monies due under the Contract.

Penalties will be as set out in the Specification Data.

6. Void

7. Void

8. MEASUREMENT AND PAYMENT

8.1 Basic principles

8.1.1 General

Except as specified below or in the Specification Data or as billed, no separate measurement and payment will be made to cover the costs of complying with the provisions of this Specification and such costs shall be deemed to be covered by the rates tendered for the items in the Bill of Quantities completed by the Contractor when submitting his tender.

8.1.2 All requirements of the environmental management specification

All work not measured elsewhere, associated with complying with any requirement of the environmental management specification shall be measured as a sum. The tendered rate shall cover any cost associated with complying with the environmental management specification and shall include for all materials, labour and plant required to execute and complete the work as specified, described in the Bill of Quantities or shown on the drawing(s).

8.1.3 Work "required by the Specification Data"

Where a clause in this Specification includes a requirement as "required by the Specification Data", measurement and payment for compliance with that requirement shall be in accordance with the relevant measurement and payment clause of the Specification Data.

8.2 Billed items

8.2.1 Method Statements: Additional work

No separate measurement and payment will be made for the provision of Method Statements but, where the Engineer requires a change on the basis of his opinion that the proposal may result in, or carries a greater than warranted risk of damage to the environment in excess of that warranted by the Specifications, then any additional work required, provided it could not reasonably have been foreseen by an experienced contractor, shall be valued in accordance with the Clause in the General Conditions of Contract dealing with Provisional Sums.

A stated sum is provided in the Bill of Quantities to cover payment for such additional work.

8.2.2**All requirements of the environmental management specification**

Unit: Sum

All other work not measured elsewhere, associated with complying with any requirement of the environmental management specification shall be measured as a sum. The tendered rate shall cover any cost associated with complying with the environmental management specification and shall include for all materials, labour and plant required to execute and complete the work as specified, described in the Bill of Quantities or shown on the drawing(s).

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APPENDIX A : APPLICABLE STANDARDS

Reference is made to the latest issues of the following standards:

SANS 1200 A	General
SANS 1200 AA	General (small works)
Specification AO	Occupational health and safety

Construction Regulations, 2003.

SPECIFICATION LK : VALVE INSTALLATIONS

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SPECIFICATION LK : VALVE INSTALLATIONS

1. SCOPE

This Specification covers valve installations on medium pressure pipelines of bore generally up to 1 000 mm but may also be used for pipelines of greater bore, for transporting and controlling cold water (at a temperature not exceeding 50 °C) or sewage under working pressures as specified but not exceeding 4,0 MPa. It includes for butterfly valves of bore up to 2 000 mm.

Interpretations of and variations to this specification are set out in the Specification Data.

2. NORMATIVE REFERENCES

2.1 Supporting specifications

Where this specification is required for a project, the following specifications shall, inter alia, form part of the Contract Document:

- a) Specification Data;
- b) SANS 1200 Series of Standardized Specifications;
 - i) SANS 1200 A or SANS 1200 AA, as applicable;
 - ii) SANS 1200 L;
- c) Standards listed in Appendix A, and
- d) the following specifications may form part of the Contract:
 - i) SANS 1200 D or SANS 1200 DA, as applicable;
 - ii) SANS 1200 DB;
 - iii) SANS 1200 G or SANS 1200 GA, as applicable;
 - iv) SANS 1200 LB.

3. DEFINITIONS AND ABBREVIATIONS

3.1 Definitions

The definitions set out in the applicable of the specifications listed in 2.1, and the following shall apply:

- | | | |
|---------------------------------|---|--|
| Anti-vacuum air valve | : | A valve that admits large quantities of air at low induction pressure to prevent the formation of vacuum in a flexible wall pipeline when a break occurs or a negative pressure is induced by water hammer. |
| Double orifice air valve | : | A valve that releases and admits air at low pressure during filling or emptying a pipeline, and has a small lever controlled orifice to release air under high pressure. |
| Lot | : | Except where otherwise defined in (and within the limits of the scope of) an SANS or BS specification listed in Appendix A, a lot is not less than one nor more than ten valves of the same size, design and method of operation from one manufacturer submitted at any one time for inspection and testing. |

Reflux valve : A valve that minimizes reflux action and reduces water hammer in rising mains. It may be of one of the following types:

- a) Single sloping swingdoor for valves of nominal bore up to 400 mm;
- b) Double sloping swingdoors for valves of nominal bore greater than 400 mm and up to 800 mm;
- c) Multiple sloping swingdoors for valves of nominal bore greater than 800 mm;
- d) Tilting disc for all valves of nominal bore up to 1 200 mm in rising mains where low hydraulic resistance is a requirement; or
- e) Recoil type for valves of nominal bore up to 600 mm in rising mains in situations where abnormally rapid reversal of flow is likely to occur.

Single large orifice air valve : A valve that admits and releases large volumes of air at low pressure during draining or filling the pipeline.

Single small orifice air valve : A valve that releases small volumes of air under high pressure during operation of a pipeline.

Sleeve-type jet dispersion valve : A valve that controls a scour outlet of a high pressure pipeline.

3.2 Abbreviations

The abbreviations set out in the specifications listed in 2.1 and the following shall apply:

MFB	:	Metropolitan Fire Board
BSP	:	British Standard Pipe Thread
ISO	:	International Standards Organization
ANSI	:	American National Standards Institute
PN	:	Nominal Pressure, i.e maximum permissible gauge working pressure. (Applicable to butterfly valves)

3.3 Explanation of terms

3.3.1 Materials.

In the context of this Specification the term materials covers both the basic materials used in the manufacture and fabrication of a valve, and the valve itself as a finished product that is to be installed and commissioned.

3.3.2 Compliance with standard valve specifications.

Each valve of nominal bore greater, or for use at a working pressure higher than those covered by the applicable details of SANS 191 or SANS 664 or SANS 665 shall, for quality of materials and fabrication workmanship, be deemed to comply generally with the same standards in such a manner that the valve is designed for a life of 40 years and the manufacturer would be prepared to guarantee its satisfactory performance for 5 years, if called upon to do so.

4. REQUIREMENTS**4.1 Materials - The valves****4.1.1 Gate valve or resilient seal valve****4.1.1.1 General**

Except as otherwise specified in 4.1.2 in the case of a valve for the control of sewage, a gate valve or resilient seal valve shall be of the non-rising spindle type, and of the nominal bore, class, gate type, and working pressure scheduled, shall comply with SANS 191 (for a cast steel valve) or SANS 664 (for a waterworks pattern valve) or SANS 665 (for a general purpose type valve), as relevant in terms of Table 1 below, the relevant requirements of 4.1.2 to 4.1.4, and the Specification Data.

Table 1 - Gate valve details

1	2	3	4	5	6
Class	Nominal bore mm	Pressure MPa		Body etc. materials	Quality of valve - applicable specification subject to 3.3.2
		Working	Operating & differential		
10	50 to 600	1,0	As per SD* or schedule, but not exceeding 1,0	Cast iron	SANS 664
				Cast iron	SANS 665
16	50 to 600	1,6	As per SD* or schedule, but not exceeding 1,6	Cast iron	SANS 664
	exceeding 600 up to 1 000			Cast iron	SANS 665
25	50 to 1 000	2,5	As per SD* or schedule, but not exceeding 2,5	Cast iron	SANS 665
	50 to 350			Cast steel	SANS 191
	exceeding 350 up to 1 000			Cast steel	See SD*
40	50 to 350	4,0	As per SD* or schedule, but not exceeding 4,0	Cast iron	SANS 191
	exceeding 350 up to 1 000			Cast steel	See SD*

* Specification Data.

4.1.1.2 End connections

A valve shall be provided with double flanged or double spigoted or double socketed end connections, as billed. Unless otherwise billed, it shall be supplied complete with all jointing material such as insertions, rings, packings, bolts, nuts and washers etc. as necessary for the type of connection billed.

In the case of flanged valves, the flanges of classes 10 and 16 valves and nominal bore up to 600 mm shall conform to SANS 664. The flanges of larger valves of classes 10 and 16 and all valves of classes 25 and 40 shall conform with BS EN 1092 and, except where blank flanges are billed, shall be drilled in accordance with the relevant requirements of SANS 1123. Where the flange size falls beyond the range of BS EN 1092, mating dimensions shall be in accordance with ISO standard TC 5 with thicknesses adequate to withstand closed-end test pressures. Tapped holes are unacceptable. The front face of all flanges shall be fully machined and, in the case of valves of classes 25 and 40 and nominal bore 450 mm and more, the back of each flange shall be spot faced.

Flanged valves shall be supplied complete with bolts, nuts and gaskets for joining up to adjacent mating flanges. Bolts shall be of sufficient length for at least two screw threads to protrude outside nuts when assemblies are fully tightened.

Where a valve of nominal bore up to 450 mm is to be installed in a chamber, unless adequate provision for removal of the valve has been made in the pipe layout for the chamber, one end connection shall be such that a removable type coupling can be fitted, and the coupling shall be provided. In the case of a valve of nominal bore greater than 450 mm the end connections shall comprise one flanged adaptor, one plain ended spacer pipe of length not less than the valve diameter, and one removable type coupling as a separate item.

Where a valve is to be used as a replacement in a pipeline fitted with flanges drilled to BS 10, the appropriate bolt circle diameter, number of bolts, and size of bolt holes shall be as specified in the Specification Data.

4.1.1.3 Manner of operation

- a) Unless otherwise specified in the Specification Data, a valve shall be closed by turning the spindle in a direction that is clockwise when seen from above the spindle.
- b) A valve shall be so designed that it can be opened or closed against whichever is the lower of the billed working pressure or the applicable differential pressure given in column 4 of Table 1, with an effort on a handwheel not exceeding 250 N in the case of valves of bore up to 300 mm, and not exceeding 400 N in the case of larger valves, unless otherwise stated in the bill or required in terms of the Specification Data.
- c) Except where a handwheel is billed, a valve of nominal bore not exceeding 300 mm for a working pressure not exceeding 1,6 MPa, shall be fitted with a cap.
- d) Except as provided for in (f) below, a valve of nominal bore 300 mm or more for use at a working pressure greater than 1,6 MPa but not exceeding 2,5 MPa, shall be fitted with a ball bearing spindle thrust collar, and close machined channel guides and shoes, and machined spur gearing having an advantage of

Nominal bore, mm	Mechanical advantage
300	2:1
375	2,5:1
450 and greater	3:1

- e) Where so billed, a valve of nominal bore exceeding 300 mm shall be fitted with a bypass valve (cast integrally with the body of the main valve or attached, as billed) of bore area 10 % to 15 % of that of the main valve and arranged to operate in the manner set out in the Specification Data.
- f) A valve of nominal bore exceeding 300 mm for use at a working pressure greater than 2,5 MPa but not exceeding 4,0 MPa may, subject to (b) and (d) above, be fitted with a handwheel or shall be fitted with an actuator that complies with 4.1.3.3.2, and is of the type (and uses the pressure supply) specified in the Specification Data.

4.1.1.4 Design**4.1.1.4.1 Lugs**

The lugs on the gate and the spindle of a valve of nominal bore exceeding 300 mm shall be machined.

4.1.1.4.2 Gland packing

A gate valve of nominal bore exceeding 400 mm shall have a gland that is so designed that it can be repacked under working pressure without shutting off the water supply.

4.1.1.4.3 Auxiliary requirements

- a) The design of the valve guides and gate shall be such that pressure may be applied to the gate from either side.
- b) The design of the guides of a valve of nominal bore not exceeding 300 mm shall be such that it can be installed in any position.
- c) Unless otherwise shown on the drawings or billed, the design of the guides for a valve of nominal bore exceeding 300 mm shall be such that the valve can be installed in an upright position.
- d) In addition to complying with (a) and (b) or (c) above, as relevant, a valve shall be provided with such inspection holes, drains, and other auxiliary requirements as are specified in the Specification Data.

4.1.1.4.4 Valve trim

Except where a gun metal/bronze or stainless steel trim (Type B or Type C of SANS 664 or Tables 1(a) or 1(c) of SANS 665, as applicable), is billed, each valve shall have an all iron trim.

4.1.1.4.5 Seat rings

A valve of nominal bore 300 mm and larger shall have seat rings that are pinned in position.

4.1.2 Wedge gate (slide valve) for sewage control

A gate valve for the control of sewage shall be of the wedge gate type, suitable for the working pressure billed, and comply with 3.1 (except as required in terms of (a) to (h) below) and capable of operating in the manner required in terms of the Specification Data:

- a) The valve shall be of flanged type and shall have a rising spindle;
- b) the wedge gate shall be constructed of ANSI 316 stainless steel or as approved;
- c) the spindle shall be constructed of EN 45 B (BS 970) stainless steel or as approved;
- d) the body and traverse seal shall be made of nitrate rubber or as approved;
- e) a resilient body seal shall ensure drop tightness from zero to maximum working pressure in either direction;
- f) the internal body contours shall be such that deposits are flushed out during valve closure;
- g) built-in scrapers that clean the valve blade shall be fitted to both sides of the body; and
- h) the body shall have a straight through passage such that no valve pockets or clean doors are necessary.

4.1.3 Butterfly valve

4.1.3.1 General

A butterfly valve for working pressures not exceeding 2,5 MPa (PN 25) shall comply with the relevant requirements of BS 5155, and 4.1.3.2 to 4.1.3.4, as applicable, and capable of operating in the manner required in terms of the Specification Data. A butterfly valve for working pressures exceeding 2,5 MPa shall be manufactured from the same materials, and be of the same quality as a valve that complies with BS 5155 and 4.1.3.2 to 4.1.3.4, as applicable, shall comply with the requirements of, and capable of operating in the manner required in terms of the Specification Data.

Where a butterfly valve has a preferred flow direction from a control point of view (see 4.1.3.3.1) a suitable arrow shall be cast on the body.

4.1.3.2 End connections

A valve shall be provided with double flanged or wafer end connections, as billed.

The flanges shall conform with BS EN 1092 and, except where blank flanges are billed, shall be drilled in accordance with the relevant requirements of SANS 1123. Flanges shall be thickened at points where tapped holes are necessary. The front face of all flanges shall be fully machined and, in the case of valves of PN ratings greater than 16 and nominal bore greater than 450 mm, the back of each flange shall be spot faced.

Where a valve of nominal bore up to 450 mm is to be installed in a chamber, one end connection shall be such that a removable type coupling can be fitted, and the coupling shall be provided. In the case of a valve of nominal bore greater than 450 mm the end connections shall comprise one flanged adaptor, one plain-ended spacer pipe of length not less than the valve diameter, and one removable type coupling as a separate item.

Where a valve is to be used as a replacement in a pipeline fitted with flanges drilled to BS 10, the appropriate bolt circle diameter, number of bolts, and size of bolt holes shall be as specified in the Specification Data.

4.1.3.3 Manner of operation

4.1.3.3.1 General

Except that where the design and construction details of a valve are such that it has a preferred flow direction (such as the need for the seal retaining ring to be on the downstream side for adjustment), a butterfly valve shall be suitable for flow in either direction, and shall be suitable for use as a regulating valve in that when tested for disc leakage at a pressure equal to the operating pressure (see Column 4 of Table 1), there shall be no sign of leakage or weeping past the gate, and when tested for disc efficiency the leakage rate shall not exceed the appropriate value given for gate efficiency (*mutatis mutandis*), in SANS 665. Also, when operating at maximum velocity, there shall be no gate flutter.

4.1.3.3.2 Actuator operated.

Where a butterfly valve is billed to be operated by an actuator using a designated power source, the actuator shall not be an integral part of the main body but shall be a separate unit bolted to the main body in such a manner that water leaking past the main shaft seal is prevented from entering the actuator.

The actuator shall comply with Section II of AWWA C 504, and shall be capable of withstanding opening and closing torques that are at least 30 % in excess of those necessary under the working conditions and using the source of power specified in the Specification Data.

An actuator shall be supplied complete with handwheel that can be installed horizontally at a height that provides for reasonable operation in the situation shown on the drawings. The handwheel shall comply with the relevant requirements of SANS 664, and, in addition, it shall be fitted with an accurate indicator to show clearly the fully open and closed positions and the $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ intermediate open positions, with acceptably embossed markings.

4.1.3.4 Design

4.1.3.4.1 Main shaft

A butterfly valve of nominal bore not exceeding 450 mm shall be suitable for installation with the main shaft in any position. A butterfly valve of nominal bore exceeding 450 mm shall be suitable for installation with the main shaft horizontal or vertical, as billed or shown on the drawings.

The main shaft shall be so offset from the centreline of the disc that it does not pass through the seal.

4.1.3.4.2 Disc and seat

The disc shall be of a single casting and of a hydrofoil section such that the maximum combined stresses in the disc do not exceed 20% of the minimum yield stress of the material used, when the unbalanced (differential) pressure specified in Table 4 (5.1.2.1) is applied to either side of the disc.

The profiles of seats shall be smooth and continuous and shall provide adequate "lead-in" for the resilient seal during closure of the disc.

Seals and seats shall be so designed that they are prevented from becoming loose or permitting the passage of water under seals or seats during all conditions of operation and test.

A replaceable stainless steel or bronze or rubber seat shall be fixed to the body, and a resilient rubber or neoprene seal, that can be replaced and adjusted on Site, shall be fixed to the edge of the disc.

4.1.3.4.3 Bearings and seals

Self lubricating sleeve type bearings shall be fitted in the hubs of the valve body. Other lubricating points, if any, shall be fitted with nipples or grease-gun lubrication.

Each valve shall be fitted with at least one adjustable thrust bearing set to hold the disc securely concentric with the body seat or seal.

In the case of valves of nominal bore greater than 1 000 mm and PN ratings greater than 16, the seal shall comprise an approved fully contained rubber "O" ring. The shape of the groove shall comply with DIN 2514.

4.1.4 Fire hydrant

4.1.4.1 General

A fire hydrant shall be of the underground or above-ground or pillar type, as billed, shall comply with the relevant requirements of Part 1 of SANS 1128, and 4.1.4.2 to 4.1.4.4. Where an underground type is billed, it shall be provided with a Class 16 gate, rising spindle and captive stopper.

A fire hydrant shall be supplied complete with all jointing material such as insertions, bolts, nuts, and washers and, in the case of an underground hydrant, a flanged closure pipe of such length that the hydrant can be installed at the depth below the cover of the hydrant chamber specified in SANS 1200 L.

An above-ground type valve shall be Class 16, flanged, of the pattern billed, or shown on the drawings, and comply with 4.1.1.3, as relevant, except that it shall be anti-clockwise opening.

4.1.4.2 End connections

The inlet end connection of a hydrant shall be flanged as specified in 4.1.1.2. Its outlet end and components shall be as specified in Part 1 of SANS 1128, be compatible with one another and, in the case of extensions to existing installations, with the Employer's existing fire fighting equipment as described in the Specification Data.

The single or double (as billed) outlet connection of an underground hydrant shall be a screw or bayonet type, as billed. In the case of a bayonet type the outlet size between hooks shall be 108 mm or 120 mm, as billed.

The outlet connection and the separate outlet coupling of an above-ground hydrant shall have a 65 mm instantaneous connection integrally cast with the body or other connection, as billed. The inlet of the adaptor shall be of the type billed.

4.1.4.3 Method of operation

The operating device on a hydrant valve shall be of the fixed wheel or tamper proof key type, as billed.

4.1.4.4 Design

Except where another design is shown on the drawings, or other requirements are specified in the Specification Data, the design of a fire hydrant shall comply with the relevant requirements of SANS 1128. A blank cap shall be provided with each fire hydrant.

4.1.5 Air valve for a water main

4.1.5.1 General

4.1.5.1.1 Water main

An air valve for use on a water main shall be of the type and pattern billed, and shall comply with Table 2 for the relevant range of working pressures.

	2	3	4
Working pressure MPa	Type	Pattern	Ball diameter mm
up to 0,7	Single, small orifice	float	50
up to 1,6			80
up to 2,5			100
2,5 - 4,0		lever	100 - 200
2,5 - 4,0		float	100 - 200
up to 4,0	Double (or multiple) orifice	2 (or more) floats	100 - 200
up to 4,0	Double (or multiple) orifice	1 lever and 1 (or more) floats	100 - 200

Unless otherwise billed or specified in the Specification Data, each air valve shall be supplied, as applicable with

- a) an isolating cock for working pressures up to 1,6 MPa; or
- b) for working pressures up to 2,5 MPa, a screw down type isolating valve fitted with a bronze spindle (with or without bevel gears) and spindle cap or handwheel (as billed) or for operation in the manner specified in the Specification Data, or
- c) for working pressures above 2,5 MPa, a flanged isolating gate valve that complies with the relevant requirements of 4.1.1.

4.1.5.1.2 Sewer rising main

Subject to the requirements of 4.1.5.3.2 and 4.1.5.4.2, an air valve for use on a sewer rising main shall comply with 4.1.5.1.1.

4.1.5.2 End connections

An air valve shall be supplied complete with end connections (and all necessary jointing material, nuts, bolts, etc.) billed or shown on the drawings. The end connections shall comply with 4.1.1.2, mutatis mutandis.

4.1.5.3 Manner of operation

4.1.5.3.1 Water main

An air valve shall be capable of operating automatically under the operating pressure and conditions specified in the Specification Data. In the case of a single small orifice air valve, it shall be capable under the same circumstances, of automatically releasing, air entrapped in the pipeline.

4.1.5.3.2 Sewer rising main

The operation of an air valve on a sewer rising main shall be such that the sewage does not come into contact with the balls or valve seats. To achieve this, a large stainless steel float shall be fitted with a rod that is suitably sleeved into the body of the valve in such a manner that

- a) when the air is expelled and the level rises in the float chamber, the rod pushes the ball upwards until it seats firmly in the large orifice; and
- b) as gas and air accumulates in the valve body, the water level is depressed, the float drops and the small orifice comes into operation to release the air pressure that is in the valve body.

4.1.5.4 Design

4.1.5.4.1 Water main

The body for all types of air valve for use on a water main shall have been successfully tested to not less than twice the working pressure, and shall, for working pressures up to 2,5 MPa, be manufactured from cast iron that conforms with the relevant requirements of BS EN 1561 for Grade 14, and for working pressures exceeding 2,5 MPa, be manufactured from cast steel. The balls and seating shall be manufactured from materials that are compatible with the body and with themselves, and are such that the seating wears faster than the ball. Where dissimilar metals are used for the balls and seating, the metals shall be such that the potential difference exceeds 0,3 volts.

Each double or multiple orifice air valve shall be

- a) flanged; and
- b) fitted with a suitable drain cock to release the pressure inside the valve when the isolating valve is closed during the time when the float is sealing the large orifice; and
- c) provided with cast iron shield plates so designed as to prevent the entry of dirt when the large orifice is open.

4.1.5.4.2 Sewer rising main

All materials used in the manufacture of an air valve and its components for use on a sewer rising main shall comply with 4.1.14.1(a).

The valve body shall be constructed of close-grained cast iron, and shall be so contoured that there are no corners or rough surfaces to which solids may adhere. The head casting shall be specially strengthened and dimensioned to receive a vertical vent pipe, if required subsequently.

Two wash-down sludge plugs for cleaning and inspection shall be provided.

Operating mechanisms shall be of high quality ANSI 316 S16 stainless steel or as approved, and shall be totally enclosed. The large and small orifice sealing components may be manufactured from vulcanite and polyurethane elastomer, or such other materials as are approved.

The seat profiles of the large and small orifices shall be such that the valve is gas-tight at atmospheric pressure.

The valve seats shall be readily accessible for cleaning and inspection on removal of the cover bolts.

The stainless steel float shall be so shaped as to allow a substantial margin of stability in the handling of sewage gases.

Comprehensive back-washing facilities shall be provided for all sealing surfaces of the operating mechanism, and facilities shall be provided for complete flushing of the air chamber and passage-ways by high pressure sprays of water.

An isolating valve of the type billed shall be provided.

4.1.6 Pressure relief valve

4.1.6.1 General

A pressure relief valve shall be of the nominal bore and class, and shall operate at the pressure(s) billed. For quality of materials and construction workmanship, it shall comply with the requirements of SANS 191 or, SANS 664, and of 3.3.2 and 4.1.1, as applicable, in addition to complying with 4.1.6.2 to 4.1.6.4.

4.1.6.2 End connections

It shall be fitted with a right angled outlet flanged connection that is drilled and complies with 4.1.1.2.

4.1.6.3 Manner of operation

A pressure relief valve shall be so designed and fabricated that it performs in the manner and fulfils the requirements set out in the Specification Data. The spring of a spring loaded valve shall be reliable in operation.

The valve shall have been tested and be guaranteed, for precision adjustment of the specified set pressure.

4.1.6.4 Design

The body shall be of CI or bronze, as billed.

The valve spindle shall be made of EN 56 B to BS 970 (or as approved) stainless steel.

The valve nozzle, disc, disc holder and guide shall be made of monel (or as approved).

The spring shall be made of a plated high quality carbon steel. The disc and nozzle sealing surfaces shall be precision lipped to ensure perfect valve tightness.

4.1.7 Control valve

4.1.7.1 General

A control valve shall be of the diaphragm or other approved type, and of the nominal bore, class, and working pressure billed. In the case of a diaphragm type of nominal bore within the range 50 mm to 300 mm for class 10 or 16, it shall comply with the relevant requirements of BS 5156. A control valve of nominal bore greater than 300 mm or of a class higher than 16 shall, for quality of materials and construction workmanship comply with the requirements of SANS 191 or SANS 664, and of 3.3.2 and 4.1.1, as applicable. In addition, all valves shall comply with 4.1.7.2 to 4.1.7.4.

A control valve shall have an hydraulically operated, pilot controlled diaphragm type single seat globe or other approved valve. A globe valve of nominal bore within the range

50 mm to 450 mm for class 10 or 16 or 25 shall comply with the relevant requirements of BS 5152.

4.1.7.2 End connections

A control valve shall be supplied with the end connections billed or shown on the drawings. The end connections shall comply with 4.1.1.2, mutatis mutandis.

4.1.7.3 Manner of operating

A control valve shall be so designed that no surface water can be drawn into the pilot system or main valve at any time, and that it performs in the manner and fulfils the requirements set out in Specification Data.

4.1.7.4 Design

A control valve shall be so designed that it shuts without inducing water hammer, and is capable of operating smoothly at low flows. It shall be fitted with single removable bronze seats and discs of synthetic rubber of rectangular cross section. The discs shall be retained on three sides by disc retainers.

All necessary repairs shall be possible without removing the valve from the pipeline.

A valve shall have external packing glands or stuffing boxes.

4.1.8 Rate of flow control valve**4.1.8.1 General**

A rate of flow control valve shall be of the diaphragm or other approved type, and of the nominal bore, class, and working pressure billed. For quality of materials and construction workmanship it shall comply with the requirements of SANS 191 or SANS 664, and of 3.3.2 and 4.1.1, as applicable, in addition to complying with 4.1.8.2 to 4.1.8.4.

Except where the design of the valve is such that the valve, differential pressure powers the diaphragm, a thin edged orifice plate shall be supplied to provide actuating differential pressure. (NOTE: This shall be installed in an orifice flange located downstream of the valve.

Pilot control shall be by means of a double acting diaphragm or other approved valve that complies with 4.1.7.1.

4.1.8.2 End connections

A control valve shall be supplied with the end connections billed or shown on the drawings. The end connections shall comply with 4.1.1.2, mutatis mutandis.

4.1.8.3 Manner of operation

Subject to the limits and tolerances specified in the Specification Data, a rate of flow control valve shall be so designed that, regardless of fluctuations in the up-steam pressure, it maintains the specified constant rate of flow at the downstream pressure specified in the Specification Data, shuts without water hammer, and is capable of operating smoothly at low flows.

The pilot control shall be designed to close when the actuating differential pressure increases beyond the spring setting.

4.1.8.4 Design

A control valve shall be so designed that it shuts without inducing water hammer, and is capable of operating smoothly at low flows. A globe type valve shall be fitted with a single removable bronze seat and disc of synthetic rubber of rectangular cross section. All necessary repairs shall be possible without removing the valve from the pipeline.

Where a larger stem stroke is required to reduce sensitivity under operating conditions, the valve shall be fitted with a V-port instead of a disc.

A valve shall have no external packing glands or stuffing boxes.

Valves shall be manufactured to conform to the requirements of BS 1655 and BS 5793 as applicable or as approved.

High quality valves consisting only of a stainless steel body and an elastomeric liner are an acceptable alternative design.

Where specified in the Specification Data, the pilot control valves shall be fitted with an electrically operated solenoid valve.

4.1.9 Check valve**4.1.9.1 General**

A check valve shall be suitable for the working pressure, and of the nominal bore and class billed. Unless specifically billed as a diaphragm type valve, it shall be a gate type valve that complies with the relevant requirements of SANS 1551-1 or SANS 191 or SANS 664, and of 3.3.2 and 4.1.1, as applicable, in addition to complying with 4.1.9.2 to 4.1.9.4.

4.1.9.2 End connections

A check valve shall be supplied with the end connections billed or shown on the drawings. The end connections shall comply with 4.1.1.2, mutatis mutandis.

4.1.9.3 Manner of operating

A check valve shall hold the pressure constant over the demand range and pressure conditions, be of the no-slam type, and fulfil the requirements set out in the Specification Data.

4.1.9.4 Design

The door on the body shall be fitted with a bronze face closing on a corresponding bronze seating in the body.

The door suspension lugs shall be hinged on a stainless steel EN 57 B (conforming to BS 970) spindle supported in trunnion bearings.

In the case of a diaphragm type valve, it shall comply with 4.1.7.1 and 4.1.7.4. In the case of a wafer type spring check valve, it shall have discs and resilient seats of either 316 stainless steel or other acceptably corrosive resistant material.

4.1.10 Pressure-reducing and pressure-sustaining valve**4.1.10.1 General**

A pressure-reducing and a pressure-sustaining valve shall be suitable for the working pressure, and of the nominal bore and class billed. It shall comply with the relevant requirements of SANS 191 or SANS 664, and of 3.3.2 and 4.1.1, as applicable, in addition to complying with 4.1.10.2 to 4.1.10.4.

A pressure-reducing shall have a pilot-control that is a direct-acting adjustable, spring loaded, normally open diaphragm valve.

A pressure-sustaining valve shall have a pilot-control that is a direct-acting, adjustable spring-loaded, normally closed diaphragm valve.

4.1.10.2 End connections

A pressure-reducing and pressure-sustaining valve shall be supplied with the end connections billed or shown on the drawings. The end connections shall comply with 4.1.1.2, mutatis mutandis.

4.1.10.3 Manner of operation

The pressure-reducing or pressure-sustaining valve shall maintain the specified constant downstream pressure, regardless of fluctuations in demand within the range, and at the inlet and maximum downstream pressures specified in the Specification Data.

When the upstream pressure becomes equal to the spring setting of the pressure-sustaining control, the valve shall throttle to maintain the specified constant inlet pressure.

If the downstream pressure is greater than the upstream pressure, the valve shall close automatically to prevent return flow.

The pressure-reducing pilot shall close when the downstream pressure exceeds the spring setting.

The pressure-sustaining pilot shall open when the upstream pressure exceeds the spring setting.

The control system shall include a fixed orifice ejector and an adjustable-opening speed control.

4.1.11 Sleeve-type jet dispersion valve

4.1.11.1 General

A sleeve-type jet dispersion valve shall be of the sliding sleeve, inverted cone, jet dispersing type with acceptable reduction drive and handwheel operation. It shall be suitable for installation horizontally or at an angle of 45o.

4.1.11.2 End connections

The valve shall have flanges of the same thickness and drilling as those of the outlet valve that is to be controlled.

4.1.11.3 Manner of operating

The valve shall be operated by a stainless screwed spindle, a handwheel, and a thrust head mounted on a trunnion for horizontal mounting or cast into a wall, in which case the sleeve lever linkage shall be operated with a watertight gland.

Where the gland is cast into the wall, the lever operating linkage shall be designed to accommodate movement restraints that may be due to casting in.

Where so required in terms of the Specification Data valve operation controls shall be integral with the valve body.

A valve and control shall be so designed that its operation is dependable when exposed to the weather and sunlight, and when non-operative for extended periods of time.

A valve shall close by clock-wise rotation of a handwheel on which arrows and the words "TO OPEN" and "TO CLOSE" shall be cast to indicate the direction of closing and opening.

4.1.11.4 Design

The valve body shall be of cast-steel with a shrunk-on stainless steel sleeve on the portion of the body that does not contain the water ports and on which the sleeve slides. The water port web edges on which the sleeve slides shall have machined weld-deposited stainless steel faces to prevent moisture getting between the facing and the webs and causing corrosion. The sliding sleeve shall be of cast-steel with two (i.e. front and rear) renewable annular zinc-free bronze sliding surfaces and a stainless steel seal seating on to a renewable rubber ring. This end rubber sealing ring in the cone of the valve body shall be out of the water-way and positively secured in position by stainless securing elements, and the rubber seal shall be readily replaceable on Site.

The back rubber water seal shall also be replaceable on Site and carried either in the sliding sleeve or, in the case of seals that rely on water pressure for watertightness, shall be carried on the valve body.

A valve shall be so designed and constructed that it is drop-tight when closed.

Operating gear and linkage shall be of corrosion resistant materials.

All lubricating points shall be provided with nipples for grease gun lubrication.

4.1.12 Other types of valve

Other types of valves shall comply with the requirements of the Specification Data.

4.1.13 Body marking and facilities for handling and mounting**4.1.13.1 Body marking**

The following information shall be legibly and indelibly cast or embossed on each valve body:

- a) the size or nominal bore of the valve;
- b) the class or working pressure of the valve.

4.1.13.2 Lifting eyes

Each valve of mass 75 kg and more shall be furnished with acceptably robust lifting eyes so placed as to be suitable for lifting the valve in a horizontal or vertical position, as appropriate.

4.1.13.3 Mounting feet

Unless otherwise stated in the Specification Data, the body of a socketed or a double-socketed type valve of nominal bore up to 600 mm, and of every valve of nominal bore greater than 600 mm shall be furnished with two robust mounting feet, one on either side of the gate. The feet shall be designed for direct grouting or for bolting as shown on the drawings, billed or specified in the Specification Data.

4.1.13.4 Protection against damage during transit to, and on site

The body ends shall be sealed in the manner specified in SANS 665, and the jointing surfaces shall be protected against damage before despatch to the Site and while being moved, stored, handled and installed on Site.

4.1.14 Protection against corrosion**4.1.14.1 General****4.1.14.1.1 Prevention of electrolysis**

- a) **Between metals used to fabricate valve.** Where the construction of the valve is such that it is impossible to avoid dissimilar metals of which the potential difference exceeds 0,3 volts, suitable insulation materials shall be used on the contact faces between such dissimilar metals.
- b) **Valve in cathodically protected pipeline of large diameter.** Where a pipeline of nominal diameter 450 mm or more is being given cathodic protection, the Contractor shall ensure that such cathodic protection measures are also applied to any valves that he installs in the pipeline.

4.1.14.1.2 Where protection not required

Except where specifically billed and required in terms of the Specification Data, internal corrosion protection shall not be provided on cast iron valves.

- a) of nominal bore up to 300 mm; and
- b) of nominal bore greater than 300 mm that are to be used, in terms of the Specification Data, for the conveyance of non-aggressive water.

4.1.14.2 External corrosion protection scheduled

Where corrosion protection of the outside surface of a valve is designated or billed, the valve shall, after proper cleaning, be given whichever of the following treatments is billed:

- a) **Bitumen/coal tar coat.** A cold applied approved mineral bitumen or coal tar coat that complies with BS 78 and is of dry film thickness not less than 300 µm.
- b) **Bituminous aluminium.** Coated in accordance with the relevant requirements of SANS 802 with bituminous aluminium to provide a dry film thickness of not less than 300 µm.
- c) **Galvanised.** Galvanised in accordance with the relevant requirements of SANS 121 or SANS 32, as appropriate.
- d) **Zinc (or aluminium) spray plus epoxy.** The external metal surfaces shall be grit blast cleaned to at least SIS Standard SA 3 and zinc (or aluminium, as billed) spray coated to a thickness of at least 150 µm in accordance with the requirements of SANS ISO 2063. The zinc coating shall be further protected with one prime coat and two coats of an approved high build epoxy tar paint that complies with the relevant requirements of SANS 801, to a total film thickness of not less than 280 µm
- e) **Epoxy painted.** The external metal surfaces shall be grit blasted to SIS Standard SA 3 and an approved epoxy paint that complies with the relevant requirements of SANS 801 applied immediately as a primer followed by two further coats not less than 6 h and not more than 24 h after the previous coat to provide a total film thickness of not less than 250 µm.
- f) **Sintered epoxy.** Clean as for (d) and (e) above, and a solvent-free sintered epoxy powder applied in one coat by the use of arc-spray machines to provide a dry film thickness of not less than 450 µm.

4.1.14.3 Internal corrosion protection of large valves

The vulnerable internal metal surfaces of a valve shall be given corrosion protection if the valve has a cast steel body or has a cast iron body and is to be installed to control aggressive water (i.e. falls outside the scope of 4.1.14.1.2) and provided also that a particular internal corrosion protection is billed and is identified in the Specification Data. Such protection shall be subject to 4.1.14.1.1, and shall comply with whichever of (a) to (e) below is billed or identified in the Specification Data or with such other specification as is acceptable as a means of providing adequate protection of the valve against corrosion caused by water of the composition set out in the Specification Data, and is approved as being equal to that billed. Internal protection may be applied before the valve has been tested at the manufacturer's works in terms of 5.1.2.1.

- a) **Zinc (or aluminium) spray plus epoxy.** The exposed internal cast steel surfaces shall be grit blast cleaned to at least SIS Standard Sa 3 and zinc, or aluminium, as applicable, spray coated to a thickness of at least 150 µm in accordance with the requirements of SANS ISO 2063. The zinc (or aluminium) coating shall be further protected with one prime coat and two coats of an approved non-toxic and non-tainting high build epoxy tar paint that complies with the relevant requirements of SANS 801, to a total film thickness of not less than 280 µm.
- b) **Epoxy painted.** The exposed internal cast steel surfaces shall be grit blasted to SIS Standard SA 3 and an approved non-toxic and non-tainting epoxy paint that complies with the relevant requirements of SANS 801 applied immediately as a primer followed by two further coats not less than 6 h and not more than 24 h after the previous coat to provide a total film thickness of not less than 260 µm.

- c) **Sintered epoxy.** Clean as for (a) and (b) above and apply a solvent-free, non-toxic and non-tainting sintered epoxy powder in one coat by the use of arc-spray machines to provide a dry film thickness of not less than 450 µm.
- d) **Plastic coated.** Clean as for (a) and (b) above and apply an approved plastic coating of thickness not less than 50 mm to all internal surfaces except plug or disc faces.
- e) **Nickel plating.** The exposed internal surfaces of cast steel shall be nickel plated in accordance with the recommendations of an approved manufacturer.

4.1.15 Marking to identify for contract

Before despatch from the manufacturer's works the body of each valve shall be clearly marked to identify it with the drawings or billed in the manner required in terms of the Specification Data, and in such a way that the marks remain until the valve is installed.

4.1.16 Concrete

The concrete used for pedestals, or bedding or other supports shall be of the strength specified, billed or given on the drawings, and shall comply with the relevant requirements of SANS 1200 G or SANS 1200 GA as applicable.

4.1.17 Bedding

Bedding materials and procedures shall be of the class billed or given on the drawings, and shall comply with the relevant requirements of SANS 1200 LB.

4.2 Plant

The terms of Clause 4 of SANS 1200 L shall apply where relevant.

4.3 Methods and procedures

4.3.1 Setting of valves and associated specials

4.3.1.1 General

- 4.3.1.1.1 Unless otherwise shown on the drawings or required in terms of the Specification Data, gate valves, fire hydrants and air valves shall be set upright and butterfly valves shall be set with the main shafts horizontal. Other valves shall be set as shown on the drawings or ordered.
- 4.3.1.1.2 Each valve, complete with associated specials, shall be correctly set, placed in position, bedded as specified in SANS 1200 LB to the class appropriate to the pipeline, or where so billed, supported on concrete as specified in 4.3.2 and 4.3.3, and as the work proceeds, properly jointed to their respective pipes.
- 4.3.1.1.3 In the case of a valve inside a chamber:
 - a) the removable type coupling (provided in terms of 4.1.1.2 or 4.1.3.2, as applicable) shall be fitted on one side of the valve;
 - b) a clear space of width at least 450 mm or the nominal bore of the valve, whichever is the larger, shall be provided on both sides and above a valve;
 - c) a clear space of at least 300 mm shall be provided under a valve.
- 4.3.1.1.4 In urban, industrial and similar areas, each valve and associated specials shall, subject to 5.2.2, be located in the position shown on the drawings or as otherwise directed, and pipe lengths shall be so arranged that the closure piece when coupling a valve into a pipeline is not less than 500 mm in length.

- 4.3.1.1.5 In open country areas, where so approved before pipe laying commences, a valve may be located to suit the pipe lengths.
- 4.3.1.1.6 An underground type fire hydrant shall be installed at a level that ensures that the top of the threaded outlet is not more than 400 mm nor less than 50 mm below the level at which the top of the hydrant cover is to be set. A double-flanged distance piece shall be used when necessary to ensure compliance with this requirement.
- 4.3.1.1.7 In the case of an air valve, a double-flanged distance piece of suitable length shall be used when necessary to ensure compliance with any depth requirement given on the drawings.

4.3.2 Jointing

4.3.2.1 Flanges

In the jointing of valves with flanges, special care shall be taken to align, grade, and level the valves to avoid straining of the flanges. All bitumen and paint shall be removed from the face of each flange immediately before jointing.

Insertion pieces that comply with the applicable requirements of Subclause 3.8.3 of SANS 1200 L and that have accurately cut holes for bolts shall be placed to form a continuous one-piece ring between the flanges. Bolts shall be tightened up evenly in opposite pairs to ensure uniform bearing on the insertion. Care shall be taken to avoid damage to the internal surface of the valves during assembly of the pipeline and installing of the valve(s).

4.3.2.2 Other end connections.

Each end of the valve shall be thoroughly cleaned by brushing and wiping immediately before being jointed. All rubber rings and seals shall be carefully inspected after being placed in position and before the joint is closed to ensure that they have not suffered any cuts, tears, or other damage, and are not in any other way defective. Only the lubricant recommended by the manufacturer shall be used for sleeve-type couplings and rubber insertion rings of AC pipes. Grease derived from petroleum products shall not be used for connections to PVC pipe joints. Connections to a uPVC pipeline shall be made in accordance with the manufacturer's instructions. Connections to an AC pipeline shall be made in accordance with the manufacturer's instructions.

4.3.3 Keeping valves clean

Every reasonable precaution shall be taken to prevent the entry of foreign matter and water into the valve(s). At the close of each day's work or at any time when work is suspended for a significant period, the open end of the last laid valve shall be plugged, capped, or otherwise tightly closed until laying is recommenced.

4.3.4 Anchor/thrust blocks and pedestals

When billed, terminal valves, under major valves, and where otherwise directed, anchor/thrust blocks and pedestals shall be constructed (and reinforced, if any) to the dimensions ordered or shown on the drawings. Anchor/thrust blocks and pedestals shall be constructed of strength concrete of grade 20 MPa.

The concrete shall be well punned round the base or mounting lugs, as applicable and, if in trenches, against the undisturbed faces and bottom of the trench. Backfilling behind or under thrust faces will not be permitted. Excess excavation shall be replaced with strength concrete of grade 20 MPa at the Contractor's expense unless an item is billed to cover payment for overbreak. Care shall be taken to leave the bolts on the valve accessible. No anchor/thrust blocks and pedestals shall be concreted until the approval of the Engineer has been obtained.

4.3.5 Holding down bolts, straps, clamps, etc.

Where and as billed the Contractor shall supply and install holding down bolts, straps, clamps, or other devices that are shown on the drawings for anchoring the valve to the valve pedestal or other concrete structure, as applicable.

All bolts, straps, clamps, etc., shall be protected against corrosion by use of approved protective materials.

4.3.6 Making good damage**4.3.6.1 Before satisfactory completion of initial test (see 5.1.4.1)**

Each valve shall be thoroughly cleaned and carefully examined for damage and defects in the valve and corrosion protection, if any, immediately before installing. Should any damaged or defective valve be installed, it shall be removed and replaced at the Contractor's expense and to the satisfaction of the Engineer. Should any damaged or defective corrosion protection be disclosed the affected area shall be thoroughly cleaned and then re-protected as specified in 4.1.14 at the Contractor's expense and to the satisfaction of the Engineer.

4.3.6.2 After acceptance in terms of 4.3.1.4.2

Except where the Contractor is barred by special requirements in the Specification Data from working on an accepted valve in a pipeline that is being operated by the Employer, the Contractor shall liaise with the Engineer in regard to acceptable arrangements for carrying out his responsibilities in terms of 4.3.6.1 and 5.1.4.2 until the end of the defects liability period.

4.3.7 Commissioning

After installation, the Contractor shall commission each valve under normal conditions of flow, and he shall satisfy himself that each valve performs in the manner, and fulfils the requirements over the full range of operating conditions specified in the Contract.

5. COMPLIANCE WITH REQUIREMENTS**5.1 Testing****5.1.1 Test certificate**

The Contractor shall make suitable arrangements with the manufacturer to ensure receipt by the Engineer of a manufacturer's test certificate in which it is certified that all valves in the lot have been inspected and tested for compliance with the 5.1.2 and the applicable specification. The actual pressures used during the tests and the result of each test shall be stated in the certificate.

5.1.2 Test requirements**5.1.2.1 At manufacturer's works**

Before despatch to the site, valves shall be tested at the manufacturer's works in accordance with the requirements of Table 4 below, as applicable.

The proof tests required in terms of columns 3 and 4 of Table 4 shall be carried out on samples selected in terms of the sampling procedure specified in the applicable standard specification. Where, in terms of 4.1.14.3, the exposed surfaces of the inside of a valve are to receive identified treatment for protection against corrosion, the valve may be tested as set out above before treatment, and again after it has been dismantled, treated and re-assembled.

Table 4 - Test requirements

1	2	3	4	5	6	7
Class and Working pressure MPa	Nominal bore mm	Proof test on sample to check design of valve at		Gate efficiency and performance test on each valve at	Applicable standard specification for tests	
		Test Pressure MPa			Gate	Others
		On body	On gate for drop tightness	Operating & differential		
10	50 to 600	2,0	1,5	As stated in SD or billed, but not exceeding 1,0	SANS 664	See 5.1.3
1,0	exceeding 600 to 1000				SANS 665	
16	50 to 60	3,2	2,4	As stated in SD or billed, but not exceeding 1,6	SANS 664	See 5.1.3
1,6	exceeding 600 up to 1000				SANS 665	
25	50 to 1000	5,0	3,8	As stated in SD or billed, but not exceeding 2,5	SANS 665	See 5.1.3
2,5	50 to 350 exceeding 350 up to 1000				SANS 191 Specifi- cation Data	
40	50 to 350	8,0	6,0	As stated in SD or billed, but not exceeding 4,0	SANS 191	See 5.1.3
4,0	exceeding 350 up to 1000				Specifi- cation Data	

5.1.2.2 On site

In addition to the test requirements of 5.1.1 and 5.1.2.1, each valve shall be:

- inspected for flaws or damage on delivery to the Site, and again immediately before installation.
- subjected to commissioning tests as specified in 5.1.4 and 5.1.5, as applicable.

5.1.3 Applicable test specifications for other than gate valves

Except where otherwise specified in an applicable standard specification listed below, each valve of whatever type shall be inspected and have its body tested as specified in SANS 191 or SANS 664 or SANS 665, as applicable, for the specified class or working pressure given in Column 5 of Table 4.

Type of valve	Applicable standard Specification for tests
Butterfly	BS 5155
Fire hydrant	SANS 1128
Air valve	Specification Data
Diaphragm	BS 5156
Globe	BS 5152

5.1.4 Commissioning (or field) test on site**5.1.4.1 Initial test**

After installation and compliance with 4.3.5, each valve (and actuator if installed) shall be subjected to a commissioning (or field) test in the presence of the Engineer to prove the ability of the valve (and actuator if installed) to operate in the manner and over the full range of normal flow and operating conditions specified in the Contract.

5.1.4.2 Maintenance checks

After the commissioning test has been completed to the satisfaction of the Engineer, the Contractor shall, from time to time during the Defects Liability Period make such checks and adjustments to mechanisms as are necessary, in the opinion of the Engineer.

5.1.5 Testing by-pass valve arrangements

By-pass valve arrangements shall be subjected to and pass the tests ordered at the same pressure as the main valve that is by-passed by such arrangements.

5.2 Tolerances**5.2.1 Manufacture****5.2.1.1 Body dimensions**

The dimensions of the body of each valve and its component parts shall comply with the relevant tolerance requirements of Table 3 below and of the applicable standard specification for the valve (see Table 1).

1		2
Face-to-face dimension, mm		Tolerance, mm
Up to and including	200	± 1
Above 200 up to and including	400	± 2
Above 400 up to and including	600	± 3
Above 600 up to and including	800	± 4
Above 800 up to and including	1 000	± 5

5.2.1.2 Flanged and couplings

Flanges shall be subject to the following tolerances:

Outside diameter of flange	± 2 mm
Thickness of flange	± 1 mm
Diameter of bolt circle	± 1 mm

Couplings shall be subject to the tolerances specified in the appropriate standard specification.

5.2.2 Installation

A valve shall be installed and located in a pipeline within the tolerances specified for the pipeline in terms of SANS 1200 L.

5.2.3 Commissioning

After commissioning each valve shall perform in the manner, and within the limits and tolerances required in terms of the Specification Data.

6. Void

7. Void

8. MEASUREMENT AND PAYMENT**8.1 Basic principles****8.1.1 General**

- a) Except as provided for in (c) below, the various operations involved in the installation of a valve will be dealt with as an extra-over the payment for supplying, laying, bedding, etc. of the pipeline in which (or onto which) the valve is installed/attached, i.e. no deduction from the overall length of the pipeline will be made for valves (see Subclause 8.2.1 of the SANS 1200 L).
- b) Generally the supply and delivery of a valve will be billed separately from the operations necessary to install and bed or support, and to commission such a valve.
- c) In the case of short piperuns (see Subclause 8.2.5 of SANS 1200 L), where the quantity of valves and specials are, for instance, of a similar magnitude to or more than those of the stated lengths of straight pipes, the operations of installing, setting and bedding each valve will be regarded as, and scheduled separately from the operations of laying and bedding etc. the adjoining length(s) of the pipe(s) or specials.

8.2 Billed items**8.2.1 Supply and deliver valve**

(type, size, working pressure, and other relevant data in terms of Clauses 4.1.1 to 4.1.10 of Specification LK, as applicable, stated)

Unit:.....number (No.)

A separate item will be billed for each type, size, etc. of valve and each type of end connection or coupling.

NOTE: All valves may be listed in a separate Bill "X" (that includes couplings and may include specials), a summary of which is to be carried to an item in the main bill.

The rate, which shall be subject to 8.1, shall cover the cost of providing, delivering, and off loading the valve on Site as directed.

8.2.2 Install, bed and field-test small valve (of nominal bore of up to 300 mm)

(type, size, working pressure, etc., as relevant, stated)

Unit:.....number (No.)

Separate items will be billed for each group of valves (depending on mass and location or circumstances, or both, of installation), and for each type and size of valve.

The rate, which shall be subject to 8.1, shall cover the cost of providing packing, bolts, etc. for flanges, if any, and of taking delivery, handling, installing, bedding, and field testing the valve, complete with couplings together with the cost of any additional cutting, turning and jointing of pipes required to locate the valve exactly.

In the case of an underground type fire hydrant, the rate shall cover also the cost of the supply, (except where billed under 8.2.1), fitting and installation of the necessary flanged distance piece(s) regardless of any variation in their total length(s) caused by variations from the specified minimum depth or depth of cover over the main pipeline that arise from the Contractor's manner of laying that pipeline.

NOTE: Unless specific provision is made in the bill, no separate payment will be made for the supply and fitting of any additional joints and jointing materials which may be required for the connection of shortened pipe lengths.

8.2.3 Provide and deliver removable type couplings

(details stated)

Unit: number (No.)

Separate items may be billed for each size and type of removable coupling required in terms of Clauses 4.1.1.2 and 4.1.3.2 of Specification LK.

The rate shall cover the cost of supplying and delivering to Site the coupling complete with all necessary rings, packings, bolts (of sufficient length for at least two screw threads to protrude outside nuts when assemblies are fully tightened), washers and nuts.

8.2.4 Install, bed and test, medium and large valve

(nominal bore more than 300 mm) (type, size, working pressure, etc., as relevant, stated)

Unit: number (No.)

The rate, which shall be subject to 8.1, shall cover the cost of the provision of each valve, and the cost of the handling, fixing, and bedding and, except where separately billed, of testing and of commissioning the valve.

No extra payment over and above the rate will be made in respect of any additional cutting, turning and jointing of pipes required for the location of a valve, special, etc., where a precise position is given on the drawings. In such an event, unless specific provision is made in the bill, no separate payment will be made for the supply and fitting of any additional joints and jointing materials which may be required for the connection of shortened pipe lengths.

8.2.5 Test and/or commission valve(s)

Unit: Sum

(Only applicable to a single or group of large valve(s) or isolated valve(s) or power operated valve(s) testing or commissioning, (or both), of which is a separate operation to installation, and billed separately). Separate items may be billed for the initial test (Clauses 5.1.4.1 of Specification LK) and for the maintenance checks in terms of Clause 5.1.4.2 of Specification LK.

The rate shall cover all costs of labour, material, equipment, and specialist supervision for whatever number of visits are required to commission and prove the valve(s) to the satisfaction of the Engineer.

8.2.6 Concrete valve pedestals (concrete strength or mix stated)

Unit: number or cubic metre (No.) or (m³)

Where valve pedestals are the same size and shape they will be billed by number, the size being stated, or they will be billed by volume and the number will be stated. In either case dimensions or reference to a drawing will be given.

Where so billed the volume of a pedestal will be calculated from the dimensions stated, specified or given on the drawings. Steel reinforcement, if required, will be measured separately in terms of Subclause 8.3 of SANS 1200 GA, as applicable.

8.2.7 Holding down bolts, nuts, and washers, complete with straps/clamps, etc.

Unit:.....Sum or No

Where all holding down bolts, straps/clamps and other anchoring devices are detailed on the drawings, they may be measured as a sum or by number of sets of similar size, design and complexity. Where details are not given at tender stage holding down bolts will be measured by mass (number stated) and straps/clamps separately by mass.

The rate shall cover the cost of provision of the bolts, nuts, washers, straps, clamps, etc. or sets of clamps complete with nuts, etc., as applicable, and the cost of boxing out pockets where required, casting or grouting in, and anchoring the valve securely in position, and corrosion protection.

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APPENDIX A. APPLICABLE STANDARDS

References is made to the applicable edition (see Subclause 2.2 of SANS 1200 A or SANS 1200 AA, as applicable) of the following standards:

ANSI 316

AWWA C 504

BS 10	Flanges and bolting for pipes, valves and fittings
BS 78	Cast iron spigot and socket pipes (vertically cast) and spigot and socket fittings
BS 970	Wrought steels for mechanical and allied engineering purposes
BS 1655	Specification for flanged automatic control valves for the process control industry (face-to-face dimensions)
BS 5152	Cast iron globe and globe stop and check valves for general purposes
BS 5155	Cast iron and carbon steel butterfly valves for general purposes
BS 5156	Screw down diaphragm valves for general purposes
BS 5793	Industrial-process control valves

BS EN 1092	Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories. Steel flanges
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BS EN 1561	Founding. Grey cast irons
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DIN 2514

EN 45 B

EN 56 B

EN 57 B

SANS 32	Internal and/or external protective coatings for steel tubes
SANS 121	Hot dip galvanized coatings on fabricated iron and steel articles - Specification and test methods
SANS 144	Metallic oxide coatings - Measurement of coating thickness - microscopical method
SANS 191	Cast steel gate valves
SANS 664	Cast iron gate valves for waterworks
SANS 665	Cast iron gate valves for general purposes
SANS 801	Epoxy-tar paints
SANS 802	Bituminous aluminium paint
SANS 1123	Steel pipe flanges
SANS 1128	Fire fighting equipment Part 1 Components of underground and above ground systems
SANS 1551-1	Check valves (flanged and wafer type) – Part 1: PN series

SANS 1200 A	Civil engineering construction : General
SANS 1200 AA	Civil engineering construction : General (small works)
SANS 1200 D	Civil engineering construction : Earthworks
SANS 1200 DA	Civil engineering construction : Earthworks (small works)
SANS 1200 G	Civil engineering construction : Concrete (Structural)
SANS 1200 GA	Civil engineering construction : Concrete (small works)
SANS 1200 L	Civil engineering construction : Medium-pressure pipelines
SANS 1200 LB	Civil engineering construction : Bedding (pipes)

SANS ISO 2063	Metallic and other inorganic coatings – Thermal spraying – Zinc, aluminium and their alloys
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SIS 05 59 00	Pictorial surface preparation standards for painting steel surfaces
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Register of Updates (commenced: 19/04/2010)

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SPECIFICATION QB : BUILDING MATERIALS AND WORKMANSHIP

1. SCOPE

This Specification covers the requirements for materials and workmanship in the construction of general building work. Materials and construction techniques required by the Bill of Quantities or the Drawings which are not covered by a Clause in this Specification shall be supplied and constructed strictly in terms of the appropriate Clause or Clauses of the Standard Building Regulations.

2. NORMATIVE REFERENCES

Standard Building Regulations

3. Void

4. REQUIREMENTS

4.1 Materials

All materials shall be of that quality and possess those properties best suited to the purpose for which they are used.

4.1.1 DRAINLAYER

The Specifications dealing with sewers, stormwater, manholes and catchpits, and bedding shall apply or in the event of no such specifications being specified, then SANS 1200 LB, LD and LE shall apply.

4.1.2 EXCAVATOR

In addition to the Specification dealing with general excavation and trench excavation the following shall apply or in the event of no such specifications being specified, then SANS 1200 D and DB shall apply.

4.1.2.1 Filling

Filling shall be clean sand or approved sand with little or no clay content.

4.1.2.2 Hardcore filling

Hardcore filling shall be 150 mm thick unless otherwise specified and shall be formed with hard broken stone or brick of 75 mm maximum size, blinded with sand or dry sub-soil.

No clay, rubbish, tins, wood or vegetation or other debris shall be used in the filling.

4.1.3 CONCRETOR

In addition to the specification dealing with concrete, or if no such specification is provided or specified in SANS 1200 G or GA, the following shall apply.

4.1.3.1 Polythene sheeting

Polythene sheeting shall comply with SANS 952, type C, 0,25 mm thick. All joints shall be overlapped and sealed by pressure-sensitive tape.

4.1.3.2 Prestressed concrete lintels

Subject to prior written approval prestressed concrete lintels may be used provided that they have been manufactured in an approved factory, of mix 35 MPa/6,7 mm strength concrete, reinforced with steel wire not less than 4 mm diameter, tensile strength 1300 to 1380 MPa stressed to not less than 900 MPa. The number of reinforcing wires in concrete lintels for the various spans shall be as set out below:

Width of opening (m)	Reinforcing per half brick soffit width
Under 1,8	2 x 4 mm HT wire
1,80 to 3,00	3 x 4 mm HT wire

Such lintels shall be not less than 60 mm deep and suitably roughened, indented or shaped to give a good bond between the lintel and the mortar for the first course of brickwork above.

4.1.4 MASON**4.1.4.1 Masonry units**

All masonry units used on the Works shall comply with SANS 227 and SANS 1215. They shall be of either burnt clay or concrete free from cracks, stones, unground lumps of material or lumps of lime or other defects and when two are struck together shall give a clear ringing sound. Face bricks shall be hard-burnt and the colour shall be subject to approval. The degree of efflorescence shall be nil.

Masonry units shall be obtained from an approved manufacturer and the Contractor shall submit to the Engineer sample units which if approved will be retained by him as standards. Sampling shall be carried out in accordance with Section 6 of SANS 227 and SANS 1215. The Engineer shall have the right to reject any consignment from which units taken at random are not equal in all respects to the standard. The delivery and removal of which shall be solely at the Contractor's cost.

Except where otherwise stated on drawings or in the Bill of Quantities, NFX (non-facing extra) bricks complying with the SANS 227 Specification for general purpose (special) class of masonry units shall be used.

Bricks for lintels, and for those parts of the structure where chases are required to be cut, shall not contain cavities or perforations.

4.1.4.2 Sills

Where external sills are required to be of masonry, the units shall be glazed burnt clay face bricks or concrete units laid on edge.

Where shown on drawings or in the Bill of Quantities, window sills, internal and external, shall be quarry tiles of the sizes specified. They shall be red, hard-burnt of approved manufacture, true and even in thickness and in shape and colour, with good arrises, free from all defects and blemishes.

4.1.4.3 Mortar

Lime shall be best quality pressure hydrated type A2P and shall comply with SANS 523. It shall be well slaked and properly hydrated. Cement for mortar shall comply with SANS 50197-1 as specified for concrete.

The sand shall be clean pit sand free from clay or other impurities, and shall comply with the requirements of BS 1199 and shall be properly screened and washed if directed by the Engineer.

The water shall be approved quality fresh water.

Unless otherwise specified, the mortar for masonry shall be composed of one part of lime to six parts of sand with 10% (of volume of sand and lime) of cement added immediately before use and thoroughly mixed.

4.1.4.4 Wall ties, wall reinforcing and wall-plate anchors

Wall ties shall be 3,50 mm galvanised steel wire ties equal to the "modified PWD Type" or "Butterfly" type wall ties and shall comply with the requirements of SANS 28.

Reinforcing for lintels and other brickwork where ordered shall be either hard drawn steel wire of 572 to 695 N/mm² ultimate strength or mild steel, both complying with SANS 920. (See also 4.3.4.4).

Wall-plate anchors shall consist of 32 mm wide by 1,6 mm thick galvanized hoop iron 1,5 m long and anchored at least 5 courses before wall plate level.

4.1.4.5 Damp proofing

Damp proofing shall consist of one layer of fabric complying with SANS 248, type GH (33,5 kg per 9 m²).

4.1.4.6 Air bricks

Air bricks shall be approved terra cotta or concrete, with vermin proof copper/PVC gauze at back, built in on the outside face of walls. On the inside face 225 x 150 mm square pattern fibrous plaster air gratings with vermin proof copper/PVC gauze at back shall be built in.

4.1.5 CARPENTER AND JOINER**4.1.5.1 Construction timber**

All timber used shall be of good sound quality thoroughly seasoned, straight, sawn square and free from sap and reasonably free from shakes, large, loose or dead knots, sapwood and wany edges.

Unless otherwise specified, all timber work for constructional purposes shall be in "merchantable grade" timber, complying with the requirements of SANS 1783-2, except that no finger joints within 500 mm of the end of any member, and not more than one finger joint per 3 m length will be accepted. Timber shall be ordered in the nominal cross sectional dimensions and to the nearest 0,3 m length in which it is to be used, except that finger jointed timber made according to SANS 10096 will be permitted.

Timber for brandering shall comply with the requirements of SANS 1783-4.

All softwood timber shall bear the mark of the South African Bureau of Standards.

All timber shall be treated against insect and other wood damaging infestation according to the recommendations of the Department of Entomology, SANS 673 and SANS 10005.

All timber to be built into walls and wall plates shall, in addition to the above, receive two coats of Solignum, carbolineum or other approved wood preservative or be wrapped in 250 micron polythene sheeting.

Fascia and barge boards if scheduled or shown on the drawings as timber, shall be wrot pine.

4.1.5.2 Joinery timber

The type of timber shall be as approved by the Engineer prior to the commencement of manufacture.

All timber used for joinery shall be best quality, specially selected, treated against insects as specified in 4.1.5.1, and shall be of good sound quality, well kiln dried and free from sap, large loose or dead knots, shakes, wany edges or other defects or blemishes such as flower grain. Solid shelving shall comply with SANS 1783-3.

The glue used shall be compatible with the treatment applied against insect attack and shall comply with SANS 1349. In the case of external doors an approved waterproof glue shall be used.

4.1.5.3 Timber doors, door frames and windows

All timber doors, door frames and windows shall be of stout design and construction and of the type billed.

a) External doors

Standard type external doors, shall be of hardwood, and, unless otherwise dimensioned on the drawings, shall be 2 032 x 813 x 45 mm single leaf, framed, ledged and braced and, except for vertical V-jointing, flush on the outside. The stiles and top rail shall be 140 x 45 mm, middle rail 140 x 23 mm and bottom rail 215 x 23 mm. Bracings shall be 115 x 23 mm. Door panels shall consist of 95 x 22 mm vertical boarding, tongued and grooved and V-jointed on the outside. Panels shall be tongued into slots in stiles and top rails and countersunk-screwed with brass screws to middle and bottom rails and bracings. Where doors are fitted with louvres, the bottom rail shall be 215 x 45 mm, and louver slats and linings shall be tongued to the stiles and bottom rail. The slats shall be not less than 55 x 10 mm, and spaced at a maximum of 45 mm centre to centre, and sloped downwards to the outside. Louvred doors shall be fitted with vermin proofing on the inside.

Where billed, external double doors shall be made in two leaves to the overall dimensions shown on the drawings, shall be of similar construction to the standard door described above, and shall have rebated stiles meeting flush at the centre.

Where softwood timber Z type doors are billed they shall be made to the overall dimensions shown on the drawings, ledged and braced and, except for vertical V - jointing, flush on the outside. The top rails shall be 165 x 45 mm, the middle and bottom rails shall be 165 x 23 mm, and braces 115 x 23 mm. Door linings shall be 95 x 22 mm, tongued and V-grooved, and shall be countersunk screwed with brass screws to rails and braces.

The jambs and head of standard size external frames shall be 95 x 70 mm, while the sill shall be 95 x 45 mm with both a dripmould and groove for the weather strip cut in. All frames shall be rebated.

b) Wooden flush doors

Wooden flush doors shall comply with SANS 545 and shall, unless stated otherwise, be single interior class, hollow core type, 2030 x 812 x 40 mm size, without openings, have top and bottom rails at least 70 mm wide, be clad with plywood type 1A and grade A to SANS 929, unless otherwise specified in the Specification Data, and be fitted with two solid timber edge strips. The doors shall be painted.

The jambs and head for internal doors shall be 70 x 70 mm.

c) Windows

Wooden windows shall be constructed in accordance with the detailed specifications and/or drawings, or shall be obtained from the manufacturer specified or scheduled.

All window frames shall be grooved as required for plaster, and all joints shall be pinned with hard wood pins cleaned off flush.

4.1.5.4 Ceilings

Ceilings shall be 6 mm thick fibre cement cellulose ceiling board complying with SANS 803 or 6,4 mm thick gypsum ceiling board complying with SANS 266, and shall be fitted to branding of approved dimensions depending on the truss/rafter spacing.

Cove cornices shall be fitted to all ceilings. For fibre cement ceilings the cornices shall be 55 mm radius x 6 mm thick fibre cement cove cornices and for gypsum board ceilings they shall be 75 mm gypsum cove cornices.

Joints between ceiling boards shall be covered with 25 mm half-round hardwood cover strips.

4.1.5.5 Roofing

The type of roofing shall be as scheduled or shown on the drawings.

Fibre cement roofing shall comply with SANS 685 and shall be straight "Big Six" or "Canadian Pattern" corrugated sheets with a minimum thickness of 5,5 mm and depth of corrugations of 57 and 60 mm, respectively.

Aluminium "Longspan" roofing shall be in straight sheets 0,71 mm thick and shall comply with SANS 903.

Corrugated galvanized iron sheets shall be 0,63 mm thick before being galvanized. Ridges and hips shall be the same gauge as the sheeting, shall be 450 mm in girth and have a roll top.

IBR pattern galvanized deep-fluted sheets and fittings shall be 0,63 mm thick before galvanizing.

'Double Roman' cement tiles shall comply with SANS 542. Their colour shall be subject to approval.

Fascia and barge boards shall be of 225 x 15 mm pressed fibre cement, unless timber boards are scheduled or shown on the drawings.

4.1.5.6 Roofing underlay

Where indicated or shown on the drawings, roofing underlay shall be yellow under-tile polythene sheeting complying with SANS 952, type C, 0,25 mm thick.

4.1.6 IRONMONGER AND SMITH

4.1.6.1 Ironmongery

Ironmongery shall be of the strongest manufacture and best finish. "Bakelite" or similar plastic furniture will not be accepted. Unless billed as prime cost items, samples of each item of ironmongery shall be submitted for approval before any particular item is ordered and fixed.

Barrel bolts shall be 150 mm. Hinges for internal and inward opening doors shall be 100 mm loose pin brass or steel butts depending on the material to which they are to be fixed. Hinges for outward opening external timber doors shall be "Parliament" or projection type fixed with 50 x 12 gauge brass screws. All external doors shall be fitted with one and a half pairs of hinges.

Brass screws shall be used for fixing ironmongery to hardwood. Unless otherwise specified, screws shall be of metal similar to the article to be fixed in the case of metal frames, doors or windows.

Locks for external doors shall be fully rebated heavy quality, 4 lever mortice with bronze or chromium plated furniture. All locks shall be provided with two keys, and all locks shall differ so that the key of any lock will open no lock other than the one to which it belongs.

All outward opening doors shall be fitted with eyes and corresponding 100 mm brass hooks shall be fitted to the walls for holding the doors open. A suitable stop shall be fitted to prevent the door knob from damage against the walls.

All Z-type doors shall be fitted with brass handles and black japanned rimlock with 2 keys. They shall be fitted with 2/250 mm mild steel Tee hinges.

All internal doors shall be fitted with 2-lever mortice locks complete with bronze or chromium plated furniture and locking plates as billed.

4.1.6.2 Steel windows and doorframes

Windows shall be constructed of suitable approved malleable mild steel and of approved medium universal profile. They shall be provided with adequate lugs for fixing to brickwork and be complete with all fittings. They shall comply with the requirements of SANS 727 for Steel windows and Steel doors.

Steel doorframes shall be of approved profile manufactured from annealed mild steel 1,60 mm in the case of single rebated or 1,25 mm in the case of double rebated frames complying with SANS 727. The whole frame shall be welded into a rigid unit. The specified number of 100 mm loose pin steel hinges for the type of door to be hung shall be welded on to each frame. Frames shall also be fitted with an adjustable plate with mortar guard suitable for mortice lock.

Steel windows and doorframes shall be hot dip galvanized in accordance with SANS 121, with a minimum mean thickness of zinc coating of 55 micrometre, treated with a metal etch primer complying and painted with one coat of zinc chromate primer complying with SANS 679 type with SANS 723 I at the factory. If any galvanized sections are subsequently welded or damaged in any manner, damage to the galvanizing shall be made good by sand blasting followed by application of zinc coating or otherwise repaired as directed by the Engineer.

4.1.7 PLASTERER, PAVIOR AND TILER

4.1.7.1 Plaster

Plaster for walls shall be prepared by mixing one part lime to five parts dry sand. Immediately before use one part cement shall be thoroughly mixed with twelve parts of the above lime/sand mix.

Plaster for rendering to concrete surfaces, beams and manholes shall be composed of one part cement to three parts sand.

4.1.7.2 Screeds

Screeds shall be composed of 3:1 sand/cement mortar.

4.1.7.3 Granolithic

Granolithic floors shall be made from:

- Cement 1 part
- Sand 1,25 parts
- Coarse aggregate 2 parts

The coarse aggregate shall consist of granite or other approved chippings which shall pass a 10 mm sieve and be retained on a 5 mm sieve.

4.1.7.4 Terrazzo

Where terrazzo is ordered, unless otherwise specified, it shall be composed of granular chippings of South African marble with other aggregates and glass chippings added as required, mixed with water-repellent cement in the proportion of 1 part cement to 2 parts of the mixed aggregate, and water added to make a plastic mixture.

The aggregate shall be of such granules and colour, and the cement shall be white or tinted, as required, to produce a finished face similar in texture and colour to a sample submitted to and approved by the Engineer, before the work is put in hand.

4.1.7.5 Floor tiles

PVC floor tiles shall comply in all respects with SANS 786 and SANS 581. They shall have a thickness of not less than 2,24 mm and shall be laid on a cement screed using a rubber base adhesive emulsion in accordance with the manufacturer's instructions. Concave skirtings shall be the same thickness, 40 mm radius and 100 mm high.

4.1.7.6 Glazed wall tiles

Glazed wall tiles shall be best quality of approved manufacture, comply with SANS 22 and be 4,75 mm thick, true and regular in shape and free from cracks and all other defects. All arrises shall be cushion edged.

PVC corner and edge strips shall be used around window and door openings and along visible tile edges.

4.1.7.7 Rainwater and surface water channels

Channels for rainwater and surface water drainage shall be 150 mm half round precast concrete units 1,0 m long, complying with SANS 927.

4.1.8 PLUMBER

4.1.8.1 Plumbing and drainage

All materials used for plumbing and drainage shall comply with the Standard Building Regulations.

Unless otherwise billed, water piping shall be in copper, the piping and valves conforming to SANS 460 and SANS 226 respectively.

When galvanized iron piping is billed or shown on the drawings, the piping shall conform to BS 1387 Medium Series, and shall have screwed and socketed joints.

Brass bibcocks shall be heavy pattern with polished bodies to the finish billed or ordered by the Engineer.

Kitchen sink and bath shall have 40 mm PVC-U traps and waste pipes with cleaning eyes fitted to each bend and trap and complying with SANS 967. Vent pipes shall be 110 mm PVC-U pipes to SANS 967.

Fittings for fixing waste and vent pipes to walls shall consist of approved pressed steel holderbats plugged to walls.

Drain pipes and fittings shall comply with SANS 559 for vitrified clay or SANS 791 for PVC-U. Unless otherwise billed, sewer and drain connections shall be in vitrified clay pipe with rubber ring or factory applied resilient plastic joints.

Where specified, billed or shown on the drawings, the following shall apply:

- a) The hot water cylinder shall be a horizontal combination type, bearing the SABS mark, of 90 litres capacity unless otherwise specified, and shall be installed on brackets sufficient to carry the mass of the filled geyser. The Contractor shall allow for all items, excluding the electrical connection, to install the cylinder.
- b) The kitchen sink shall be 1 050 mm long of standard stainless steel single bowl type, bearing the SABS mark, and fitted with grid, plug, chain and screwed union for waste trap and pipe. The whole shall be rigidly supported by metal brackets.

If a hot water system is being installed, two 13 mm brass bibcocks shall be fitted to the sink. If no geyser is being installed, one 13 mm bibcock shall be fitted, with provision made for a future hot water bibcock.

4.1.8.2 Sanitary fittings

Sanitary fittings shall comply with SANS 497 and shall be subject to selection and approval.

When specified, billed or shown on the drawings, the following shall apply:

- a) The WC suite shall consist of a hard plastic low level cistern with metal flushing mechanism of 11 litres capacity and vitreous china WC bowl, with plastic flush pipe and hinged plastic seat flap and cover.

- b) The bath shall be of cast iron, white enamelled with square top build-in type complete with cast iron feet, 32 mm overflow and 40 mm outlet connection. Bibcocks shall be fitted as for kitchen sink.

4.1.8.3 Rainwater goods

Unless otherwise stated or approved, rainwater goods shall be of fibre cement, of "Everite" or equal approved manufacture.

4.1.9 GLAZIER AND PAINTER

4.1.9.1 Glazing

Unless otherwise stated, windows up to 300 mm maximum dimension shall be glazed with 7,32 kg/m² (9,76 kg/m² up to 500 mm maximum dimension) clear sheet glass of the best quality of its kind, free from bubbles, waves, air holes, scratches or other defects and conforming to BS 952 "Ordinary Glazing Quality". Obscure figured and texture glass shall be the best of the respective kinds described and approved. Obscure glass shall be used at windows to showers and toilets.

Polished plate glass, if specified, shall be "Glazing for Glazing" quality, conforming to BS 952.

4.1.9.2 Paints, stains, etc.

All paints and stains, etc, or materials used in their preparation, shall be of the best quality of their respective kinds and shall comply with the relevant SANS specification. The paints and stains, etc, their colours and shades, shall be approved as to brand and manufacture, and the Contractor shall submit samples in their respective colours to the Engineer, for approval, when called upon to do so.

Floor stain shall be composed of Turkey Umber with a small quantity of burnt sienna mixed to the proper consistency with raw oil, with sufficient quantity of terebene to ensure proper drying.

Fast limewash shall be composed of fresh unslaked lime with 7 kg of salt and 5 kg of tallow, or equal mass of boiled linseed oil, added for every 50 kg of lime, well mixed with the lime while slaking. The mixture shall be passed through a sieve. A sufficient quantity of yellow ochre is to be added to bring to a light cream shade to approval.

4.2 Void

4.3 Methods and procedures

4.3.2 EXCAVATOR

The depth of excavation shall be such that the top of the concrete foundations are not less than 150 mm below existing ground level. Trenches and holes shall be excavated to the dimensions of the foundations shown on the drawings or to such other depth as directed in order to ensure a firm foundation.

Bottoms of foundations shall be level and the sides trimmed to full width. The bottoms of trenches shall be stepped in masonry/block course dimensions as required.

Foundation trenches shall have been inspected and approved by the Engineer before the concrete is poured.

4.3.2.1 Filling under floors

The filling under floors shall be constructed in layers of thickness not exceeding 200 mm before compaction, watered and compacted to 93% (100% in the case of sand) of modified AASHTO maximum dry density.

4.3.2.2 Hardcore filling

Hardcore filling shall be levelled and thoroughly compacted by ramming, to receive the concrete floor.

4.3.3 CONCRETOR

In addition to the Specification dealing with concrete the following shall apply.

4.3.3.1 Polythene sheeting

Before casting the floor slab a polythene sheeting complying with 4.1.3.1 hereof shall be laid on the compacted hardcore or fill.

4.3.3.2 Prestressed concrete lintels

Regardless of whether the width of prestressed units are full or half brick or 150 mm they shall be laid to the full width of the bricks in the wall.

4.3.4 MASON**4.3.4.1 Masonry**

All brick foundation walls, superstructure walls, piers and the like shall be built to the various lengths, heights and thicknesses shown and figured on the drawings with masonry units as described and unless otherwise specified, built in English bond. Where thicknesses of 110, 220, 280 and 330 mm are shown on the drawings they are regarded as nominal and are subject to adjustment to suit the masonry units approved for any particular project.

No false headers shall be built in and none but whole masonry units shall be used except where legitimately required to form bond. Burnt clay bricks shall be well soaked in water immediately before being laid and the course of bricks last laid shall be well wetted before laying a fresh course upon it. Concrete units shall not be wetted and if the stockpile has been exposed to rain, the units shall only be used once they have dried out.

Masonry shall have the joints flushed up at every course solid throughout the whole width of each course and all to be laid on a solid bed of mortar.

All walls shall be carried up regularly so that no part of the walling is more than 1,3 m higher than the adjoining work except as shown on the drawings.

Mortar joints to masonry generally shall not exceed 10 mm in thickness. The joints of all walls intended to be plastered or tiled shall be raked out as the work proceeds to form a key for plaster.

Where facing and pointing is specified, the walls shall be faced with facing units as specified and, unless otherwise specified, built in stretcher bond in 3:1 cement mortar, and pointed with a neat recessed joint formed with a steel jointing tool well pressed into the joints as the work proceeds. The face masonry shall be tied back to the walling with wire ties at the rate of 6/m². The face work shall be protected by pasting paper over exposed surfaces, or by other means approved by the Engineer. On completion, the face shall be cleaned down with spirits of salts, wire brushed and finally washed down with ammonia and water.

Ventilators, gratings, dowels, corbels, ties, ends of timber, and slips for fixing joiner's work shall be built in as the work proceeds.

4.3.4.2 Mortar

The mortar shall be mixed in small quantities, with the materials mixed dry on a proper platform with water added gradually through a fine rose and the mixture turned over until the ingredients are thoroughly incorporated. It is essential that mixing platforms shall be well cleaned and stale mortar removed before any batch of mortar is prepared for mixing. Mortar shall be used within 2 hours of cement being mixed in.

4.3.4.3 Cavity walls

Cavity walls shall have the inner and outer skins tied together with ties 1 m apart horizontally in every fourth course with alternate rows staggered.

Mortar droppings shall be carefully gathered up on laths supported on the ties and the laths shall be removed and cleaned at every fourth course. Openings shall be left at the bottom of walls as required for cleaning, and afterwards built in and made good. The wire ties shall be cleaned of all mortar droppings. Vertical dry joints for drainage shall be left at every third brick in the bottom course.

Cavities at jambs and ends of walls shall be built solid for a depth of 110 mm and cavities below sills or at heads of walls shall be built solid for three courses of masonry.

Doors and windows shall be provided with damp proof courses to sills and jambs.

4.3.4.4 Masonry lintels

Masonry lintels shall be formed of masonry units complying with the same specifications as those of the wall in which the lintel is being formed except as specified in 4.1.4.1. They shall be properly bonded longitudinally and be bedded in 1:3 cement mortar. At each reveal, the end unit of the bottom course shall have a bearing of at least half its width.

Masonry lintels shall be reinforced for their full length and shall be formed at least of the minimum number of courses, all as set out in Table A, below.

Masonry lintels shall be formed on rigid temporary supports which shall be left in position for seven days or such longer period as the Engineer shall order.

Subject to prior written approval, prestressed concrete lintels may be used provided they comply with 4.1.3.2.

Masonry shall be built in 1:3 cement mortar with all joints filled solid with mortar. Lintels shall have a bearing of not less than 225 mm on each side of the opening.

Table A

Type of Lintel	Width of opening m	Min. No. of brick courses over lintel	Reinforcing per half unit soffit width
Brick Reinforced	under 1,50	4	3/3,15 mm HT wire
	1,50 to 2,25	6	3/6 mm Mild Steel or 3/3,15 mm HT wire
	2,25 to 3,00	8	4/3,15 mm HT wire
Concrete Prestressed	under 1,80	Beam + 3	(See 4.1.3.2 hereof)
	1,81 to 3,00	Beam + 4	(See 4.1.3.2 hereof)

4.3.4.5 Window sills

Unless otherwise billed, external sills shall be constructed of bull-nosed facing masonry units, or quarry tiles, of approved colour as shown on the drawings or in the Bill of Quantities. Where specified, masonry units shall be laid to a uniform slope, true to line and level, and solidly bedded in 3:1 cement mortar with damp proofing, all as shown on the relevant drawing. Joints which shall not exceed 9 mm in width shall be neatly pointed.

Internal sills shall be constructed of red, or other approved colour, quarry tiles set in 3:1 mortar and laid true to line and level. Joints shall not exceed 6 mm in width. When similar tiles are scheduled, or shown for external sills, they shall be laid as for internal sills but on a uniform slope. All sills shall be kept free from cement and other stains, and shall be cleaned off on completion.

4.3.4.6 Damp proof course

Damp proofing in the walls shall be laid without any longitudinal joints, and lapped 150 mm at all end joints and intersections. Damp proofing shall be kept 10 mm back from the external face of walls and pointed in cement mortar.

Damp proofing under floors shall be laid with 150 mm laps at all joints in both directions.

Damp proofing in cavity walls shall be stepped up one course over a cement mortar triangular fillet in the bottom of the cavity.

Where brickwork rests on concrete the damp proofing shall be sealed to the concrete with hot bitumen.

Doors and windows shall be provided with damp proofing to sills and joints.

4.3.4.7 Separation of concrete from masonry - jointing

Concrete slabs and beams, including lintels, shall be separated from masonry by covering the contact bearing surfaces with 0,56 mm thick galvanised steel sheet bedded on a levelled up 3:1 cement mortar before the concrete is cast. The sheet iron shall be lapped not less than 25 mm at joints and intersections.

Unless otherwise specified or shown on drawings, 12 mm impregnated soft board shall be placed against the end of masonry where in contact with the sides of concrete columns and walls.

4.3.4.8 Bagged finish to masonry

Bagged finish to masonry, if done whilst the mortar in joints is still soft, shall be formed by rubbing over the wall surfaces with wet rough sacking, until all joints and crevices are filled up and an even surface is obtained. Mortar, as specified in 4.1.4.3 and 4.3.4.2 hereof, shall be added as may be necessary.

If bagging to walls is done after the mortar in joints has set, the wall surfaces shall be rubbed over with wet rough sacking as above, but cement grout shall be added as necessary to fill up the joints and crevices and to obtain an even surface.

4.3.5 CARPENTER AND JOINER

4.3.5.1 Carpentry general

Timber work shall be neatly executed and finished and all jointing shall be accurately cut and well fitted together.

Timber shall be of sizes specified or stated on drawings and shall be framed, checked, lapped, spiked and/or bolted together and as detailed below unless otherwise specified.

Wall plates shall be halved at junctions and angles. Purlins, battens, etc., shall be bevelled at junctions, and in all cases the joints shall be placed over a point of support and well spiked.

Where splices are necessary in rafters, ties or ceiling joists, the timbers shall be lapped at least five times the width of the timber and securely spiked. Splices in timber wider than 114 mm shall be bolted with at least three 9,5 mm bolts and washers, in addition to spiking.

Except where framed, or where bolts are specified to be used, all intersections and passing of constructional timbers shall be adequately spiked and where possible clinched in addition.

A patented nail system and factory made jointing techniques for roof trusses will be permitted with the written prior approval of the Engineer.

Roof trusses shall be set up at the centres indicated on the drawings, or as instructed by the Engineer, on 114 x 38 mm timber wall plates, and securely strapped down with mild steel straps, with one end wrapped around and spiked to the foot of the truss and purlin, and the other end built sufficiently far into the brickwork to preclude any risk of the finished roof being blown off.

4.3.5.2 Joinery

All joinery shall be well manufactured, all necessary framing, scribing, notching, mitring, fittings etc. being properly executed. All framed joints shall be pinned in addition to being glued. No portions of panels shall be glued. Nailing, where necessary, shall be done on the surrounding mouldings and in the most concealed manner.

All items shall be constructed of the timber specified, or approved by the Engineer in writing, and shall comply with the finished size dimensions as shown on the detail drawing.

The Engineer reserves the right to reject any joinery which is considered to be below the required standard, either because of the timber used or the quality of workmanship.

4.3.5.3 Timber doors and windows

Door frames shall be of profile suitable for the walls in which they are to be fixed, and shall be secured to walls with three lugs to each jamb. The feet of frames shall be firmly strutted and fixed solidly to floors complete with GI weatherproofing strips, as shown on the drawings.

Softwood doors and frames shall be knotted and primed before fixing.

All doors shall be hung plumb and level, so as to swing freely, and shall be stained, oiled or painted two coats approved paint after erection.

All external doors shall be hung on one and a half pair of hinges screwed into wooden frames or welded to steel frames. The doors shall be furnished with barrel bolts, and mortice locks.

Internal doors shall be hung on frames with one pair of hinges welded or screwed into the frames, and furnished with 2-lever mortice locks and bronze or chromium plated furniture as billed.

Window frames shall be secured to walls with 2 mm galvanized hoop iron lugs 38 mm wide, one end bent and screwed to frame and two screws to each and built 450 mm into wall with other end turned up into masonry joints. Windows not exceeding 914 mm in height of clear opening shall have two lugs at each jamb, but windows exceeding 914 mm in height of clear opening shall have three lugs at each jamb unless otherwise specified.

4.3.5.4 Ceilings

Ceiling, where shown on drawings, shall be erected on bracing at 300 x 1 000 mm spacing, or in accordance with the manufacturer's recommendation and approval.

4.3.5.5 Roofing

a) Fibre cement

Fibre cement roofing shall be carefully laid and fixed in accordance with the manufacturer's instructions, with side laps of half a corrugation and 300 mm end laps. All cutting shall be done with a suitable saw. Sheets shall be carefully drilled through the crown of the corrugation for, and secured to wood purlins with, galvanized iron drive screws, or secured to steel purlins with galvanized steel hook bolts, with washers as specified by the manufacturer.

The ridge of the fibre roof shall be covered with adjustable close-fitting ridge capping fixed in accordance with the manufacturer's instructions, complete with all necessary finials.

b) Aluminium "Longspan"

Aluminium "Longspan" roofing shall be carefully laid and fixed in accordance with the manufacturer's instructions, with side laps of one corrugation and 300 mm end laps. Sheets shall be carefully drilled for, and secured to wood purlins, with 90 mm aluminium drive screws, or secured to steel purlins with aluminium hook bolts, each with one aluminium alloy diamond shaped washer and round bituminous felt washer. Laps at ends and edges of sheets shall be sealed with an approved non-hardening mastic compound, and edges of sheets shall be bolted together at centres not exceeding 300 mm with 20 mm type "A" aluminium alloy, self-tapping screws with neoprene washers.

c) Galvanized iron

Corrugated galvanized iron sheets shall be lapped one and a half corrugations at sides, with end laps not less than 150 mm. Sheets shall be secured to wood purlins with galvanized iron screws and galvanized iron and lead washers. No iron affected by sea water or otherwise damaged shall be used on the Works. Ridges and hips shall be fixed with 150 mm end laps, and edges shall be closely beaten into the corrugations of roofing iron, and fixed with galvanized iron screws and galvanized iron and lead washers spaced not more than 300 mm apart.

Galvanized deep-fluted sheets shall be carefully laid and fixed in accordance with the manufacturer's instructions with side laps of one corrugation and 300 mm end laps, with ends of sheets bent up or down as required. Sheets shall be carefully drilled for, and secured to wood purlins with, galvanized drive screws, or secured to steel purlins with galvanized hook bolts, each with one galvanized steel and flat bitumen washers. Laps at ends or edges shall be primed with one coat approved self-etching primer and sealed with bitumen strips, size 30 mm wide x 3 mm thick, and carefully drilled for, and secured with, self-tapping screws or 6 mm galvanized bolts with bitumen washers.

d) Cement tile

Cement tile roofing shall be fixed in accordance with the manufacturer's instructions and generally as specified in SANS Code of Practice No. 10062.

e) FC Fascias and barge boards

Fibre cement fascia and barge boards shall be carefully drilled and screwed to roof timbers with, 40 x 12 gauge brass cup headed screws and washers, and shall be painted with two coats acrylic paint.

4.3.6 IRONMONGER AND SMITH

4.3.6.1 Ironmongery

All ironmongery shall be cleaned, oiled and eased until it operates perfectly, after it has been fixed in the work.

4.3.6.2 Windows and door frames

Before building-in, any damage to the shop primer shall be made good by painting with zinc chromate primer.

Windows and doorframes shall wherever possible be built into walls during construction and the lugs well secured. They shall be securely strutted to prevent distortion while the masonry is being built.

After completion and before plastering, the space between the frames and masonry shall be carefully and thoroughly filled with 3:1 cement mortar and the external joints raked out to a depth of at least 10 mm and caulked with a mastic cement forced into the joints.

Steel windows and doorframes, after glazing, shall receive two coats of oil paint to selected colours, after any damage to the zinc chromate primer has been made good.

4.3.7 PLASTERER, PAVIOR AND TILER**4.3.7.1 Plasterwork**

All masonry joints shall be raked out to afford a proper key for plaster and all surfaces shall be properly cleaned down and well wetted before any plaster is applied.

When plastering is required on concrete surfaces, these shall be hacked and thoroughly brushed with strong wire brushes to afford a proper key for the plaster. Soffits, beams, etc. shall be rendered in cement plaster as thinly as possible to provide a uniform surface on which cement plaster of a similar composition shall be skimmed.

External plaster shall be finished off with wood floats and internal plaster shall be steel trowelled unless otherwise specified. Plasterwork shall be kept damp until properly set and all finished surfaces shall be protected from injury.

No plaster on walls shall be less than 12 mm or more than 18 mm in thickness unless otherwise specified.

All salient angles and arrises shall be slightly rounded and all internal angles shall be finished perfectly true, square and smooth.

4.3.7.2 Air bricks

Openings formed for air bricks shall be rendered with plaster.

4.3.7.3 Screeds

Preparatory to the application of the screed, the concrete sub-floor shall be well soaked with water and coated with the thinnest practicable layer of (a) in the case of a concrete surface which is rough enough to ensure a good bond - a grout of neat cement well brushed on, and (b) in the case of a concrete surface which is not rough enough to ensure a good bond - with a slurry composed of one part of cement to two-and-a-half parts of coarse sand vigorously thrown on by means of a trowel or other suitable device. The screed shall be laid before the grout or slurry has set.

The screed shall be well compacted and rammed in with a wooden punner, and finished off level with a wood float or steel trowel as particularly specified, and then left to mature, being protected from damage during this period.

All screeds to receive special floorings shall be laid with surfaces, and cleaned off or washed, to the satisfaction of the specialist executing such flooring.

A screed on which PVC floor tiles are to be laid shall be between 25 and 40 mm thick. It shall be levelled off with a steel trowel, after the initial set has taken place, to a smooth surface free of all score marks, grooves and depressions. If shown on the drawings or required, a 40 mm radius concave skirting 100 mm high shall be formed in the screed against all walls.

4.3.7.4 Granolithic

The paving shall be not less than 20 mm thick and shall be laid in one operation. The surface shall be divided by V-grooves into rectangular panels not exceeding 9 m² in area.

When hard, the finished surface of granolithic floors shall be repeatedly scrubbed with clean water until all discolouration has disappeared. It shall then be damp-cured by covering with sand or hessian and kept damp for at least seven days. Thereafter the granolithic surfaces shall be protected from damage and discolouration, and prior to handing over the Works they shall again be thoroughly washed with clean water.

All skirtings shall be run direct on the masonry or concrete surface, and not against plaster of walls, and to the heights shown on drawings or directed by the Engineer. Skirtings shall be coved at floor and angle rounded along the top edge and to finish 6 mm past the face of the plaster.

Where tinting is directed, the pigment shall be mixed with the cement before the addition of water. Dusting on of colouring will not be permitted.

4.3.7.5 Terrazzo facings

Where shown on the drawings or ordered by the Engineer, walls or floors shall be surfaced with in situ terrazzo plaster with a scrubbed or polished finish. Such work shall conform to the following:-

The total thickness of terrazzo shall be 18 mm. The surface on which the terrazzo is to be placed shall be wetted and screeded with cement plaster, with the surface scratched over to form a key, and finished with a 10 mm thickness of terrazzo proportioned and mixed as specified in 4.1.7.4.

The terrazzo plaster shall be applied to the wall and floor surfaces and trowelled to an even surface. The plastered area shall be divided into panels of shapes and sizes shown on drawings with dividing strips set into the screed whilst still in a semi-plastic state. The facings shall be scrubbed with a brush to remove the cement and expose the aggregate, or polished, if so specified, after the cement has set.

The terrazzo shall be covered up, protected and washed down on completion. The work shall be carried out by skilled workmen experienced in this class of work.

4.3.7.6 Glazed wall tiling

Glazed wall tiling shall be fixed in accordance with SANS 10107. The wall tiling shall be fixed to a plumb-true 3:1 cement mortar screed, not less than 12 mm thick, which shall be scratched and left to dry.

The tiles shall be thoroughly soaked in water, the edges dipped in a grout of White Portland cement and pressed into a solid bed of 2:1 cement mortar, previously applied to the screed. The joints shall be continuous vertically and horizontally and as thin as possible, any white cement being wiped away and the whole cleaned off on completion.

The tiling shall be complete with all internal angles and rounded edge fittings, and shall be of the best quality executed by competent workmen.

4.3.7.7 PVC tiles

PVC floor tiles shall be laid in accordance with SANS 10070, on straight regular lines, and the finished floor shall have a neat and workmanlike appearance as specified in 8.2.3 hereof.

Before the floor covering is laid, the Contractor shall ensure that the screed has dried out to a moisture content of less than 6% and that it is thoroughly cleaned of all dust, grime, oil etc. The tiles shall be stuck down after applying the approved adhesive emulsion to both the screed and to the underside of the tiles.

4.3.7.8 Precast concrete slabs

Precast concrete paving slabs shall be laid on a 100 mm thick sand bed compacted to 100% of modified AASHTO maximum density. Joints between slabs shall not exceed 12 mm and shall be filled carefully by washing a weak cement sand mixture into the joints.

4.3.7.9 Concrete rainwater channels

Precast concrete channels shall be laid at falls from each downpipe as shown on the drawings. The ground on which the channels are laid shall be even and well compacted.

4.3.8 PLUMBER**4.3.8.1 Plumbing, drainage and sanitary work**

All workmanship and methods used for the installation of plumbing, drains and sanitary work shall comply with Chapter 12 of the Standard Building Regulations except that local Building Regulations having the force of law shall take precedence where conflict exists.

The work will be subject to approval by the Local Authority's Inspectors, if any, and by the Engineer. The Contractor's attention is drawn to the need to employ registered drainlayers and plumbers who are fully conversant with local regulations and codes of practice for this portion of the Works, to ensure that the Local Authority's Inspectors accept the work when finished.

4.3.8.2 Rainwater goods

Fibre cement rainwater goods shall be free from cracks, twists or other defects, with walls of uniform thickness, straight and smooth inside and out and truly circular in section. Gutters shall be accurately fixed, closely fitted together and jointed with an approved jointing compound and bolted. Rainwater pipes shall be closely fitted together, jointed with tarred rope gasket and approved jointing compound, and grouted with 3:1 sand/cement fillets.

4.3.9 GLAZIER AND PAINTER**4.3.9.1 Glazing**

Glass shall be cut to fit the rebates with due allowance for expansion, and shall be carefully bedded in putty, pegged or clipped in position, puttied evenly to a uniform level and neatly finished, all in accordance with SANS 680.

4.3.9.2 Painting

Before any paintwork is put in hand, surfaces shall be made good after all other trades and the Contractor shall inspect and satisfy himself that all surfaces of plaster, wood, metal, etc., which are to receive finishes of paint, stain, distemper, oil, etc., or paintwork of any description, are in a proper condition to achieve a high quality paint finish on them. All surfaces shall be filled with suitable stopping where necessary, rubbed down, perfectly clean, free from dust, dirt, grease, etc., before any painting etc., is undertaken. No painting or distempering shall be undertaken on plastered wall or ceiling surfaces until in the opinion of the Engineer they have thoroughly dried out and are in a fit state to receive the finish. All rooms and corridors etc., shall be swept clean before the painting is commenced, and no sweeping or dusting shall be done whilst painting or distempering is in progress.

Each coat of paint shall be a distinctive colour. Sample colours are to be prepared in all cases for the final coat. Every coat of paint, etc., shall be a good thick covering coat, and, if not, the Contractor will be required to apply extra coats at his own expense.

Walls behind baths and sinks to a height of 1,8 m or as shown on the drawing shall be painted with one coat alkaline resistant primer and one coat gloss oil paint.

New wrot woodwork specified to be painted (including the backs of wood frames etc.) shall be primed with white and red lead priming paint. Knots shall be knotted with shellac knotting before priming. Where special brands of patent paints are to be used, the manufacturer's priming, suitable for the particular brand employed, shall be used in accordance with the manufacturer's instructions.

New wood work shall be properly sandpapered and rubbed down to a smooth even surface before painting or staining and before each successive coat is applied. Stopping is to be tinted as required to match oiled or stained woodwork.

Existing woodwork previously painted shall be properly rubbed down and sandpapered to approval, or the existing paint removed if required. Running knots shall be cleaned off and coated with shellac knotting.

Where new galvanized iron surfaces are specified to be 'oxidised' before being painted, they shall be prepared with a 10% solution of copper sulphate in water, and the galvanized surfaces shall be washed with the solution. The black deposit formed almost immediately shall be thoroughly washed off whilst still wet with clean cold water and the surface allowed to dry. Other approved patent oxidising solutions if approved may be used to render new galvanized surfaces fit for painting, provided these are applied strictly in accordance with the manufacturer's instructions.

Hardwoods shall be given two coats of an approved timber seal or raw refined linseed oil well rubbed in. Fibre cement shall be painted with an undercoat and two coats of acrylic paint.

Exposed timber, unless painted or oiled, shall be given two coats of carbolineum preservative or equivalent.

Steel and iron surfaces, including those bedded in concrete, shall be painted as specified in the Specification dealing with Structural Steelwork.

Cast iron work shall be delivered to site without painted or coated surfaces. After erection, the cast iron shall be washed, using a detergent and nylon brushes to remove all rust and foreign matter. All traces of detergent shall then be washed off. As soon as the surface is dry it shall be painted two coats of 60% red lead primer, and then two coats of approved bituminous paint. No cast iron which is to be painted shall be previously dipped in tar or bitumen solution. Under no circumstances may wire brushes be used for removing rust or other contaminants.

The whole of the paintwork shall be touched up and made good on completion, and all paint spots and stains removed from floors, glass, etc. and all left perfect. All glass shall be thoroughly cleaned, all floors washed and the work left in a clean and properly finished condition.

4.3.10 ELECTRICIAN

4.3.10.1 General

The Contractor shall provide electrical wiring, internal and external lighting and fittings as shown on the drawings, shall undertake the relevant electrical work in accordance with SANS 10142-1, the Code of Practice for Wiring of Premises, and, on completion, shall submit to the Engineer a certificate obtained from the relevant authority stating that the electrical work complies with its requirements and regulations.

4.3.11 MISCELLANEOUS TRADES, FIXTURES AND APPLIANCES

See Specification Data.

5. Void

6. Void

7. Void

8. MEASUREMENT AND PAYMENT

8.1 Basic principles

8.1.1 General

Unless the building is measured by the sum in terms of item 8.2.12, the relevant items 8.2.1 to 8.2.11 shall apply.

8.1.2 Glazing

The cost of glazing will be held to have been included in the tendered rate for the items such as windows, doors, etc., that require glazing.

8.2 Billed items**8.2.1 Drainlayer**

The measurement and payment clauses of the Specifications dealing with sewers, stormwater, manholes and catchpits, and bedding, as applicable, shall apply.

8.2.2 Excavator

In addition to the measurement and payment clauses of the Specifications dealing with general excavation and trench excavation, the following shall apply.

8.2.2.1 Hardcore

Unit: square metre or cubic metre (m^2) or (m^3)

Hardcore filling will be measured by area or volume as billed.

The unit rate shall cover the cost of the provision, placing and compacting of the hardcore filling including filling of voids as necessary.

8.2.3 Concretor**8.2.3.1 Prestressed lintels**

(opening to be spanned to be stated)

Unit: metre (m)

Prestressed lintels will be measured linear.

The unit rate shall cover the cost of the supply of all materials and labour in manufacturing and installing the lintels.

8.2.4 Mason**8.2.4.1 Masonry**

Unit: square metre (m^2)

Masonry will be measured as the net area after all door, window and similar major openings have been deducted.

The unit rate shall cover the cost of the supply of all materials, cutting and waste, building in of timber, masonry lintels, wall ties, etc., plumbing openings and angles, forming all openings and reveals, struck jointing and all other labours, not separately billed. The cost of building in of windows, door frames etc. will be held to have been included in the unit rates tendered for those items.

8.2.4.2 Sills

Unit: metre (m)

External and internal sills will each be measured separately and linear.

The unit rate shall cover the cost of the supply of all materials and for all labours, cutting, waste, jointing, reinforcement, damp proofing of sills where shown on drawings, and cleaning on completion.

8.2.4.3 Damp proofing

(for walls width to be stated)

Unit: metre or square metre (m) or (m^2)

Damp proof course for walls will be measured linear as the net length of wall proofed. Damp proofing under floors will be measured as the net area of floor damp proofed.

The unit rates shall cover the cost of the supply and laying of all material, cutting, waste, laps and bitumen sealing where required.

8.2.4.4 Air bricks
Unit: set

Air bricks will be measured by sets comprising inside and outside, complete with copper gauze and reveals.

The unit rate shall cover the cost of the supply and fixing of the complete set.

8.2.4.5 Bagging
Unit:square metre (m²)

Bagging will be measured by area.

The unit rate shall cover the cost of all material and labour required to carry out the work.

8.2.4.6 Masonry reinforcing
(width of wall to be stated)
Unit: metre (m)

Where billed, masonry reinforcing will be measured linear.

The unit rate shall cover the cost of the supply, cutting, waste, installation and tools.

8.2.5 Carpenter and joiner

8.2.5.1 Timbers
Unit: metre or number (m) or (No.)

Timbers will be measured net linear. Roof trusses may be measured by number.

The unit rate shall cover the cost of cutting, scarfing, laps, waste and for nails and spikes.

The unit rate for roof trusses, where these are billed by number, shall cover the cost of the supply, manufacture and erection of the trusses including for all necessary "beam filling" between the top of the wall and underside of the roofing.

8.2.5.2 Joinery
Unit:number (No.)

Joinery items will be measured by number and type.

The unit rate shall cover the cost of the supply of all materials, manufacture of the items and for all fixing and painting or oiling as specified.

8.2.5.3 Doors
Unit:number (No.)

Doors will be measured by the number of complete units of each size and type.

The unit rate shall cover the cost of the supply, fixing and sealing of the door and frame (timber or steel, as specified) complete with GI strips, lugs and damp proofing where shown on drawings or as required, furniture, glazing and painting, or oiling. (See also items 8.2.4.1 and 8.2.9).

8.2.5.4 Timber windows
Unit:number (No.)

Timber windows will be measured by number of each size and type.

The unit rate shall cover the cost of the supply and fixing complete including all ironmongery, lugs, glazing and painting or oiling and sealing with mortar and/or damp proof course or GI strips as applicable. (See Subclauses 4.1.9 and 4.3.9 of

Specification QB).

8.2.5.5 Ceilings

- a) Ceilings (type to be stated)
Unit:square metre (m²)
- b) Cornice
Unit: metre (m)

Ceilings will be measured by area and the cornice will be measured linear.

The unit rates for ceilings and cornices shall cover the cost of the supply of all materials and labour including brandering, fixing, cutting, waste, nails and all fixings and for trimming and forming one trapdoor 600 x 600 mm in each building.

8.2.5.6 Roofing

- (type to be stated)
Unit:square metre (m²)

Roofing will be measured as the net area covered measured on the slope, if any.

The unit rate shall cover the cost of all laps, cutting, waste and fixing, and flashings and sealing materials to complete the roof to a weatherproof condition.

8.2.5.7 Fascias and barge boards

- (type to be stated)
Unit: metre (m)

Fascia and barge boards will be measured linear.

The unit rate shall cover the cost of the supply of all materials and for all cutting, waste, brackets, fixing, painting, and for all screws, bolts and the like.

8.2.5.8 Skirtings

- (type to be stated)
Unit: metre (m)

Skirtings will be measured linear.

The unit rate shall cover the cost of the supply of all materials and for all cutting, waste, brackets, fixing, painting, and for all screws, bolts and the like.

8.2.6 Ironmonger

8.2.6.1 Ironmongery

Ironmongery will NOT be measured or paid as separate items unless the Bill of Quantities includes specific prime cost or other items therefor.

8.2.6.2 Steel windows

- Unit:number (No.)

Steel windows will be measured by number of each size and type.

The unit rate shall cover the cost of the supply and fixing complete including all ironmongery, glazing and painting. (See item 8.2.6.9)

8.2.7 Plasterer, Pavior and Tiler

8.2.7.1 Plaster

- Unit:square metre (m²)

Plaster work will be measured as the net area plastered, including reveals, lintels and similar areas, and no deduction will be made for door frames or window frames, airbricks and the like. Internal and external plaster will be measured separately.

Separate items will be provided for plastering on masonry, on concrete and on manholes.

The unit rate shall cover the cost of the supply of all materials, labour and equipment to carry out the specified work.

8.2.7.2 Screeds, granolithic and skirtings

- a) Screeds and granolithic
Unit:square metre (m²)
- b) Skirtings
Unit: metre (m)

Screeds and granolith will be measured separately by area of floor surface covered and formed skirtings will be measured linear.

The unit rates shall cover the cost of all materials, compacting and levelling, forming of screeds and concave skirtings, waste, laying, jointing, cleaning and everything necessary to complete the work. The same principles will apply to floors specified to be stained.

8.2.7.3 Terrazzo facing

(whether floors or walls to be stated)

Unit:square metre (m²)

Terrazzo facings will be measured by area of the surface treated.

The unit rate shall cover the cost of the supply, mixing, laying and polishing or scrubbing complete with rebates, coves and edges.

8.2.7.4 Tiling

Unit:square metre (m²)

Tiling will be measured by area of completed tile surface.

The unit rate shall cover the cost of the supply of all materials complete with internal angles, rounded edge fittings and specials, and forming screeds.

8.2.8 Plumber

8.2.8.1 Rainwater goods

Unit:metre and number (m) and (No.)

Gutters and down pipes will be measured linear and drop ends, swan necks, shoes, etc. will be measured by number.

The unit rates shall cover the cost of the supply of all materials and for all fixing, jointing, cutting and waste, screws, brackets, holder bats and other fixings.

8.2.8.2 Drainage

Unit: sum or prime cost sum

Plumbing and drainage are billed as "sum" or as Prime Cost items.

The amounts tendered for these items shall cover the cost of the supply of all materials and labour for the complete installation of the relevant facilities in accordance with Subclauses 4.1.8.1, 4.1.8.2 and 4.3.8.1 of Specification QB from the service connections on the mains, excluding only the individual units of sanitary ware which are billed separately. (See item 8.2.8.3).

8.2.8.3 Sanitation

Unit: number (No.) or provisional sum

Sanitary ware items will be measured by number or as Provisional sums as billed.

The unit rate for billed items shall cover the cost of the supply and installation, including all fixings.

Provisional sums will be held to include for the cost of purchase and delivery of the relevant items in terms of the Clause in the General Conditions of Contract dealing with Provisional Sums (as amended by the Contract Data, if applicable). Any additional amount added to the Bill by the Contractor will be held to include for all costs of selection, installation, commissioning and defects liability in terms of the GCC.

8.2.9 Glazier and painter

8.2.9.1 Painting

Unit:square metre (m²)

Painting etc. will be measured and paid on walls and ceilings only. Measurement will be by the net areas painted, reveals, lintels and similar areas being measured.

The unit rates for doors, windows, steelwork, plumbing, fascias and the like will be held to include for painting etc. of the relevant items.

The unit rates for painting etc. shall cover the cost of all labour and material required to prepare the surfaces, paint the specified number of coats and clean up on completion.

8.2.10 Electrician

Unit:number, sum or prime cost

Electrical items will be measured by number, or will be billed as sum or as "Prime Cost" items.

The unit rates or sum shall cover the cost of all labour and material to complete the installation as specified.

8.2.11 Miscellaneous trades, fixtures and appliances

As set out in these Pricing Instructions.

8.2.12 Payment for complete building

Unit: sum or sum per building

Where specified or billed, buildings will be measured and paid by the sum or unit rate per each type of building.

The tendered sum or unit sum shall cover the cost of the supply of all necessary materials and the construction of the building complete as specified and shown on the drawings, assuming the building to be on level ground with the top of the floor slab 225 mm above ground level and the top of the concrete foundation 150 mm below ground level and including:

- i) the compacted fill under floors,
- ii) final clearing up of the site.
- iii) all plumbing, including trench excavation and backfilling, two vertical elbows, 10 m of 20 mm diameter polyethylene leading from the house to the end of the existing house water leading in the vicinity of the front cadastral boundary, the supply and complete construction of the meter/stopcock assembly and chamber and final connection to the existing house water leading.
- iv) drain laying including trench excavation and backfilling, two vertical 45° bends at the base of the stack, two horizontal 45° bends, 10 m of 110 mm diameter PVC-U pipe and the final connection to the existing end cap in the vicinity of the sewer main.

Furthermore, on sloping sites, the sum or unit rate for each house shall cover the costs of any additional vertical length of piping and drain laying required as a result of the height of foundation walls exceeding minimum dimensions for level sites, and of providing steps in the foundations.

8.2.12.2 Variations in quantities

- i) Any addition to or reduction from the standard horizontal length of 10 m of polyethylene water leading required will be measured and payment will be adjusted separately.
- ii) Any addition to or reduction from the standard horizontal length of 10 m of PVC-U drain piping or the number of bends required will be measured and payment will be adjusted separately.
- iii) Where sloping sites require additional work below floor level, the following items of additional work will be measured as billed:
 - a) Excavation to footings Unit:cubic square (m³)
 - b) Footing walls, area in elevation of each wall thickness measured separately Unit:square metre (m²)
 - c) Filling Unit:cubic square (m³)
 - d) Steps; sets of two, three or more steps will be measured separately as sets Unit:number (No.)

In all cases only the extra quantities required as a result of the sloping site will be measured.

The unit rates for these items shall cover the cost of all extra materials, labour, tools, plant, etc. required to bring the work below floor level to the specified levels over and above that required for a level site.

8.2.12.3 Interim stages

For the purpose of interim payments for building units successive stages of completion will be deemed to have the following proportional values:

- | | | |
|------|---|------|
| i) | Completion of foundations | 5% |
| ii) | Completion to window sill height including building-in of windows and door frames | 20% |
| iii) | Completion of roof | 40% |
| iv) | Completion of plasterwork, floors and ceilings | 60% |
| v) | Completion of doors and plumbing | 85% |
| vi) | Completion of glazing and painting | 95% |
| vii) | On handing over | 100% |

Note: The above will be subjected to the normal retention in terms of the General Conditions of Contract.

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APPENDIX A : APPLICABLE STANDARDS

Reference is made to the latest issue of the following standards:

BS 952	Glass for glazing
BS 1199	Building sands from natural sources
BS 1387	Screwed and socketed steel tubes and tubulars and plain end steel tubes suitable for welding or for screwing to BS 21 pipe threads
SANS 22	Glazed ceramic wall tiles and fittings
SANS 28	Metal ties for cavity walls
SANS 121	Hot dip galvanized coatings on fabricated iron and steel articles - Specification and test methods
SANS 226	Water taps (metallic bodies)
SANS 227	Burnt clay masonry units
SANS 248	Bituminous damp-proof courses
SANS 266	Gypsum plasterboard
SANS 460	Plain-ended solid drawn copper tubes for potable water
SANS 497	Glazed ceramic sanitaryware
SANS 523	Limes for use in buildings
SANS 542	Concrete roofing tiles
SANS 545	Wooden doors
SANS 559	Vitrified clay sewer pipes and fittings
SANS 581	Semi-flexible vinyl floor tiles
SANS 673	Mixtures of copper - chromium - arsenic compounds for timber preservatives
SANS 679	Zinc chromate primers for steel
SANS 680	Glazing putty for wooden and metal window frames
SANS 685	Fibre-cement sheets (flat and profiled)
SANS 723	Wash primer (metal etch primer)
SANS 727	Windows and doors made from rolled mild steel sections
SANS 786	Flexible vinyl flooring
SANS 791	Unplasticized poly(vinyl chloride) (PVC-U) sewer and drain pipes and pipe fittings
SANS 803	Fibre-cement boards
SANS 903	Aluminium alloy corrugated and troughed sheets
SANS 920	Steel bars for concrete reinforcement
SANS 927	Precast concrete kerbs, edgings and channels
SANS 929	Plywood and composite board
SANS 952	Polyolefin film for damp- and waterproofing in buildings
SANS 967	Unplasticized poly(vinyl chloride) (PVC-U) soil, waste and vent pipes and pipe fittings
SANS 1215	Concrete masonry units
SANS 1349	Phendic, aminoplastic and one-part polyurethane resin adhesives for the lamination and finger-jointing of timber, and for furniture and joinery
SANS 1783	Sawn softwood timber
SANS 10005	The preservative treatment of timber
SANS 10062	Fixing of concrete interlocking roofing tiles
SANS 10070	The installation of resilient thermoplastic and similar flexible floor covering
SANS 10096	The manufacture of finger-jointed structural timber
SANS 10107	The design and installation of ceramic tiling
SANS 10142	The wiring of premises
SANS 50197	Cement Part 1: Composition, specifications and conformity criteria for common cements

Standard building regulations

SANS 1200 D	Earthworks
SANS 1200 DB	Earthworks (pipe trenches)
SANS 1200 G	Concrete (structural)
SANS 1200 GA	Concrete (small works)
SANS 1200 LB	Bedding (pipes)
SANS 1200 LD	Sewers
SANS 1200 LE	Stormwater drainage

