BOOK 2 OF 2

public works & infrastructure
Department:
Public Works and Infrastructure
REPUBLIC OF SOUTH AFRICA

36-MONTH REPAIR AND REFURBISHMENT PROGRAMME

TENDER No: H22/037AI
REFERENCE NO: 21/1/2(47)

SOUTH AFRICAN POLICE SERVICE: VARIOUS CENTRES: MPUMALANGA ACORNHOEK, LEBOWAKGOMO, NELSPRUIT & THOHOYANDOU: LOCAL CRIMINAL RECORD CENTRES: REPAIR AND UPGRADING

TENDER DOCUMENT

NOVEMBER 2022

ISSUED BY:

NATIONAL DEPARTMENT OF PUBLIC WORKS AND INFRASTRUCTURE
Central Government Offices
c/o Bosman & Madiba (Vermeulen) Streets
PRETORIA
0002

NAME OF TENDERER: .....

TABLE OF CONTENTS

BOOK 2 OF 2

SPECIFICATIONS

TECHNICAL SPECIFICATIONS

PARTICULAR SPECIFICATIONS

ADDITIONAL SPECIFICATIONS

Technical Specifications

AA	Plumbing and Drainage installations
AB	Building electrical installations
BA	Roof Coverings
BB	Carpentry for concrete roofs
BC	Waterproofing for concrete roofs
BD	Walls
BE	Floors
BF	Structural concrete
BH	Fittings
BJ	Paintwork
CB	Storm water Drainage
CE	Water Distribution networks
FC	Hot Water Generation
FO	Local Criminal Record Centres
HE	Exterior Lighting installations
JC	Conventional Fire Fighting Equipment

Particular Specifications

PAA	Plumbing and Drainage
PJC	Conventional Fire Fighting Equipment

Additional Specifications

SA	General maintenance
SB	Operating and maintenance manuals
SC	General decommissioning, testing and commissioning procedures
SD	General training
SH	HIV / AIDS Requirements
SI	Occupational Health and Safety
SJ	Covid -19

TECHNICAL SPECIFICATION

AA PLUMBING AND DRAINAGE INSTALLATIONS

CONTENTS

AA 01 SCOPE

This specification covers the general maintenance and servicing of plumbing and drainage installations, which include the following:

(a) Rainwater disposal systems
(b) Soil and wastewater drainage systems
(c) Domestic water distribution and reticulation systems
(d) Sanitary and brassware equipment
(e) Fire water piped reticulation networks.

This specification shall form an integral part of the maintenance and servicing contract document, and shall be read in conjunction with the additional and particular specifications compiled as part of this document.

This specification shall act as a guideline to the Particular Specification and, in the event of any discrepancies between the Technical Specification and the Particular Specification, the latter shall take precedence.

AA 02 STANDARD SPECIFICATIONS

AA 02.01 GENERAL STANDARD SPECIFICATIONS, REGULATIONS AND CODES

The latest edition, including all amendments up to date of tender, of the following specifications, publications and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof:

AA 02.01.01 SANS Specifications and codes

SANS 10400	-	The application of the National Building Regulations
SANS 1200 DB	-	Earthworks (pipe trenches)
SANS 1200 LB	-	Bedding (pipes)
SANS 1200	-	Medium-pressure pipelines
SANS 1200 LD	-	Sewers
SANS 10252. Part 1	-	Water supply installations for buildings
SANS 10252. Part 2	-	Drainage installations for buildings

SANS Specifications listed on page 3 of the DPW Specification OW 371

AA 02.01.02 Department of Public Works Specifications

OW 371 - Specification of materials and methods to be used. (Fourth revision, October 1993)
Guide for architects concerning drainage, water supply and stormwater drainage
PW 343 - Building specifications for regional offices
FPO/G61/3E - Guide to architects
Drainage details.

AA 02.01.03 Occupational Health and Safety Act of 1993

All regulations and statutory requirements as laid down in the latest edition of the Occupational Health and Safety Act of 1993: Construction Regulations, 2003 as promulgated in Government Gazette No 25207 and Regulation Gazette No 7721 of 18 July 2003 shall be adhered to.

AA 02.01.04 Manufacturers' specifications, codes of practice and installation instructions

All equipment and materials shall be installed, serviced and repaired strictly in accordance with the manufacturers' specifications, instructions and codes of practice.

AA 02.01.05 Municipal regulations, laws and by-laws

All municipal regulations, laws, by-laws and special requirements of the Local Authority shall be adhered to unless otherwise specified.

AA 03 VARIATIONS AND ADDITIONS TO STANDARD SPECIFICATIONS

The following additional general specifications and requirements shall be read in conjunction with this specification and shall be adhered to unless otherwise specified in the Particular Specification.

AA 03.01 GENERAL REPAIR AND INSTALLATION REQUIREMENTS

(a) All materials and equipment supplied and installed shall be new, high quality and designed and manufactured to the relevant specifications and suitable for providing efficient, reliable and trouble-free service.

(b) All work shall be executed in a first-class workman-like manner by qualified registered plumbers.

(c) All equipment, component parts, fittings and materials supplied and/or installed, shall conform in respect of quality, manufacture, test and performance to the requirements of the applicable current SANS specifications and codes, except where otherwise specified or approved by the Engineer in writing.

(d) All materials and workmanship which, in the opinion of the Engineer, are inferior to that specified for the work will be condemned. All condemned material and workmanship shall be replaced or rectified as directed and approved by the Engineer.

(e) The Contractor shall submit a detailed list of the equipment and material to be used to the Engineer for approval before placing orders or commencing installation.

(f) All new piping shall be installed and positioned such as to not impede on access routes, entrances and other services. The Contractor shall coordinate these new pipe routes taking other services and equipment into account.

(g) All control equipment and serviceable items shall be installed and positioned such that they will be easily accessible and maintainable.

(h) The Contractor shall make sure that all safety regulations and measures are applied and enforced during the repair and maintenance work to ensure the safety of the public and the User Client.

(i) Repair and maintenance work shall be programmed in such a manner as to ensure the shortest possible downtime of any service and the least inconvenience to the User Client and the public. The Contractor shall make sure that the necessary notifications and notices are timeously put into place for these activities.

AA 03.02 GENERAL REQUIREMENTS FOR REPAIR AND INSTALLATION OF DOMESTIC WATER INSTALLATIONS

(a) All pipes are to be carefully examined for defects and flaws before installation and shall be neatly fitted. They shall be installed in such manner as to prevent the formation of air locks. Automatic air vents shall be installed on all high points of the installation.

(b) The ends of all the pipes are to be cleaned, free from burrs, and rough edges, and joined together tightly. Where applicable, an approved pipe joint compound may be sparingly used with best quality hemp. All surplus or exposed hemp is to be thoroughly cleaned off joints before the painting of pipes.

(c) All vertical pipes must be securely fixed with brackets and supports of approved type, fixed securely into the wall and not more than 40 mm from the wall. These fixings must be strictly adhered to.

(d) Pipes installed in service ducts and ceiling voids are to be perfectly plumbed and secured with approved brackets, fixed securely at distances not exceeding the specified distances and not more than 40 mm away from the face of the walls or soffits. Pipes inside buildings and where specified shall be chased into walls, wrapped with building paper and properly secured and covered. Pipes must be free to move in the brackets.

(e) Pipes passing through the walls and concrete floors are to be provided with suitable pipe sleeves extending 10 mm beyond finished floor or wall surfaces. All pipe fixings and throughways shall be free to allow movement for expansion and contraction. Any pipe fitting feeding a pipe which is rigidly secured by a structural element shall be securely anchored to prevent any stress developing between the fitting and the structural element.

(f) Chromium or nickel-plated metal covering plates are to be provided and fixed securely to pipes passing through the ceilings and walls. This requirement is not applicable to concrete floors and ceilings.

(g) Pipes passing through the ceilings or floors shall be offset from the wall to the front of the cornice with sufficient clearance to allow for the clear fixing of a ceiling plate. Pipes installed directly through the cornice will not be allowed. In multi-storey buildings where wall thickness varies, the same shall apply.

(h) All offsets are to be evenly and symmetrically set, the offsets being as high and as near the ceiling as possible.

(i) Pipes shall be installed in such a manner to allow for contraction and expansion.

(j) During construction all pipe ends shall be kept plugged to prevent any ingress of dirt, rubble, etc.

(k) Damages, chases, holes, etc, in brickwork, concrete and other finishes resulting from repair, replacement and service work shall be made good to match the existing and shall include plaster, concrete work, brickwork, paint, tiling, ceilings and all required materials for the remedial action.

(l) The work shall be of a high quality and executed by qualified tradesmen in accordance with the relevant specifications.

AA 03.03 GENERAL REQUIREMENTS FOR REPAIR AND INSTALLATION OF SOIL AND WASTEWATER INSTALLATIONS

The following requirements shall apply to this installation unless otherwise specified.

AA 03.03.01 Underground sanitary drainage installations

(a) All manhole covers and frames shall be cast into the concrete cover slabs.

(b) Manholes in trafficable areas shall be provided with type 1A heavy-duty cover and frame and surrounded by concrete slabs.

(c) Fittings in the ground and below floor slabs shall be without access eyes.

(d) Sewer pipes in the ground with a slope steeper than 1:5 and under surface beds shall be encased in concrete as detailed.

(e) The sewer outside the boundary of the building complex shall be constructed strictly in accordance with the details and specifications of the local authorities.

(f) Existing drainage invert levels and positions are to be checked against invert levels given on the drawings before commencing the work. The Contractor shall inform the Engineer immediately of any discrepancy.

(g) All existing services are to be located and opened before commencing the proposed drainage work.

(h) The drainage system shall be tested according to the specifications laid down by the NBRI. This shall be carried out in the presence and to the satisfaction and approval of the Engineer.

(i) During construction all pipe ends are to be suitably plugged to prevent any ingress of dirt, rubble, etc.

(j) Modern technology video surveying equipment and detection equipment shall be utilised to establish blockage problems and indicate the positions of such problems.

(k) Any drainage pipe within the 45° range below building foundations shall be encased in concrete or soilcrete as specified.

AA 03.03.02 Above ground sanitary drainage installations

(a) All accessible waste and soil fittings above ground level shall have inspection eyes. Inspection eyes shall not be underneath any fittings.

(b) All single wash hand basins shall be connected to a 40 mm internal diameter waste pipe.

(c) All groups of wash hand basins and sinks shall be connected to a 50 mm internal diameter waste pipe, unless otherwise indicated.

(d) All traps up to and including 50 mm diameter shall be of the "deep reseal" (75 mm) type.

(e) The maximum bend on any single fitting shall be 45°, with the exception of ventilation pipes where bends of up to 90° may be used.

(f) Drainage pipes and fittings running below concrete slabs and along walls and columns shall be suspended by means of approved type hangers, holderbats, etc, and at appropriate intervals, to provide a rigid, proper suspended system and as required by the manufacturer.

(g) All ventilation pipes shall be finished off with a suitable durable grating.

(h) All S-trap WC pans shall have plugged anti-siphon horns fitted to provide for cleaning access.

AA 03.04 PRESSURE TESTING OF PIPES

(a) All new pipe installations under the repair Contract shall be pressure tested before being taken into use. The Engineer shall witness this pressure test.

(b) Completed sections of the pipe installation shall be filled with water after all branches have been plugged, sealed or closed.

(c) The section of pipe shall be hydraulically pressure tested by means of a suitable manually operated or mechanically driven pressure pump.

(d) A pressure of at least 1,5 times the working pressure of the class rating of pipes or fittings shall be applied for a period of time specified in the specifications or as recommended by the manufacturers. (Refer to SANS 1200 L for minimum and maximum test pressures.)

(e) Tests shall not be performed against closed valves.

(f) Leakage which occurs shall be measured and calculated and checked against the allowable losses, as specified in SANS 1200 L.

(g) If the completed section of pipe complies with all specifications and passes the tests and inspection, it can be approved by the Engineer and the Contractor instructed to backfill the open sections of trench at the joints and connections, where applicable.

(h) The Contractor shall then proceed to build all the valve chambers, inspection chambers, etc, for underground installations and close off pipes in walls, voids and ducts for above ground installations.

AA 03.05 STERILISING OF WATER PIPES

(a) Before any repaired and new pipeline is taken into use, the pipeline shall be sterilised over its complete length, including the fittings. The pipe shall be filled with potable water chlorinated to a concentration of 15 mg of chlorine per litre of water, which shall remain in contact with the inner surface of the pipeline for a period of not less than 24 hours. The pipeline shall be filled for sterilising in such a manner that no chlorine shock is created or air is trapped in the pipeline.

(b) The Contractor shall submit full details of the proposed method of sterilising the pipeline to the Engineer for approval at least fourteen days prior to the commencement of sterilising.

(c) The cost of water for filling the pipeline for sterilising shall be borne by the Contractor.

(d) The Contractor shall provide all necessary materials, tools, equipment and labour required for sterilising the pipeline. After sterilising the pipeline the Contractor shall, at no extra cost, empty the pipeline and dispose of the water in a manner approved by the Engineer.

The Contractor may use the following products as a source of chlorine:

- chloride of lime to SANS 295 yielding 33 % free chlorine by mass;
- calcium hypochlorite to SANS 295 yielding 70 % free chlorine by mass;
- chlorine gas applied by chlorinator.

After sterilisation, an approved water quality test shall be carried out to a minimum number of 10 % of the total water points, randomly selected, evenly spread and marked on drawings. These tests shall include a full bacteriological test as per SANS 241 and the results shall be submitted to the Engineer for approval. Each abortive test shall be for the Contractor's account.

AA 03.05.01 Bacteriological requirements

When tested the water shall comply with the limits given in table AA 03.05.01/1.

TABLE AA 03.05.01/1

PROPERTY	RECOMMENDED MAXIMUM LIMIT	MAXIMUM ALLOWABLE LIMIT
Total coliform bacteria count per 100 millilitre	Nil*	5
Faecal coliform bacteria count per 100 millilitre	Nil	Nil
Standard plate count per millilitre	100	Not specified

*(a) If any coliform bacteria are found in a sample, a second sample must be taken immediately after the tests on the first sample have been completed. This sample shall be free from coliform bacteria.

(b) Not more than 5 % of the total number of water samples (from any one reticulation system) tested per year may contain coliform bacteria.

The Engineer shall witness the sterilising of the pipes.

The Contractor shall ensure that during the sterilising procedure the necessary safety precautions are instituted to prevent the intake of water by the user and/or public from the system. On completion the system shall be properly flushed out.

AA 03.06 AIR TEST FOR SEWER AND DRAINS

The following air test requirements as specified in the NBRI information sheet X/BOU 2-34 shall be applicable to all air tests on new sewers and drains installed under the repair work phase, and shall be executed by the Contractor and witnessed by the Engineer.

AA 03.06.01 Method of air testing

All openings in the pipeline are plugged by means of sewer testing plugs. The sewer plug at the lowest end of the pipeline is connected to an air supply hose, which is attached to a mechanically driven air blower, compressor or hand pump. Air is pumped into the pipeline at a pressure of approximately 375 mm water gauge. The pressure is held at this level for a period of two minutes to allow the air temperature to become constant. Subsequently the air supply is closed off and the time recorded for the air pressure to drop from 250 to 125 mm water gauge. If the recorded time is less than the value given in table AA 03.06.01/1 below, it means that the pipeline leaks and does not comply with the required standards of tightness. The apparatus required for the air test is commercially available.

The following requirements have to be taken into account when performing the air test:

(a) Air-permeable pipelines such as vitrified clay or asbestos cement should preferably be tested when moist or wet.

(b) The trench should be partially backfilled before the test is carried out. This is to stop possible temperature variations and to prevent damage to the pipeline during subsequent backfilling operations.

(c) The testing equipment should be shielded from the direct rays of the sun.

(d) Flexible joints are recommended for sewer and drain pipelines. Good quality flexible joints are superior to cement caulked joints and they also provide the pipeline with flexibility to prevent cracking due to subsequent soil movement.

(e) The test method is very sensitive to flaws in the pipeline, such as cracks or leaking joints. The actual positions of flaws along the pipeline can be determined by using the special equipment.

(f) If the pipeline is below the water table and subjected to external water pressure, the test method should be modified so that the final pressure value is higher than that of the external water pressure acting on the lowest part of the installation.

TABLE AA 03.06.01/1: MINIMUM TIMES FOR PRESSURE DROP OF 250 mm TO 125 mm WATER GAUGE

PIPE (DIAMETER (mm)	MINIMUM TIME (min - s)	CRITICAL LENGTH OF PIPELINE (m) (58 m^2 INTERNAL SURFACE AREA)	MINIMUM TIME (S) FOR LONGER LENGTH (L) OF PIPELINE
100	1 - 58	184,6	0,640 L
150	2 - 57	123,1	1,439 L
200	3 - 56	92,3	2,559 L
225	4 - 26	82,1	3,239 L
250	4 - 55	73,8	3,998 L
300	5 - 54	61,5	5,757 L
375	7 - 23	49,2	8,996 L
450	8 - 51	41,0	12,954 L
525	10 - 20	35,2	17,632 L
600	11 - 49	30,8	23,030 L

AA 04 OPERATING AND MAINTENANCE MANUALS

The Contractor shall be responsible for the compilation of an inventory list and operating and maintenance manuals.

This shall be done in accordance with Additional Specification SB: Operating and Maintenance manuals.

All information shall be recorded and captured in electronic format as well as supplying the Department with three sets of hard copies.

AA 05 TESTS AND INSPECTIONS ON COMPLETION OF REPAIR WORK

Except where otherwise provided in the Contract, the Contractor shall provide all labour, materials, power, fuel, accessories and properly calibrated and certified instruments necessary for carrying out such tests. The Contractor shall make arrangements for such tests and he shall give at least 72 hours notice to the Engineer, in writing, prior to commencing test.

In the event of the plant or installation not passing the test, the Employer shall be at liberty to deduct from the Contract price all reasonable expenses incurred by the Employer or the Engineer attending the repeated test.

Whenever any installation or equipment is to be operated for testing or adjusting as provided for above, the Contractor shall operate the entire system for as long a period as may be required to prove satisfactory performance at all times in the occupied space served by that system for up to twenty-four hours a day continuously until the system is handed over.

The Contractor shall provide all labour and supervision required for such operation and the Department may assign operating personnel as observers, but such observation time shall not be counted as instruction time.

After completing the installation or system, all equipment shall be tested, adjusted and readjusted until it operates to the satisfaction and approval of the Engineer.

The Contractor shall submit certificates of tests carried out to prove the performance of all equipment and also certificates to be obtained from all relevant authorities and statutory bodies, etc.

AA 06 QUALITY ASSURANCE SYSTEM

The Contractor shall institute an approved quality assurance (QA) system which shall be submitted to the Engineer for approval. The records of this QA system shall be kept throughout the duration of the Contract and be submitted to the Engineer at regular intervals as required.

AA 07 OPERATING AND COMMISSIONING OF PLANT AND INSTALLATION

On completion of the repair work and/or the installation of new systems the plant and equipment shall be put into operation after all tests and adjustments have been carried out to the satisfaction of the Engineer. The Contractor shall run and operate the system for a period of time as specified by the Engineer and train the staff of the User Client to operate and maintain the system. This period of time shall not exceed one month.

Logging of the operation of the installations shall commence immediately upon start-up.

The Contractor shall submit a full commissioning report.

AA 08 GUARANTEE OF INSTALLATION AND EQUIPMENT

The Contractor shall provide and obtain guarantees from the manufacturer(s) and/or supplier(s) to the effect that each piece of new equipment, supplied and installed under the repair contract, shall comply with the required performance and will function as part of the complete system.

All new equipment, including the complete new installations and the systems as a whole shall be guaranteed for a period of 12 (twelve) months commencing on the day of issue of a certificate of completion for repair work of the installation.

AA 09 REPAIR WORK TO INSTALLATIONS, SYSTEMS AND EQUIPMENT

AA 09.01 GENERAL

During the repair and maintenance Contract all the systems, installations and equipment shall be repaired as specified in the Particular Specification. This repair work shall include but not be limited to the specified Particular Specification details.

All repair work shall be executed using approved materials and equipment suitable to the systems and/or installations they serve.

All materials and equipment shall comply fully with the requirements as specified for each installation.

The said repair work shall be executed in accordance with the relevant codes of practice, standards, regulations, municipal laws and by-laws, manufacturer's specifications and codes of practice and all additional and particular specifications included in this document.

The repair work items shall be listed in tabular form in the Particular Specification with all relevant details, such as capacity, size, manufacturer, model number, etc.

All repair work shall be executed within the specified durations listed in the Appendix to Tender. All new equipment, materials and systems shall be furnished with a written guarantee with a defects liability period of 12 months from date of issue of a certificate of completion for the repair work. These guarantees shall be furnished in favour of the Department of Public Works. On completion of the required and specified repair work the systems, installations and equipment shall be commissioned and handed over to the satisfaction of the Engineer.

Repair work items for the plumbing and drainage installations shall be categorised under the following headings:

(a) Rainwater disposal systems
(b) Soil and wastewater drainage systems
(c) Domestic water distribution and reticulation networks
(d) Sanitary and brassware equipment
(e) Fire water piped reticulation networks.

AA 09.02 RAINWATER DISPOSAL SYSTEMS

AA 09.02.01 General

Repair work to the rainwater disposal system shall be detailed in the Particular Specification and shall include but not be limited to the following:

(a) Replacement of damaged, broken, leaking, corroded pipework and fittings;

(b) Replacement of damaged, broken and missing rainwater outlets, stormwater catch pit gratings, manhole covers and frames and floor drains;

(c) Repair work to damaged manholes, catch pits, kerb inlets, channel drains and drain points including builder's work and benching;

(d) Initial unblocking and clearing of all rainwater drainage pipes, manholes, catch pits, drain points, channel drains and gutters;

(e) Repair and upgrading of drainage system where necessary;

(f) Provision of additional rainwater drainage points where outlets are insufficient and ponding occurs;

(g) Prevention of any unauthorised effluent into this drainage system;

(h) Reinstatement and making good of walls, tiling, floors, concrete, road surfaces, etc, to approved acceptable levels where any repair, upgrade and/or service work have been executed;

(i) Realign and fix gutters to correct falls where necessary, including additional brackets where required.

AA 09.02.02 Material and equipment specification for rainwater disposal systems

Materials and equipment to be used for repair items shall be suitable and/or adaptable to the existing installation and shall comply with the following:

(a) Vitrified clay pipe and fittings

Vitrified clay pipes shall only be used for underground installations. The pipes and fitting shall strictly conform to SANS 559. The pipes and fittings shall have a minimum crushing strength of 45 kN/m.

The joining method to be used shall be polypropylene couplings with integral rubber seal similar or equal to Vitrosleeve in accordance with SANS 974 allowing up to 2,5° angular movement per joint and 5 mm line displacement per joint. The joint shall retain an effective water seal with regard to above conditions with a 6 m water head.

Pipes shall be cut using an approved pipe cutter and the ends shall then be trimmed by means of a pipe trimmer to remove any sharp edges.

The piping system shall be tested as indicated in this specification.

(b) Supercast cast-iron pipe and fittings

Supercast cast-iron pipes can be used for underground and above ground installations. Plain-ended cast-iron pipes and fittings, manufactured from 150, grade A grey iron in accordance with SANS 1034 shall be used. Fittings and pipes shall be free of pinholes, blowholes, blemishes, flash and foundry sand and have a smooth bore. All pipes and fittings shall be sand-blasted and coated on the inside and outside by submersion in a corrosion inhibiting oxide primer or bitumen paint.

The pipes and fittings shall be joined by means of stainless steel neoprene couplings as supplied by the manufacturer of the pipe system. The coupling shall be installed according to the manufacturer's specification and tightened with a torque wrench to a torque of 6,8 Nm.

(c) uPVC pipe and fittings above ground

uPVC pipes and fittings can be used for above ground installations.

For pipe sizes larger than 160 mm diameter uPVC class 6 pressure pipe to SANS 966 shall be used with prefabricated uPVC bends and junctions. Prefabrication shall be done by means of hot-air welding of fittings to be covered with three layers of fibreglass reinforced lining over welded sections. The resin to be used shall be as specified by the manufacturer for usage with PVC. Bends shall be manufactured out of 3 to 4 sections per bend. Pipe joints shall be done by means of couplings fixed with solvent cement for PVC piping. This joint shall be reinforced with a fibreglass lining of three layers.

Piping has to be supported and bracketed with properly sized and designed brackets consisting of two half sections clamped over the pipe and hanged with two hanger rods.

Pipes to be pressure tested in sections as specified in this specification.

(d) Prefabricated galvanized steel piping and fittings above ground

Prefabricated galvanized steel piping can be used for above ground rainwater drainage systems. The pipe to be used shall be plain ended medium gauge uncoated pipe to SANS 62 galvanized to SANS 763. All fittings are to be manufactured from the same material welded with flanged ends or rolled ends to fit clambon fittings. Fittings are only to be galvanized after manufacturing. All joints to be either flanged or equipped with clambon couplings. All fittings and junction to be 45° sections.

The pipe system shall be properly secured and bracketed at regular intervals with correctly sized and designed galvanized brackets.

Pipes are to be pressure tested in sections as specified in this specification.

(e) Geberit HDPe pipe and fittings

Geberit HDPe pipes and fittings can be used for underground and above ground installations where specified. Pipes shall be plain ended and only Geberit HDPe bends and fittings shall be used. Jointing of pipes and fittings shall be done by butt welding, electro-sleeve couplings and/or flanged joints. Pipes and fittings shall only be installed by Geberit approved installers and the Contractor shall furnish a certificate to this effect. Pipes and fittings shall be installed strictly according to the Geberit application technique.

Pipes to be pressure tested in sections as specified in this specification.

(f) Roof outlets

Where waterproofing is installed, as for roof slabs, an adjustable roof outlet/drainage point to be used consisting of a cast-iron unit with cast-iron ring clamp to fit over waterproofing edge and an adjustable height outlet to fit in with the screed level. For surfaces such as paving and walkways a flat grating of brass or cast iron shall be used with a catch basket. Within paving blocks a square top frame shall be used. For roof outlets a domed grating is to be used. Where roofs are to be covered with stones, a mesh shall be installed to prevent any stones from entering the rainwater system.

Two-way side outlets shall be used in cases where required.

Floor and roof outlets to be fitted to cast-iron pipe by means of SSN couplings.

AA 09.03 SOIL AND WASTEWATER DRAINAGE SYSTEM

AA 09.03.01 General

Repair work to the soil and wastewater drainage system shall be detailed in the Particular Specification and shall include but not be limited to the following:

(a) Replacement of damaged, broken, leaking, corroded above and underground pipework and fittings;

(b) Replacement of damaged, broken and missing gully gratings, manhole covers and frames, cleaning eye covers, screws and bolts, inspection eye covers, end caps and vent cowls;

(c) Repair work to damaged manholes, gullies, cleaning eyes, floor drains, etc, including builder's work and benching;

(d) Initial unblocking and cleaning of all drainage pipework, traps, floor drains, gullies and sanitary ware equipment;

(e) Video surveying of all underground drainage pipework to establish root ingress, damaged pipework, fat build-up, blockages, incorrect falls, sagging and as-built information. This survey shall be utilised to establish the extent of repair and upgrade work to be executed;

(f) Repair and upgrading of soil and wastewater drainage systems where necessary;

(g) Repair work to bracketing systems including fixing and repair of existing brackets and the introduction of additional brackets where required;

(h) Repair, re-fix and bracket sanitary ware equipment to walls, floors, etc, where required;

(i) Repair, replace and clean out sanitary ware and equipment traps;

(j) Test pipe system, traps and equipment for leakage;

(k) Empty, clean out separators, clean out strainers, and test for leak tightness, repair and recommission oil and grease separators. Check the conformance of the capacities of the oil and grease separators in relation to the facilities they serve; where necessary these shall be upgraded and where no separators have been provided, new separators shall be provided;

(l) Reinstatement of walls, tiling, floors, concrete finishes, holes, chases, surfaces, etc, to an approved acceptable level where any repair, upgrade and/or service work have been executed;

(m) Prepare, paint and repaint pipework and equipment where necessary, in accordance with Technical Specification BH: Fittings.

AA 09.03.02 Material and equipment specification for soil and wastewater drainage systems

Materials and equipment to be used for repair items shall be suitable and/or adaptable to the existing installation and shall comply with the following:

(a) Vitrified clay pipe and fittings

Vitrified clay pipes shall only be used for underground installations. The pipes and fittings shall strictly conform to SANS 559. The pipes and fittings shall have a minimum crushing strength of 45 kN/m.

The jointing method to be used shall be polypropylene couplings with integral rubber seal similar or equal to Vitrosleeve according to SANS 974 allowing up to 2,5 ° angular movement per joint and 5 mm line displacement per joint. The joint shall retain an effective water seal with regard to the above conditions with a 6 meter water head.

Pipes shall be cut using an approved pipe cutter and the ends shall then be trimmed by means of a pipe trimmer to remove any sharp edges.

The installation shall be tested according to the NBRI information sheet X/BOU 2-34.

(b) Supercast cast-iron pipe and fittings

Supercast cast-iron pipes can be used for underground and above ground installations. Plain-ended spun cast-iron pipes and fittings manufactured from 150 grade A grey iron in accordance with SANS 1034 shall be used. Fittings and pipes shall be free of pinholes, blowholes, blemishes, flash and foundry sand and to have a smooth bore. All pipes and fittings are to be sand-blasted

and coated on the inside and outside by submersion in corrosion inhibited oxide primer or bitumen paint.

The pipes and fittings shall be joined by means of stainless steel neoprene couplings as supplied by the manufacturer of the pipe system. The coupling shall be installed according to the manufacturer's specification and be tightened with a torque wrench to a torque of 6,8 Nm.

Where cast-iron stub stack overflow gullies are used with pipe materials such as PVC a rubber O-ring shall be used to fit over the PVC pipe into the cast-iron fitting. The joint shall be grouted up afterwards.

Above ground piping shall be bracketed with properly sized and designed brackets according to the manufacturer's specification at correct intervals.

The piping system shall be tested in accordance with the NBRI information sheet X/BOU 2-34.

(c) uPVC soil and waste pipe and fittings

UPVC soil, vent and waste pipe systems can be used for underground and above ground drainage installations. This piping shall conform in all respects to SANS 971 for underground systems and to SANS 967 for above ground systems.

All underground pipes, as well as soil pipes above ground, shall be joined by means of rubber ring seal couplings and fittings in accordance with the manufacturer's specification. All waste and vent pipes shall be joined by means of solvent weld fittings and couplings. The solvent weld glue to be used shall be as specified by the pipe manufacturer, allowing for thermal contraction and expansion.

The piping system shall be pressure tested in accordance with the NBRI information sheet X/BOU 2-34.

(d) Structural wall uPVC pipes and fittings

Structural wall uPVC drainage pipe can be used for underground drainage systems. This piping system shall be used with standard underground uPVC pipe fittings, equipped with rubber ring joints. The pipe shall be equipped with z-lock type rubber ring joints.

The piping system shall be pressure tested in accordance with the NBRI information sheet X/BOU 2-34.

(e) Geberit HDPe pipes and fittings

Geberit HDPe pipes and fittings can be used for underground and above ground installations. Pipes shall be plain ended and only Geberit HDPe bends and fittings shall be used. Jointing of pipes and fittings shall be done by butt welding, electro-sleeve couplings and/or flanged joints. Pipes and fittings may only be installed by Geberit approved installers and the Contractor shall furnish a certificate to this effect. Pipes and fittings shall be installed strictly according to the Geberit application technique.

The complete system shall be pressure tested in accordance with the NBRI information sheet X/BOU 2-34.

(f) Stainless steel floor traps and floor channels

Stainless steel floor traps and channels shall be manufactured from 304 stainless steel with a load capacity of 1 500 kg. The floor traps shall have a flow capacity of 3 litre/second.

The units shall be fitted with a double water seal, large sludge box and shall be easily dismantleable for cleaning purposes. Tiling keys and waterproofing flanges shall be provided where required. Side inlets with diameter of 50 mm shall be provided for waste connections to other equipment where required.

(g) Cast-iron floor traps

Cast-iron floor traps shall be manufactured from cast iron and shall be fitted with a water seal and a large sludge box and lid to be easy removable for maintenance purposes. The unit shall be designed such as to provide access to the drainage system and to be used as a cleaning point.

AA 09.04 DOMESTIC WATER DISTRIBUTION AND RETICULATION NETWORKS

AA 09.04.01 General

Repair work to the domestic water distribution and reticulation networks shall be detailed in the Particular Specification and shall include, but not be limited to the following:

(a) Replacement of damaged, broken, leaking, corroded above and underground pipe work, fittings and equipment;

(b) Repair, replace and service valves, which shall include new gaskets, gland packings, seals, bolts and nuts, etc;

(c) Where valves do not close properly, all these valves shall be refurbished, descaled and replaced where necessary;

(d) Repair, clean and service all strainers, including the replacement of strainer elements where corroded and installation of new gaskets;

(e) Repair, service, test and readjust pressure-reducing valves. Pressure gauges are to be recalibrated and checked. Up and downstream pressures are to be logged. Downstream pressure has to be adjusted to an acceptable level, taking into account the allowable working pressure of the system and its components;

(f) Repair, service and check the proper functioning of all non-return valves;

(g) Repair, service, readjust and calibrate all safety and expansion relief valves;

(h) Repair, service and clean out all air release valves and vacuum breakers;

(i) Repair work to bracketing systems including fixing and repair of existing brackets and provision of additional brackets where required;

(j) Hot-water pipe lagging and cladding shall be inspected, repaired, sealed and replaced where required;

(k) Repair, service and log readings of water meters including cleaning of integral strainers;

(l) Water storage tanks are to be emptied, cleaned out, repaired, sealed and put back into operation. Ball float and/or filling valves to these tanks are to be serviced and repaired where required;

(m) Water pipes are to be sampled for corrosion and scaling. The Engineer will evaluate the actions to be taken if the results of this sampling indicate that attention is required;

(n) Water supply has to be sampled and chemically analysed for the suitability to the systems and materials it serves;

(o) Domestic geysers are to be repaired and serviced in accordance with the manufacturer's specification and shall include descaling, replacement of elements, testing for any leaks, checking of safety valve operation (replace if required), testing of the thermostat operation and set point (replace if necessary);

(p) Pressure test and sterilise repaired new installation and equipment;

(q) Reinstatement and making good of walls, tiling, floors, concrete, finishes, holes, chases, surfaces, etc, to an acceptable level where repair, upgrade and/or service work have been executed.

AA 09.04.02 Material and equipment specification for domestic water distribution and reticulation networks

Materials and equipment to be used for repair items shall be suitable and/or adaptable to the existing installation and shall comply with the following requirements:

(a) Copper pipe installation

(i) The installation of copper piping systems shall be done in accordance with the manufacturer's code of practice and all relevant codes, standards and regulations.

(ii) Copper pipes shall only be installed downstream of galvanized mild steel pipes when applicable.

(iii) Where dissimilar metals are joined, dielectric or isolating couplings shall be used. This is not required where copper and brass dezincified alloys join.

(iv) Copper pipes shall be of the hard drawn type Class 0 in accordance with SANS 460 and shall be joined by means of capillary soldered type fittings. No compression type fittings shall be allowed unless otherwise specified.

(v) Copper capillary soldered type fittings shall be used in accordance with ISO 2016, SANS 1067, DIN 2856 or BSS 864.

(vi) The soldering flux to be used shall be water based and easily flushed out, withstand temperatures above 240 °C and shall contain no ammonia. The flux shall be non-toxic when dissolved in water.

(vii) The solder to be used shall be in accordance with SANS 24 and shall consist of a material containing 97 % tin and 3 % copper. Solders containing lead, resin core and acid core shall not be used.

(viii) The heat source to be used shall be propane gas with induction air, at a temperature not higher than 240 °C. The pipe ends and fittings shall be cleaned and waxed with an approved solder flux, before soldering.

The pipe and fittings shall then be fitted together and heated to the correct temperature before the solder is applied. Care must be taken not to add too much or too little solder to the joint. Immediately after setting of the solder the joint shall be wiped clean with a wet cloth. Pipes shall be washed out as soon as possible after jointing and all traces of flux shall be removed.

(ix) All bronze or brass equipment and fittings shall be of the dezincified type.

(x) Copper pipes and fitting shall be installed strictly to the manufacturer's specification and include the following:

(1) No labour bends;

(2) Provision for thermal contraction and expansion of pipes;

(3) Pipe brackets shall be installed at appropriate positions where pipes are installed on surface level;

(4) Pipes chased or built into walls or floors shall be wrapped with two layers of building paper or similar approved material. Hot and cold water pipes running next to each other shall be at least 50 mm apart;

(5) Equipment fixed to copper pipe outlets, where the pipes are surface mounted or built into walls, shall be done by means of copper wall plate fittings on the copper pipes, properly secured to the structure to prevent structural damage to soldered joints.

(xi) Pipe hangers and brackets shall be of copper, copper alloy or non-conductive materials. No piece of copper pipe shall touch any other conductive surface. Brackets shall be designed to structurally support and fix the pipe system, and shall allow enough clearance from walls, soffits, etc, to insulate hot-water pipes and maintain equipment.

(xii) Pipe hangers and brackets shall be installed according to the manufacturer's specification on the following maximum spacings:

PIPE DIAMETER (mm)	HORIZONTAL (metre)	VERTICAL (metre)
15	1,3	1,9
22 and 28	1,9	2,5
35 and 42	2,5	2,8
54	2,5	3,9
67 – 108	2,8	3,9

(xiii) All copper pipes open to structural damage, shall be protected by steel sleeves or structurally designed cover.

(xiv) All pipework shall be pressure tested and sterilised as specified.

(xv) Where flanged fittings are used, cadmium-plated bolts, nuts and spring washer shall be used to joint these flanges.

(xvi) All hot-water pipes shall be lagged as specified.

(xvii) Shut-off valves shall be installed on all branch pipes and ball-o-stop valves shall be installed on all connectors to basin pillar cocks, sink mixers, cistern type WCs and other fittings.

(xviii) All types shall be marked in accordance with SANS 10140 or as specified by the Engineer.

(xix) Approved type expansion bellows shall be installed where required for expansion and contraction to prevent excessive strain on fittings and soldered joints.

(b) Galvanized steel pipe installations

(i) All galvanized steel pipes shall be medium gauge mild steel screwed and socketed pipes to SANS 62 and shall be normalised and marked as such by the manufacturer. Pipes shall be hot-dip galvanized to SANS 763.

(ii) All fittings shall be malleable cast-iron fittings to SANS 509 and galvanized to SANS 763.

(iii) All 80 mm diameter and larger pipes shall be joined with Class 16 flanged couplings to SANS 1123/1600. The bolts, nuts and spring washers to be used on these joints shall be cadmium-plated.

(iv) In pipe ducts and elsewhere pipes shall be fixed onto walls, soffits, etc, with approved type of supports, holderbats, clamps, etc. Brackets shall be designed to structurally support and fix the pipe system and shall have enough clearance from walls, soffits, etc, to insulate hot-water pipes and maintain equipment.

(v) Pipes shall be supported according to the manufacturer's specifications with approved brackets at the following maximum intervals:

PIPE DIAMETER (mm)	HORIZONTAL (metre)	VERTICAL (metre)
15 dia to 20 dia	1,200	1,830
32 dia to 40 dia	1,830	2,450
50 dia to 150 dia	2,450	3,050

(vi) Pipes shall be installed in such a manner as to prevent air locks. A minimum rise of 1:250 shall be maintained to high points, which shall be fitted with suitable air release valves.

(vii) All pipes shall be marked according to SANS 10140 or as specified by the Engineer. All surface pipes shall be painted.

(viii) Pipes shall be installed flush unless otherwise instructed by the Engineer.

(ix) Provision shall be made for thermal contraction and expansion.

(x) The type of pipe joint compound shall be approved by the Engineer and used sparingly with good quality hemp. For pipes larger than 80 mm diameter a jointing compound such as Epidermix 32 shall be used.

(xi) Any pipe buried shall have at least 900 mm cover and be coated and wrapped to SANS 1117 and tested in the presence of the Engineer.

(xii) All exposed hot-water pipes shall be lagged as specified.

(xiii) All pipework and fittings shall be pressure tested and sterilised as specified

(xiv) Valves shall be installed on all branch pipes and ball-o-stop valves on all connectors to basin pillar cocks, sink mixers, cistern type WCs and other fittings.

(xv) Approved type expansion bellows shall be installed where required for expansion and contraction to prevent excessive strain on fittings and pipe joints.

(c) <u>uPVC underground pipe installations</u>

(i) uPVC piping shall conform to SANS 966 with rubber ring type joints.

(ii) All bends shall be uPVC type fittings with rubber ring joints.

(iii) All other fittings such as T-pieces, reducers, flanges, etc, shall be bitumen-dipped cast-iron rubber ring jointed fittings to SANS 546.

(iv) No solvent weld type fittings will be allowed.

(v) All cast-iron fittings shall be coated and wrapped to SANS 1117.

(vi) All pipes shall be layed on a 100 mm sand-bedding cradle and covered with 300 mm sand before backfilling.

(vii) All backfilling shall be in accordance with SANS 1200 DB and to the Engineer's and approval.

(viii) Pipe trenching and bedding:

AREA	MINIMUM COVER	BEDDING TYPE	MAIN FILL
Vehicle traffic	1 100	Flexible pipe bedding as per SANS 1200 LB	Soilcrete
Under surface bed	600		Soilcrete
Other areas	900		90 % of modified AASHTO density

(ix) All thrust blocks shall be cast between the pipe and the undisturbed trench material.

(x) No concrete shall come into direct contact with the UPVC pipe. At the thrust blocks the bend shall be wrapped with a Densopol 80 HT Tape or similar approved.

(xi) HDPe pipe connections to uPVC pipes up to 50 mm can be done by means of SG Iron manufactured saddles with the appropriate gaskets and cadmium-plated bolts and nuts.

(xii) All pipe crossings under traffic areas shall be backfilled with soilcrete and compacted as specified.

(xiii) All pipework shall be pressure tested with all joints uncovered, to the satisfaction of the Engineer.

(xiv) Suitably sized air release valves built into valve chambers shall be installed at all high points of the pipeline.

(d) HDPe underground pipe installations

(i) HDPE piping shall be Type 4 HDPe pipe to SANS 533.

(ii) All fittings shall be of Plasson compression type and shall conform to ISO/DIS 3458.

(iii) All pipes shall be laid on a 100 mm sand bedding cradle and covered with 300 mm of sand of selected material.

(iv) All backfilling shall be in accordance with SANS 1200 DB and to the Engineer's and approval.

(v) Pipe trenching and bedding:

AREA	MINIMUM COVER	BEDDING TYPE	MAIN FILL
Vehicle traffic	1 100	Flexible pipe bedding as per SANS 1200 LB	Soilcrete
Under surface bed	600		Soilcrete
Other areas	900		90 % of modified AASHTO density

(vi) No concrete shall come into direct contact with the HDPe pipe. At these points the fittings shall be wrapped with Densopol 80 HT tape or similar approved.

(vii) All pipe crossings under traffic areas shall be backfilled with soilcrete and compacted as specified.

(viii) All pipework shall be pressure tested with all joints uncovered to the satisfaction of the Engineer.

(ix) Suitably sized air release valves built into valve chambers shall be installed at all high points of the pipeline.

(e) Valves

(i) Gate valves underground in valve chambers to connect to uPVC piping (65 mm NB and larger)

Gate valves are to be equipped with non-rising spindle, spherical graphite iron body to SANS 936 Grade 42, cast-iron nitrile butadiene rubber covered gate, stainless steel spindle, nitrile butadiene rubber O-rings and seals, cast-iron bonnet and gunmetal thrust collar to BS 1400 LG2.

The valves shall conform to SANS 664 and/or 665 and shall be capable of withstanding a working pressure of 1 600 kPa.

The valves shall be fitted with a square key spindle top to close the valves in clockwise direction and socket ends to SANS 665 to fit into uPVC Class 12 pipe and installed to detail.

(ii) Gate valves underground in valve chamber to connect to HDPe piping

The gate valves shall be of the dezincified brass type with brass gate, brass body, non-rising spindle and BSP threaded socket ends. The valves shall conform to SANS 776 Class 125. The valves shall be able to withstand a working pressure of 1 600 kPa. The valve shall be fitted with a hand wheel on an extended spindle shaft of 700 mm to close in a clockwise direction and installed to detail.

(iii) Gate valves above ground for temperatures up to 40 °C to connect to steel piping (65 mm NB and larger)

Gate valves are to be equipped with non-rising spindle, spherical graphite iron body to SANS 936 Grade 42, cast-iron nitrile butadiene rubber covered gate, stainless steel spindle, nitrile butadiene rubber O-rings and seals, cast-iron bonnet and gunmetal thrust collar to BS 1400 LG2.

The valves shall conform to SANS 664 and/or 665 and shall be capable of withstanding a working pressure of 1 600 kPa.

The valves shall be fitted with flanged ends to SANS 1123, table 16, hand wheel to close the valves in a clockwise direction and installed in an upright position or sideways to a maximum 90 ° from upright.

(iv) Gate valves above ground for temperatures above 40 °C to connect to steel piping (65 NB mm and larger)

Gate valves shall be equipped with non-rising spindle, spherical graphite iron body to SANS 963 Grade 42, cast-iron gate, gunmetal seat and gate rings, high-tensile bronze spindle, cast-iron bonnet and gunmetal thrust collar to BS 1400 LG2.

The valves shall conform to SANS 665 and shall be capable of withstanding a working pressure of 1 600 kPa and a temperature of 90 °C.

The valve shall be fitted with flanged ends to SANS 1123, table 16, hand wheel to close the valve in a clockwise direction and installed in an upright position or side ways to a maximum 90° from upright.

(v) Gate valves above ground to fit to copper pipes (65 mm NB and larger)

Gate valves shall be equipped with non-rising spindle, gunmetal bronze or dezincified brass body, gunmetal or dezincified brass gate and graphite asbestos packing in the gland.

The valve shall be fitted with a hand wheel to close in a clockwise direction and installed in an upright position or sideways to maximum 90° from upright.

The valve shall be equipped with flanges to SANS 1123, table 16, hand wheel to close the valve in a clockwise direction and installed in an upright position or sideways to a maximum 90° from upright.

(vi) Gate valves above ground for temperatures up to 100 °C (up to 50 mm NB)

The gate valves shall be of the dezincified brass type with brass gate, brass body, non-rising spindle and BSP threaded socket ends. The valve shall conform to SANS 776, Class 125.

The valves shall be able to withstand a working pressure of 1 600 kPa.

The valve shall be equipped with a hand wheel to close in a clockwise direction.

The valve shall be installed in an upright position or sideways to a maximum 90° from upright and shall be so placed with other fittings to be removable without cutting the pipework.

(vii) Ball-O-Stop valves (15 mm diameter - 25 mm diameter)

These valves shall be full-way ballcock type with BSP threaded ends. The valves shall conform to SANS 1056, Part 3, shall be rated for a test pressure of 2 000 kPa, and shall be chrome-finished when exposed.

(viii) Angle regulating valves

These valves shall be 15 mm chromium-plated angle regulating valves with a 350 mm chromium-plated copper tube and cap nuts where required.

(f) Strainers

(i) Strainers for connection to steel or UPVC pipes (65 mm NB and larger)

These strainers shall be of the Y-type with cast-iron body, stainless steel or bronze strainer element and shall be equipped with flanged ends to SANS 1123, table 16. The hole sizes of the strainer element shall be maximum 1 mm diameter and be removable without dismantling of pipework. The strainer shall be suitable for a temperature of up to 90 °C at a 1 000 kPa pressure rating and installed with the element facing downwards or a maximum of 45° sideways.

(ii) Strainers for connection to copper pipes (65 mm NB and larger)

These strainers shall be of the Y-type with bronze or dezincified brass body, stainless steel strainer element and must be equipped with flanged ends to SANS 1123, table 16. The hole sizes of the strainer element shall be maximum 1 mm diameter. The strainer element shall be removable without dismantling of pipework. The strainer shall be suitable for a temperature of up to 90 °C at a 1 000 kPa pressure rating and installed with the element facing downwards or a maximum of 45° sideways.

(iii) Strainers for connection to steel and copper pipes (up to 50 mm NB)

These strainers shall be of the Y-type with bronze or dezincified brass body, stainless steel strainer element and must be equipped with BSP threaded socket ends. The hole sizes of the strainer element shall be maximum 0,8 mm diameter. The strainer shall be suitable for a temperature of up to 90 °C at a pressure rating of 1 000 kPa and installed with the element facing downwards or a maximum of 45° sideways.

(g) Non-return valves

(i) Non-return valves for cold water (65 mm NB and larger)

The non-return valve shall be of the spring-loaded dual flap plate type fitted between two flanges (wafer).

The non-return valve shall be equipped with a cast-iron body, aluminium bronze plates, stainless steel springs and neoprene seals on the plates. The valves shall be suitable for a working pressure of 1 000 kPa.

(ii) Non-return valves for hot water (up to 100 mm NB) and cold water (up to 50 mm NB)

These non-return valves shall be of the spring-loaded piston type, with bronze or dezincified brass body, stainless steel spring and bronze disc with neoprene seal fitted with BSP threaded socket ends. The valve shall be suitable for a working pressure of 1 000 kPa and a temperature of up to 90 °C. All valves shall be installed as to be removable without extensive pipework removal.

(h) Air release valves and vacuum breakers

(i) Double orifice double-acting air release valves with sizes from 50 mm NB to 200 mm NB

This air release valve shall be fitted with small and large orifice. The air release valve shall be fitted with a cast-iron body, stainless steel or fibreglass balls, integral shut-off valve and flanged ends to SANS 1123, table 16.

The valve shall be suitable for maximum pressure of 1 600 kPa.

(ii) Single orifice air release valves for main water lines with sizes from 25 mm NB to 50 mm NB

This air release valve shall be fitted with a small orifice, cast-iron body, fibre glass or stainless steel ball float and BSP threaded inlet.

When the valve is installed a shut-off valve shall be installed on the inlet side.

The valve shall be suitable for maximum pressure of 1 600 kPa.

(iii) Single orifice double purpose air release valves for domestic water lines up to 15 mm NB

This air release valve shall be fitted with a stainless steel float, brass or cast steel body with an integral shut-off valve fitted.

The valve shall be capable to withstand a working pressure of 1 000 kPa at 110 °C.

(iv) Vacuum breaker up to 40 mm diameter

The vacuum breaker shall be fitted with neoprene seal, spring-loaded disc in a dezincified brass or bronze body. The valve shall seal watertight and shall be designed to withstand a working pressure of 1 000 kPa and a temperature of 90 °C.

(i) Pressure-reducing valves

(i) Combination pressure-reducing stations

Where a high peak flow as well as a small flow can occur and the small flow is out of the range of the large pressure-reducing valve, a small pressure-reducing valve is installed in parallel with the large pressure-reducing valve. The two pressure-reducing valves in parallel shall be set according to the manufacturer's specification.

(ii) Large pressure-reducing valves (65 mm NB and larger)

This pressure-reducing valve shall be equipped with a cast-iron body, neoprene nylon-reinforced diaphragm, bronze seal disc washer, stainless steel shaft and flanged ends. The valve shall be pilot operated and shall be designed to handle high flows at a minimum head loss.

The valve must be adjustable to handle a wide range of incoming pressures at a constant downstream pressure.

The valve shall be equipped with flanged ends to SANS 1123, table 16.

(iii) Small pressure-reducing valves (15 mm NB to 50 mm NB)

This pressure-reducing valve shall be equipped with brass body, balanced single seat and integral strainer. The valve shall be able to handle a wide range of incoming pressures while the downstream pressure stays constant with maximum inlet pressure of 1 000 kPa and a maximum water temperature of 40 °C.

The valve shall be equipped with BSP male threaded brass union couplings.

(j) Water meters

(i) Combination water meters

Where high peak flow, as well as a small flow, can occur and the small flow is out of the registration range of the large water meter, a small water meter shall be installed in parallel with the large water meter to cater for the small flows with integral automatic change-over valves. These valves shall be designed to have a minimum pressure drop at operating point.

(ii) Water meters (50 mm NB and larger)

These water meters shall be of the dry type with all gears and transmission and roller counters in a dry head, and shall be equipped with flanged ends to SANS 1123, cast-iron body with high quality corrosion-proof coating. The meter shall be protected from magnetic fields and sealed to prevent tampering with adjustments. The meter must be able to work up to a pressure of 1600 kPa under a maximum water temperature of 40 °C. The scale of meter must be in cubic metre (m^3) and equipped with needle indicators reading in litres. Accuracy of meter shall be not less than 98 %.

The meters shall be installed with leading and trailing lengths of pipes to the manufacturer's specification.

(iii) Water meters (up to 50 mm NB)

The meter shall be of the volumetric rotary piston type with brass body equipped with union couplers. The meter reading must be in kilolitres. The meter shall have an accuracy of not less than 98 %. The meter must be able to operate up to a water pressure of 1000 kPa at a water temperature of 40 °C.

The meters shall be installed with leading and trailing lengths of pipes to the manufacturer's specification.

(k) Adjustable balancing valves

Adjustable balancing valves shall be supplied and installed as indicated on the applicable drawings. A portable differential pressure meter shall be used, with all the necessary pipes, shut-off valves and air release valves to set the balancing valves. A graph chart shall be supplied to indicate the flow units against the valve adjustment and as the pressure differential over the valve.

The pressure gauge shall be calibrated according to the current accepted SI units.

The calibrated adjustable balancing valves shall be of the angle valve type equipped with bronze valve body, bronze disc, internal seals with BSP threaded ends. The valve shall be fitted with stop-cock connection ends on inlet and outlet onto which the differential pressure gauge can be coupled. The valve shall be equipped with an indicator on the valve handle to show the position of the valve opening. The valve shall be suitable for operating at a temperature of 90 °C against a pressure of 1 000 kPa.

(l) Semi-conductive reheating tape for hot-water pipes

Semi-conductive reheating tape shall be strapped to the hot-water pipes under the thermal insulation. This reheating tape shall be installed strictly according to the manufacturer's specification.

The system shall be fitted with all the necessary end seals, tee splices, straps, etc, as required by the supplier.

The reheating tape shall be of the self-regulating type equipped with a parallel circuit, self-regulating conductive core, polyolefin jacket and tinned copper braid on the outside.

The reheating tape shall be sized to maintain an operating temperature of 60 °C of water inside the pipe.

(m) Expansion bellows

(i) Expansion bellows for pipes (50 mm NB and larger)

Expansion bellows shall be of the rubber-lined type fitted between flanges. These bellows shall be suitable for an operating temperature of -10 °C to 110 °C at an operating pressure of 1 500 kPa. The bellows shall be installed strictly in accordance with the manufacturer's specifications.

(ii) Expansion bellows for copper pipes (up to 40 mm NB)

These expansion bellows shall have a copper body with corrugated stainless steel lining and soldered capillary type couplings. The bellows shall be capable to withstand a working pressure of 600 kPa

at a temperature of 140 °C. Installation shall be strictly in accordance with the manufacturer's specifications.

(n) Lagging of hot-water pipes

(i) Preformed closed cell flame retarded flexible insulation sections

Where pipes are installed in service ducts, ceiling voids and where specified the pipes shall be insulated with Thermaflex preformed pipe insulation sections. This insulation shall be used with pipe systems where the maximum temperature is 80 °C. For a temperature higher than 80 °C preformed fibreglass sections shall be used with galvanized sheet metal muffs.

All bends and T-pieces shall be cut in a 45° mitre box to form a neat joint. All joints shall be glued together with a contact adhesive supplied by the manufacturer. Pipe sizes larger than 50 mm diameter shall be insulated with preformed fibreglass sections with canvas covers glued together with cold wood glue.

Thermaflex thickness for various pipe sizes shall be as follows:

PIPE SIZE (STEEL)	PIPE SIZE (COPPER)	THERMAFLEX THICKNESS
50 mm dia	54 mm dia	20 mm
40 mm dia	42 mm dia	20 mm dia
32 mm dia	35 mm dia	15 mm dia
25 mm dia	28 mm dia	15 mm dia
20 mm dia	22 mm dia	15 mm dia
15 mm dia	15 mm dia	15 mm dia

(ii) Preformed fibreglass sections with galvanized sheet metal muffs

All hot-water pipes in service tunnels, service corridors and where exposed to damage and/or weather shall be insulated with preformed fibreglass sections covered with galvanized sheet metal muffs in a watertight manner. Sheet metal muffs shall be installed with the joints overlapping at least 50 mm and the longitudinal overlap pointing downwards to prevent ingress of water. The sheet metal muff shall be strapped with 10 mm galvanized straps by means of a strapping tool with a minimum of 2 straps/section. All pipe bends, T-pieces, etc, shall be insulated with 25 mm diameter fibreglass rope covered with a 12 mm thick layer of self-setting fibre cement. A reinforcing gauge shall be wrapped over the fibre cement while wet and painted with mastic paint when dry.

Fibreglass section thickness for the various pipe sizes shall be as follows:

PIPE SIZE (STEEL)	PIPE SIZE (COPPER)	FIRBREGLASS THICKNESS
100 mm dia	108 mm dia	50 mm dia
80 mm dia	76 mm dia	40 mm dia
65 mm dia	67 mm dia	40 mm dia

PIPE SIZE (STEEL)	PIPE SIZE (COPPER)	FIRBREGLASS THICKNESS
40 mm dia	54 mm dia	25 mm dia
40 mm dia	42 mm dia	25 mm dia
32 mm dia	35 mm dia	25 mm dia
25 mm dia	28 mm dia	20 mm dia
20 mm dia	22 mm dia	20 mm dia
15 mm dia	15 mm dia	20 mm dia

AA 09.05 SANITARY AND BRASSWARE EQUIPMENT

Repair work to the sanitary and brassware equipment is detailed in the Particular Specification and shall include but not be limited to the following:

(a) Damaged and/or broken irreparable sanitary and brassware equipment shall be replaced with equal specification equipment or approved alternative. These shall be installed strictly to the manufacturer's specifications.

(b) Sanitary and brassware equipment that are unsuitable for the purpose and application they serve are to be replaced with suitable equipment.

(c) The quantity of sanitary and brassware equipment for the number of people and application they serve, shall be investigated in accordance with the current SANS 10400 application regulations. If found to be insufficient these facilities shall be upgraded only if approved by the Engineer.

(d) Loose sanitary ware shall be re-fixed and bracketed to structures in accordance with the manufacturer’s specifications.

(e) Stained sanitary ware equipment shall be cleaned, where possible, with approved cleaning agent in accordance with the manufacturer’s specification.

(f) All cisterns are to be cleaned out and filling and flushing mechanisms shall be serviced and repaired. Where beyond repair status these items shall be replaced with equal specification or approved alternatives.

(g) All worn-out and leaking flush valves are to be repaired by utilising the manufacturer’s replacement kits. Where flush valves are damaged beyond repair these shall be replaced with equal specification or approved alternatives.

(h) All pillar taps, mixers, sink taps and other taps are to be serviced, utilising repair kits. Where equipment is beyond repair these items shall be replaced with equal specification or approved alternatives. Where equipment connections are loose these shall be properly secured to sanitary ware and other equipment.

(i) Leaking, corroded or damaged chromium-plated flush pipes to water-closets and urinals are to be replaced where required.

(j) Replace missing and/or damaged shower gratings with equal specification or approved alternatives.

(k) Service and repair water metering taps by utilising manufacturer’s replacement kits where necessary. Where damaged beyond repair the complete item shall be replaced with equal specification or approved alternative.

(l) Replace missing or damaged tap handles with matching handles from the manufacturer of the tap.

(m) Readjust all timing mechanisms on flush valves and metering taps in accordance with repairs and services to the correct flushing and flow times.

(n) Replace damaged or missing basin and/or sink mixer swivel arms with equal specification or approved alternative.

(o) Replace missing or damaged toilet seats and covers with equal specification or approved alternatives.

(p) Repair and service urinal syphonic valves with replacement kits from manufacturer. Where no spares are available or equipment is damaged beyond repair, these items are to be replaced with equal specification or approved alternatives.

(q) Repair and clean out all bottle traps. Bottle traps that are damaged beyond repair are to be replaced with equal specification or approved alternatives.

(r) Repair and service bath taps and mixers by utilising manufacturer's replacement kits. Where damaged beyond repair, the taps and mixers shall be replaced with equal specification or approved alternatives.

AA 09.06 FIRE WATER PIPED RETICULATION NETWORKS

AA 09.06.01 General

Repair work to the fire water piped reticulation networks is detailed in the Particular Specification and shall include but no be limited to the work described below. This specification only covers the water piped reticulation for the fire water protection system, while the equipment to this installation, such as fire hydrants, hose reels and extinguishers, are covered and detailed in Technical Specification JC: Conventional Fire Fighting Equipment. This specification has to be read in conjunction with the afore-mentioned specification.

(a) Replace damaged, broken, leaking, corroded above and underground pipework, fittings and equipment.

(b) Repair, replace and service valves which shall include new gaskets, gland packings, seals, bolt and nuts, etc.

(c) Where valves do not close properly, all these valves are to be refurbished, descaled and if necessary replaced.

(d) Repair, service and check the proper functioning of all non-return valves and backflow preventers.

(e) Repair, service, readjust and calibrate all pressure gauges.

(f) Repair bracketing systems including fixing and repair of existing brackets and the provision of additional brackets where required.

(g) Report all problems related to fire fighting equipment to the Engineer.

(h) Water storage tanks are to be emptied, cleaned out, repaired, sealed and put back into operation. Ball float and/or filling valves to these tanks are to be serviced and repaired where required.

(i) Pressure test and sterilise repaired new installation and equipment.

(j) Reinstate and make good walls, tiling, floors, concrete, finishes, holes, chases, surfaces, etc, to an acceptable level where any repair, upgrade and/or service work have been executed.

(k) Record pressure readings on supply to installation.

AA 09.06.02 Material and equipment specification for fire water piped reticulation networks

Materials and equipment to be used for repair items shall be suitable and/or adaptable to the existing installation and shall comply with the following:

(a) Galvanized steel pipe installation

(i) All galvanized steel pipes shall be medium gauge mild steel screwed and socketed pipes to SANS 62 and shall be normalised and marked as such by the manufacturer. Pipes shall be hot-dip galvanized to SANS 763.

(ii) All fittings shall be malleable cast-iron fittings to SANS 509 and galvanized to SANS 763.

(iii) All 80 mm diameter and larger pipes shall be joined with Class 16 flanged couplings to SANS 1123/1600. The bolts, nuts and spring washers to be used on these joints shall be cadmium-plated.

(iv) In pipe ducts and elsewhere pipes shall be fixed onto walls, soffits, etc, with approved type of supports, holderbats, clamps, etc. Brackets shall be designed to structurally support and fix the pipe system and shall have enough clearance from walls, soffits, etc, to maintain equipment.

(v) Pipes shall be supported according to the manufacturer's specifications at the following maximum intervals:

NORMAL SIZE (mm)	HORIZONTAL (mm)	VERTICAL (mm)
15 dia to 20 dia	1 200	1 830
32 dia to 40 dia	1 830	2450
50 dia to 150 dia	2 450	3 050

(vi) All pipes shall be marked according to SANS 10140 or as specified by the Engineer. All surface pipes shall be painted.

(vii) Pipes shall be installed on the surface, unless otherwise specified.

(viii) Provision shall be made for thermal contraction and expansion.

(ix) The type of pipe joint compound shall be approved by the Engineer and used sparingly with good quality hemp. For pipes larger than 80 mm diameter a jointing compound such as Epidermix 32 shall be used.

(x) Any buried pipe shall have at least 900 mm cover and be coated and wrapped to SANS 1117 and tested in the presence of the Engineer.

(xi) All pipework and fittings shall be pressure tested as specified.

(b) uPVC underground pipe installations

(i) uPVC piping shall conform to SANS 966 with rubber ring type joints.

(ii) All bends shall be uPVC type fittings with rubber ring joints.

(iii) All other fittings such as T-pieces, reducers, flanges, etc, shall be bitumen-dipped cast-iron rubber ring jointed fittings to SANS 546.

(iv) No solvent weld type fittings will be allowed.

(v) All cast-iron fittings shall be coated and wrapped to SANS 1117.

(vi) All pipes shall be laid on a 100 mm sand bedding cradle and covered with 300 mm sand before backfilling.

(vii) Pipe trenching and bedding:

AREA	MINIMUM COVER	BEDDING TYPE	MAIN FILL
Vehicle traffic	1 100	Flexible pipe bedding as per SANS 1200 LB	Soilcrete
Under surface bed	600		Soilcrete
Other areas	900		90 % of modified AASHTO density

(viii) All thrust blocks shall be cast between the pipe and the undisturbed trench material.

(ix) No concrete shall come into direct contact with the uPVC pipe. At the thrust blocks the bend shall be wrapped with Densopol 80 HT tape or similar approved.

(x) HDPe pipe connections to uPVC pipes up to 40 mm diameter can be done by means of SG Iron manufactured saddles with the appropriate gaskets and cadmium-plated bolts and nuts.

(xi) All pipe crossings under traffic areas shall be backfilled with soilcrete and compacted as specified.

(xii) All pipework shall be pressure tested with all joints uncovered to the satisfaction of the Engineer.

(xiii) Suitably sized air release valves built into valve chambers shall be installed at all high points of the pipeline.

(xiv) Duckfoot bends shall be used to all fire hydrants at the foot of fire hydrants. This to be cast into thrust blocks.

(c) HDPe underground pipe installations

(i) All HDPe piping shall be Type 4 HDPe pipe to SANS 533.

(ii) All fittings shall be of Plasson compression type and shall conform to ISO/DIS 3458.

(iii) All pipes shall be laid on a 100 mm sand bedding cradle and covered with 300 mm of sand or selected material.

(iv) All backfilling shall be to the SANS 1200 DB and to the Engineer's approval.

(v) Pipe trenching and bedding:

AREA	MINIMUM COVER	BEDDING TYPE	MAIN FILL
Vehicle traffic	1 100	Flexible pipe bedding as per SANS 1200 LB	Soilcrete
Under surface bed	600		Soilcrete
Other areas	900		90 % of modified AASHTO density

(vi) No concrete shall come into direct contact with the HDPe pipe. At these points the fittings shall be wrapped with Densopol 80 HT tape or similar approved.

(vii) All pipe crossings under traffic areas shall be backfilled with soilcrete and compacted as specified.

(viii) All pipework shall be pressure tested with all joints uncovered to the satisfaction of the Engineer.

(ix) Suitably sized air release valves built into valve chambers shall be installed at all high points of the pipeline.

(d) Valves

(i) Gate valves underground in valve chambers to connect to uPVC piping (65 mm NB and larger)

Gate valves are to be equipped with non-rising spindle, spherical graphite iron body to SANS 936 Grade 42, cast-iron nitrile butadiene rubber covered gate, stainless steel spindle, nitrile butadiene rubber O-rings and seals, cast-iron bonnet and gunmetal thrust collar to BS 1400 LG2.

The valves shall conform to SANS 664 and/or 665 and shall be capable of withstanding a working pressure of 1 600 kPa.

The valves shall be fitted with a square key spindle top to close the valves in clockwise direction and socket ends to SANS 665 to fit into uPVC.

Valves are to be provided with locking devices to lock valves in open position.

(ii) Gate valves underground in valve chambers to connect to uPVC piping

The gate valves shall be of the dezincified brass type with brass gate, brass body, non-rising spindle and BSP threaded socket ends. The valves shall conform to SANS 776 Class 125. The valves shall be able to withstand a working pressure of 1 600 kPa. The valve shall be fitted with a hand wheel on an extended spindle shaft of 700 mm to close in a clockwise direction and installed to detail.

(iii) Gate valves above ground to connect to steel (65 NB and larger)

Gate valves are to be equipped with non-rising spindle, spherical graphite iron body to SANS 936 Grade 42, cast-iron nitrile butadiene rubber covered gate, stainless steel spindle, nitrile butadiene rubber O-rings and seals, cast-iron bonnet and gunmetal thrust collar to BS 1400 LG2.

The valves shall conform to SANS 664 and/or 665, and shall be capable of withstanding a working pressure of 1 600 kPa.

The valves shall be fitted with flanged ends to SANS 1123/1600, hand wheel to close the valves in a clockwise direction and installed in an upright position or sideways to maximum 90° from upright.

These valves shall be equipped with locking devices to lock valves in open position.

(iv) Gate valves above ground (up to 50 mm NB)

The gate valves shall be of the dezincified brass type with brass gate, brass body, non-rising spindle and BSP threaded socket ends. The valves shall conform to SANS 776 Class 125.

The valves shall be able to withstand a working pressure of 1 600 kPa.

The valve shall be equipped with a hand wheel to close in a clockwise direction.

The valves shall be installed in an upright position or sideways to maximum 90° from upright and shall be so placed with other fittings as to be removed without cutting the pipework.

The valves shall be equipped with locking devices to lock valves in open position.

AA 10 MAINTENANCE TO INSTALLATIONS, SYSTEMS AND EQUIPMENT

AA 10.01 GENERAL

Monthly maintenance responsibilities for each installation including all units and components as specified, shall commence with access to the site. A difference shall be made in payment for the maintenance prior to and after practical completion of repair work.

Maintenance responsibilities of the completed installation shall commence upon the issue of a certificate of practical completion for repair work, and shall continue for the remainder of the 36-month contract period.

This part of the Contract shall include routine preventative maintenance, corrective maintenance, and breakdown maintenance, as defined in Additional Specification SA: General Maintenance, for the specified installations described under the section AA 01 of this document.

The maintenance work to be performed and executed shall be done strictly in accordance with Additional Specification SA: General Maintenance, and as specified in the Particular Specification and this specification.

The said maintenance work shall be executed in accordance with the relevant codes of practice, standards, regulations, municipal laws and by-laws and the manufacturer's specifications and codes of practice.

The maintenance schedules and frequency shall be developed under the maintenance control plan to be instituted by the Contractor.

All new equipment, components and materials supplied and installed under the maintenance Contract shall be furnished with prescribed manufacturer's guarantees.

The maintenance work and items are to be categorised for each maintenance activity under the following headings:

(a) Rainwater disposal system
(b) Soil and wastewater drainage systems
(c) Domestic water distribution and reticulation systems
(d) Sanitary and brassware equipment
(e) Fire water piped reticulation networks.

AA 10.02 ROUTINE PREVENTATIVE MAINTENANCE

This routine maintenance of the installations, systems and equipment shall be done in accordance with Additional Specification SA: General Maintenance and the Particular Specification related to this work.

The routine maintenance work to be performed and executed shall include, but not be limited to the items listed in tables AA 10.02/1, AA 10.02/2, AA 10.02/3, AA 10.02/4 and AA 10/02/5 below under each heading.

These actions and findings shall be logged and reported on the relevant approved schedules and reports.

TABLE AA 10.02/1 - RAINWATER DISPOSAL SYSTEM

NO	ROUTINE PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCEFREQUENCY
1	Clean out and clear all rainwater gutters and full bores	Monthly
2	Clean out and clear all catch pits, channel drains and floor outlets	Monthly
3	Clean and unblock all drain pipes	Monthly
4	Check alignments of gutters	Six-monthly
5	Check and inspect all rainwater outlet gratings and replace if necessary	Six-monthly
6	Check gutter and pipe bracketing system and repair and replace if necessary	Four-monthly
7	Check and inspect manhole covers and frames for damages and replace if necessary	Six-monthly
8	Paint repairs to surface piping and equipment	Annually
9	Visually inspect and report on total system	Monthly

TABLE AA 10.02/2 - SOIL AND WASTEWATER DRAINAGE SYSTEM

NO	ROUTINE PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCEFREQUENCY
1	Visually inspect and report on complete installation	Monthly
2	Check, service and clean out grease traps	Monthly
3	Check, service and clean out oil separators	Monthly
4	Check, inspect and clean out all floor drains	Monthly
5	Check, inspect and clean out all gullies	Monthly
6	Replace broken or missing gully gratings	Four-monthly
7	Check, inspect, repair or replace all manhole covers and frames and builder's work to manholes	Four-monthly
8	Check, inspect and repair manhole benching.	Four-monthly
9	Check, inspect, repair or replace all inspection eyes, end caps and cleaning eye covers	Four-monthly
10	Check, inspect, repair or replace all bracketing systems	Four-monthly
11	Check, inspect, report and unblock any blockage that occurs	Monthly
12	Check, inspect, repair/replace and clean out all equipment traps	Monthly
13	Paint repairs to surface piping and equipment	Annually
14	Rodding of all main sewer lines	At start of Contract
15	Check, inspect, service, repair/replace all vacuum and two-way vents	Four-monthly

TABLE AA 10.02/3 - DOMESTIC WATER DISTRIBUTION AND RETICULATION SYSTEMS

NO	ROUTINE PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Visually inspect and report on complete system	Monthly
2	Log all water meter readings	Monthly
3	Log all pressure gauge readings	Monthly
4	Check, inspect, report and repair leaks	Monthly
5	Replace all valve gaskets, gland packings and seals	Annually
6	Sample water supply and chemical analyses to be provided by approved company	Annually
7	Bulk Water storage tanks to be emptied, cleaned out, inspected, repaired and resealed where necessary	Annually

NO	ROUTINE PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
8	Check, inspect, service, repair and readjust all pressure-reducing valves	Six-monthly
9	Check, inspect and test operation of all valves on site	Monthly
10	Clean out all strainers	Monthly
11	Check, inspect, service test and repair/replace all safety and expansion release valves	Six-monthly
12	Check, inspect, repair or replace all bracketing systems	Six-monthly
13	Check, inspect, service, repair/replace all air release valves and vacuum breakers	Six-monthly
14	Check, service, repair or replace all ball float valves	Four-monthly
15	Check, inspect, test, service, repair/replace all geyser installations	Six-monthly
16	Check, inspect, test, service and repair/replace all non-return valves	Four-monthly
17	Paint repairs to piping, fittings and equipment	Annually

TABLE AA 10.02/4 - SANITARY AND BRASSWARE EQUIPMENT

NO	ROUTINE PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Visually inspect and report on complete installation	Monthly
2	Inspect, repair/replace WC seats and covers	Monthly
3	Replace all tap washers	Six-monthly
4	Replace all tap gland packings	Six-monthly
5	Check, inspect, repair, fix and where necessary replace sanitary ware mountings and brackets	Four-monthly
6	Check, inspect, service, repair/replace all cistern flushing mechanisms	Monthly
7	Check, inspect, service, repair/replace all brassware	Four-monthly
8	Check, inspect, service, repair/replace all sanitary ware	Four-monthly
9	Check, inspect, service, repair, readjust all flushing valves	Four-monthly
10	Replace all flushing valve internal parts with replacement kits	Once per Contract
11	Stained equipment to be cleaned with approved manufacturer's cleaning agent	Six-monthly
12	Check, inspect, report and repair all leaks	Monthly
13	Check, inspect, repair/replace all shower gratings	Four-monthly
14	Paint repairs to all equipment	Annually

NO	ROUTINE PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
15	Check, inspect, repair, service, replace all missing valves	Six-monthly
16	Replace missing tap handles	As occur
17	Replace missing bath, basin, sink, etc, plugs	As occur

TABLE AA 10.02/5 - FIRE WATER PIPED RETICULATION NETWORKS

NO	ROUTINE PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Visually inspect and report on complete system	Monthly
2	Report any failures/breakage of fire fighting equipment to the Engineer	Monthly
3	Log all pressure gauge readings	Monthly
4	Replace all valve gaskets, gland packings and seals	Annually
5	Water storage tanks to be cleaned out resealed/repaired if necessary	Annually
6	Check, inspect, service, repair/replace all non-return valves and backflow preventers	Four-monthly
7	Check, inspect, report and repair all leaks	Monthly
8	Inspect, service, readjust and calibrate all pressure gauges	Four-monthly
9	Paint repairs to piping, fittings and equipment	Annually
10	Check, inspect, repair or replace all bracketing systems	Four-monthly

AA 10.03 CORRECTIVE MAINTENANCE

The corrective maintenance of the installations, systems and equipment shall be done in accordance with Additional Specification SA: General Maintenance and the Particular Specification related to this work.

The Contractor shall inspect and check all equipment, materials, systems and installation for any pending breakdowns, maladjustments or anomalies of equipment.

The Contractor shall report and take actions to correct such deficiencies.

AA 10.04 BREAKDOWN MAINTENANCE

Breakdown maintenance of the installations, systems and equipment shall be done in accordance with Additional Specification SA: General Maintenance.

All breakdown problems experienced shall be acted upon within the time limitations allowed in the General Maintenance documents.

All breakdown maintenance shall be done in accordance with the related specifications, standards, regulations and codes.

The Contractor shall have access to the necessary spares, equipment and tools for the expected breakdowns.

TECHNICAL SPECIFICATION

AB BUILDING ELECTRICAL INSTALLATIONS

CONTENTS

AB 01 SCOPE

AB 01.01 This specification comprises all aspects regarding the maintenance and servicing of building electrical systems. Building electrical systems comprise:

(i) Distribution boards and low voltage cable
(ii) Interior and exterior lighting of buildings
(iii) Small power and fixed appliances
(iv) Earthing and lightning protection system

AB 01.02 This specification shall form an integral part of the maintenance and servicing contract document and shall be read in conjunction with portion 3, the Additional Specifications included with this document.

AB 02 STANDARD SPECIFICATIONS, REGULATIONS AND CODES

AB 02.01 The latest edition, including all amendments up to date of tender of the following specifications, publication and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof.

AB 02.02 SANS Specifications

General	Distribution and meter boards	LV cables and conductors	Lighting system	Earthing and lightning protection system	Small power installation	
					Power outlets	Conduits, powerskirting, cable trays and ducting
SANS 10142	SANS 152		SANS 10114	SANS 03	SANS 152	SANS 950
SANS 10160	SANS 156	SANS 10198	SANS 163	SANS 10199	SANS 164	SANS 1065
SANS 10400	SANS 172	SANS 1411	SANS 1012		SANS 1084	SANS 1085
SANS 1222		SANS 1507	SANS 1084		SANS 1239	
			SANS 1250			
			SANS 1279			
			SANS 1777			
			SANS 10114			

AB 02.03 Department of Public Works Specifications PW 774 and PW 343.

AB 02.04 Occupational Health and Safety Act of 1993: Construction Regulations, 2003 as promulgated in Government Gazette No 25207 and Regulation Gazette No 7721 of 18 July 2003.

AB 02.05 Manufacturer's specifications and installation instructions.

AB 02.06 Additional requirements

Equipment and material installed shall be new and unused.
Luminaires, control gear, isolators and power outlets shall bear the SANS stamp. The Contractor shall ensure that all safety regulations and measures are applied and enforced during repair and maintenance work on cabling, wiring, distribution boards, luminaires, power points and fixed appliances.

AB 03 OPERATING AND MAINTENANCE MANUALS

AB 03.01 No operating and maintenance manuals shall be developed for this section.

The contractor shall use the maintenance control plan to schedule preventative maintenance actions.

AB 04 TESTS AND INSPECTIONS PRIOR TO PRACTICAL COMPLETION

AB 04.01 All systems are to be re-checked by the Contractor prior to re-commissioning. Copies of all checks for each installation shall be presented to the Engineer for approval before re-commissioning takes place.

AB 04.02 It is the responsibility of the Contractor to provide all labour, accessories and properly calibrated and certified measuring instruments necessary to record the following parameters:

AB 04.02.01 continuity of ring final circuit conductors
AB 04.02.02 continuity of protective conductors, including main and supplementary equipotential bonding
AB 04.02.03 earth electrode resistance
AB 04.02.04 insulation resistance

AB 04.02.05 polarity
AB 04.02.06 earth fault loop impedance
AB 04.02.07 operation of residual current devices
AB 04.02.08 phase voltage
AB 04.02.09 current per phase
AB 04.02.10 illumination levels in lux

AB 04.03 The Contractor is responsible for the arrangement of such tests. He shall give at least 72 hours notice to the Engineer prior to the test date.

AB 05 LOGGING AND RECORDING PROCEDURES

AB 05.01 The Contractor shall as part of this Contract institute a Recording system as part of his Maintenance Control Plan as defined in the Additional Specification SA – General Maintenance. This shall consist of a Record book which shall be utilised to log and record all faults, system checks, breakdowns, maintenance visits, inspections etc.

AB 05.02 The logbook shall be stored in a safe place and shall only be utilised by the Contractor and Engineer. A copy of the monthly entries and recordings into this logbook shall be submitted by the Contractor together with his monthly report to the Engineer.

This logbook shall be structured to at least include the following:

AB 05.02.01 Bi-annual inspection and testing of all systems.
AB 05.02.02 Monthly lamp inspection and maintenance actions.
AB 05.02.03 Annual earthing test report.
AB 05.02.04 Bi-annual inspection and testing of distribution boards.

AB 06 MAINTENANCE TOOLS AND SPARES

AB 06.01 On commencement of the Repair and Maintenance Contract, the Contractor shall supply and deliver certain Tools and Spares to the User Client. These tools and spares will be the property of the Department of Public Works. Any deficiencies or short fall or damaged Tools and Spares during the contract shall be replaced with new equipment / material.

AB 06.02 The Tools and Spares shall be kept safe in a lockable store room on site. The Contractor shall provide his own lock for the designated store room. The inventory of the Tools and Spares shall be verified on a monthly basis. Any short fall shall be replaced by the Contractor as part of his responsibility under this contract.

AB 06.03 The Tools and Spares shall at least include the following:

20 off PL 9W lamps
20 off 21W lamps
50 off 36W fluorescent lamps
20 off 58W fluorescent lamps
20 off 18W fluorescent lamps
10 off 250W HPS lamps
5 off 70W HPS lamps
Distribution kiosk key
DB face plate square key
DB face plate triangular key

AB 06.04 Tools and Spares: Measurement and payment

Item		Unit
(a)	**Supply of Tools and Spares**	No

The unit of measurement shall be the number of Tools and Spares supplied.

The tendered rate shall include full compensation for the supply and delivery of the Tools and Spares as specified.

AB 07 QUALITY ASSURANCE SYSTEM

AB 07.01 Following formal approval of his Quality Assurance system by Engineer, the Contractor shall implement the approved QA system.

AB 07.02 Records of this QA system shall be kept throughout the duration of the contract and shall be submitted to the Engineer as required by the Department.

AB 08 RE-COMMISSIONING OF INSTALLATION

AB 08.01 On practical completion of the repair work, the contractor shall re-check and put all systems into operation.

AB 08.02 All commissioning shall be performed by the Contractor, to the satisfaction of the Engineer. The Contractor shall confirm in writing that all systems have been repaired according to specification and are fully operational.

AB 08.03 All installations shall be energised for a minimum continuous period of 96 hours immediately prior to the Engineer's Practical Completion inspection to verify lamp stability and reliability of power reticulation

AB 09 REPAIR WORK TO LIGHTING INSTALLATIONS

AB 09.01 The various electrical systems shall be repaired during the first phase of the repair and maintenance contract.

AB 09.02 The scope of the repair work shall include, but shall not be limited to the activities listed below.

AB 09.03 The Contractor shall record the repair actions in tabular format before the Contractor's responsibility for maintenance commences.

AB 09.04 Repair work shall be executed within the approved period for repairs.

AB 10 INSTALLATION TECHNICAL DETAILS

AB 10.01 Installation description

Repair and maintenance work of the building electrical systems shall be categorised under the following installations:

AB 10.02 Scope of repair work

AB 10.02.01 Distribution boards and cabling

(a) Service distribution boards: inspect and clean the distribution boards, treat the enclosure for moisture ingress and corrosion.

(b) Check for rigidity and fastening of equipment trays, panels, doors and handling devices.

(c) Check locking mechanism and fit padlock. All padlocks shall be of local manufacture with brass bodies and 75 mm chrome shackles. Three keys (with pvc labels) shall be provided for each lock.

(d) Replace damaged or missing faceplates, doors, mounting frames, handles, thumb catches, etc.

(e) Check operation of distribution board equipment and meters, replace if faulty or damaged with an approved type.

(f) Remove all obsolete equipment and meters.

(g) Check and fasten wiring and cable terminations.

(h) Re-arrange wiring and equipment to give a neat installation.

(i) Trace outgoing circuits.

(j) Fit labelling and blank face plate covers.

(k) Replace the distribution boards if required and replacement is approved by Engineer. Check earth bar and earth continuity, record.

(l) Label all wiring and cabling with Grafoplast Trasp PVC markers.

(m) Replace all circuit breakers that are rated below 5 kA.

AB 10.02.02 Lighting system

(a) Indoor luminaires

(i) Operational and complete luminaires

- Remove lamps and wash luminaire body with detergent. Clean polycarbonate diffusors with detergent. Clean polished pure aluminium diffusors / reflectors with benzene.

- Check condition of luminaire seal, entrance gland, lampholder and internal wiring.

- Ensure that earth stud and earth connection is sound.

- Replace missing screws, catches, bolts and plugs.
- Check condition of suspension cords of pendant luminaires.
- Re-lamp.

(ii) Damaged or incomplete luminaires

- Remove luminaire.
- Replace luminaire and reconnect.
- Fit new lamps.

(b) Light switches

Note: All light switches shall have steel faceplates with permanent glued Multi-layered phenolic plastic labels.

- Remove switch cover.
- Check continuity of earth connection.
- Check operation of switch and replace if suspect.
- Replace switch cover, fit new csk stainless steel screws if required.

(c) Photocells

- Wash translucent body with detergent.
- Cover photocell and verify operation.
- Check bypass manual switching circuit.
- Enclose all exposed wiring in 16 mm ø Sprague.
- Install photocell in a dummy bulkhead

(d) Floodlight and bulkhead luminaires

- Remove lens and lamp. Wash lens thoroughly.
- Wash luminaire body with detergent.
- Clean polished pure aluminium reflectors with benzene.
- Check condition of internal wiring, capacitor, ballasts and starters.
- Check condition of neoprene seal and replace if worn or damaged.
- Check condition of lampholder.
- Seal conduit and wiring entry with silicone to eliminate water ingress.
- Fit new lamp.
- Check condition of earth stud and luminaire earth connection.
- Replace all missing screws, lens catches, bolts.

- Close cover securely, check stirrup bolts.

SCHEDULE OF LUMINAIRES

TYPE	DESCRIPTION
A	2 x 58W SABS OPEN CHANNEL FLUORESCENT LUNINAIRE – VOLTEX LIGHTING TYPE : R1/T-258 SS
B	2 x 36W SABS OPEN CHANNEL FLUORESCENT LUNINAIRE - VOLTEX LIGHTING TYPE : R1/T-236 SS
C	1 x 58W SABS OPEN CHANNEL FLUORESCENT LUMINAIRE - VOLTEX LIGHTING TYPE : R1/T-158 SS
D	1 x 36W SABS OPEN CHANNEL FLUORESCENT LUMINAIRE - VOLTEX LIGHTING TYPE : R1/T-136 SS
E	2 x 58W SABS IP 55 FLUORESCENT LUMINAIRE - VOLTEX LIGHTING TYPE : C2-258SS WITH WATERTIGHT DIFFUSER
F	3X 36W RECESSED MOUNTED FLUORESCENT LUMINAIRE WITH SINGLE PARABOLIC REFLECTOR
G	2X 36W RECESSED MOUNTED FLUORESCENT LUMINAIRE WITH SINGLE PARABOLIC REFLECTOR
H	2X 18W RECESSED MOUNTED FLUORESCENT LUMINAIRE WITH SINGLE PARABOLIC REFLECTOR
I	3X 18W RECESSED MOUNTED FLUORESCENT LUMINAIRE WITH SINGLE PARABOLIC REFLECTOR
J	2X 58W SURFACE MOUNTED FLUORESCENT LUMINAIRE WITH SINGLE PARABOLIC REFLECTOR
K	70W HPS B40 BRITELITE WALL MOUNTED BULKHEAD LUMINAIRE : VOLTEX LIGHTING TYPE B40-70W HPS
L	BULKHEAD LUMINAIRE - VOLTEX LIGHTING TYPE: B10 WITH 2XPL9 LAMPS
M	BULKHEAD LUMINAIRE - VOLTEX LIGHTING TYPE: B10 WITH 21 W DULUX EL ECO LAMP

N	DÉCORATIVE ROUND BULKHEAD – RADIANT TYPE: WT2A
O	DÉCORATIVE ROUND BULKHEAD WITH GRID – RADIANT TYPE: WT2G
P	250W HPS FLOODLIGHT LUMINAIRE : VOLTEX LIGHTING TYPE : L14ST-250 HPS
Q	250W MV LOWBAY DOWNLIGHTER BEKA TYPE: BEKATEC 250W HPS
R	400W MV SABS APPROVED HIGH BAY LUMINAIRE WITH AUTO LIGHT SIMILAR OR EQUALT TO BEKA BAY
S	BOWL TYPE IP55 BATHROOM FITTING WITH CERAMIC LAMP HOLDER WITH DULUX EL ECO 21W/E27 LAMP
T	DÉCOR ROUND CHEESE BULKHEAD 250 MM GLASS BOWL-ILM TYPE: DEC/RND/CHS/250 WITH 21 W DULUX EL ECO LAMP
U	WALL MOUNTED DÉCOR SPOT LIGHT ILM TYPE : ACC/SPT/100
V	CEILING MOUNTED 3 LIGHT DECORATIVE LUMINAIRE WITH GLASS CUPS AND DULUX EL ECO 21W/E27 LAMPS
W	CEILING MOUNTED 2 LIGHT DECORATIVE LUMINAIRE WITH GLASS CUPS AND DULUX EL ECO 21W/E27 LAMPS
X	CEILING MOUNTED SINGLE LIGHT DECORATIVE LUMINAIRE WITH GLASS CUPS AND DULUX EL ECO 21W/E27 LAMPS
Y	BULKHEAD LUMINAIRE - BEKA TYPE SERIES 30: WITH 2XPL9W CFL LAMPS
Z	CEILING FAN WITH 1 X GLASS CUPS AND 100W GLS LAMPS
AA	2XPL26W DOWN LIGHTER VOLTEX LIGHTING TYPE : CAS/S-2PL26
AB	21W DOWN LIGHTER VOLTEX LIGHTING TYPE : CAS/S-21W

AB 10.02.03 Power outlets and fixed appliances

Note: All power outlets shall have steel faceplates with permanent glued Multi-layered phenolic plastic labels.

(a) Inspect all power outlets and verify earthing.

(b) Check contact points and tighten screws.

(c) Replace missing screws and covers for outlet and draw boxes.

(d) Replace missing, faulty or damaged socket outlets and plugs.

(e) Check conditions and operation of local isolators and control switches for fixed equipment and replace if faulty, damaged or missing.

(f) Check earthing of fixed appliances and test for earth continuity.

(g) Inspect cable and wireways.

(h) Check for rigidity and fastening of the cable ducts, ladders, ducting, powerskirting and surface conduiting, fasten or replace if loose or damaged, check earthing and test for earth continuity.

AB 10.02.04 Earthing, bonding and lightning protection

(a) Check earthing and bonding of outlet points, equipment, cable and wireways, fixed appliances, water and gas pipes, etc.

(b) Check installation and termination of protective conductors and earth electrodes

(c) Test for earth continuity.

(d) Provide 6 mm² copper earth wire jumper between roof cladding and all gutter downpipes. Fasten with lugs and galvanized zinc bolts. Typically ten downpipes per housing unit. Earth at least two gutter downpipes by means of 16 mm² green insulated earth wire connected to 1,2 m earth electrode by means of cadwelding. Typically two downpipes per 25 m long housing unit.

(e) Installation of 50 mm² aluminium roof conductor in galvanised conduit from the roof cladding against the building to the earth electrode.

AB 10.03 Repair work : measurement and payment

AB.01 Distribution boards and cabling

Item	Unit
AB.01.01 Service distribution board	No

The unit of measurement shall be the number of distribution kiosks or boards opened and serviced as specified in Clause AB 10.02.

The tendered rate shall include full compensation for the opening of the distribution board or kiosk, internal cleaning of the enclosure, cleaning of equipment and meters, removal of obsolete distribution board equipment, re-arrangement of equipment and wiring, treatment of the enclosure for moisture ingress and corrosion, vermin protection, fastening and / or replacement of wiring, tracing of outgoing circuits, labelling of outgoing wiring and mcb's and cable terminations and earth testing.

The tendered sum shall further include for replacement of damaged, missing or faulty distribution board switchgear, meters, face plates, mounting frames, handling devices, doors, labelling with engraved Multi-layered phenolic plastic labels, neutral bars, earth bars etc. All downstream circuit breakers shall be rated at 6 kA fault level.

Item	Unit
AB.01.02 Replace distribution board	No

The unit of measurement shall be the number of distribution boards removed and replaced if replacement is approved by Engineer.

The tendered rate shall include full compensation for the dismantling of the DB equipment, removal of the dilapidated enclosure, supply and installation of an epoxy painted new enclosure, mounting frames, plates, equipment, meters, tracing of outgoing circuits, labelling etc.

The tendered sum shall further include for re-wiring of the board, cable termination, cable labelling, remedial builders work and earth testing.

Item	Unit
AB.01.03 Replace cabling	m

The unit of measurement shall be the linear length of cable supplied and installed.

The tendered rate shall include full compensation for the removal of the existing cabling; supply, handling, installation and termination of the specified type of cable.

This rate shall further include for the supply of all cable ties, clamps and other material necessary to ensure that the installation conforms to the specification.

Item	Unit

AB.01.04 **Replace wiring** m

The unit of measurement shall be the linear length of conductors supplied and installed.

The tendered rate shall include full compensation for the removal of the existing conductors, the supply, handling, installation, pulling in conduit and termination of the specified type of conductor.

This rate shall further include for the supply of all cable ties, labelling, and other material necessary to ensure that the wiring conforms to the specification.

Item	Unit

AB.01.05 **Jointing and termination of cables** No

The unit of measurement shall be number of cable joints or terminations.

The tendered rate shall include full compensation for the cost for providing the kits, complete with compound, ferrules and cable lugs, the cost for cutting the cable, handling and fitting kits and the cost of testing the joints and terminations. Position of joints shall be indicated on as-built drawings

Item	Unit

AB.01.06 **Supply and install padlocks** No

The unit of measurement shall be number of padlocks supplied and installed.
The tendered rate shall include full compensation for the ordering, supply and installation of the 75 m locally manufactured padlocks and locking devices as well as fitting each of the three keys with purpose-made pvc labels.

Item	Unit

AB.01.07 **Excavate in all materials for trenches, backfill, compact and dispose of surplus material** m^3

The unit of measurement shall be the cubic meter of material excavated in trenches.

The tendered rate shall include full compensation for clearing and grubbing the trench areas, for excavating the trench, preparing the bottom of the trench, separating material unsuitable for backfill and dealing with any surface or subsurface water.

The tendered rate shall furthermore cover the cost of installing the sand bed and sand cover, backfilling, compacting and disposing of the surplus material.

Item	Unit

AB.01.08 **Supply and install cable sleeves** m

The unit of measurement shall be the linear length in meter of the cable sleeve supplied and installed.

The tendered rate shall include full compensation for the supply, delivery, handling and installing the specified sleeves including the all the required, couplings, steel draw wires and plugs.

	Item	Unit
AB.01.09	**Supply and install plastic warning tape**	m

The unit of measurement shall be the linear length in meter of the plastic warning tape supplied and installed.

The tendered rate shall include full compensation for the supply, handling and laying of the plastic warning tape.

	Item	Unit
AB.01.10	**Termination of the low voltage cable**	No

The unit of measurement shall be the number of low voltage cable terminations.

The tendered rate shall include full compensation for providing the cable glands and shrouds, the cost for handling, fitting and cutting the cable.

	Item	Unit
AB.01.11	**Supply and install earth continuity conductor**	m

The unit of measurement shall be the linear length in meter of the earth continuity conductor supplied and installed.

The tendered rate shall include full compensation for procuring, furnishing and laying the specified earth continuity conductor.

	Item	Unit
AB.01.12	**Termination and connect earth continuity conductor**	No

The unit of measurement shall be the number of earth continuity conductors terminated and connected.
The tendered rate shall include full compensation for supplying all the material required to terminate and connect the earth continuity conductors and the connecting thereof to the earth bars, including label tags.

	Item	Unit
AB.01.13	**Supply and installation of circuit breakers**	No

The unit of measurement shall be the number of circuit breakers supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the specified type and size of circuit breaker, including printed PVC labelling.

	Item	Unit
AB.01.14	**Supply and installation of isolators**	No

The unit of measurement shall be the number of isolators supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the specified isolator, including printed PVC labelling.

	Item	Unit
AB.01.15	**Supply and install contactors**	No

The unit of measurement shall be the number of contactors supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the specified type of contactor, including engraved labelling on rear tray.

	Item	Unit
AB.01.16	**Supply and install switching timers**	No

The unit of measurement shall be the number of switching timers supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the specified type of switching timer, including labelling.

	Item	Unit
AB.01.17	**Supply and install earth leakage units**	No

The unit of measurement shall be the number of earth leakage units supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the specified type of earth leakage units, including labelling.

	Item	Unit
AB.01.18	**Supply and install fuses**	No

The unit of measurement shall be the number of fuses supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the specified type of fuse, including engraved label indicating fuse rating.

	Item	Unit
AB.01.19	**Supply and install surge arrestors**	No

The unit of measurement shall be the number of surge arrestors supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the specified type of surge arrestors, with visual indication.

	Item	Unit
AB.01.20	**Supply wire marker kit**	No

The unit of measurement shall be the number of specified wire marker kits supplied.

The tendered rate shall include full compensation for the procurement and delivery of the cable marker kit as specified.

AB.02 Lighting system

	Item	Unit
AB.02.01	**Re-lamp luminaire**	No

The unit of measurement shall be the number of lamps replaced.

The tendered rate shall include full compensation for the supply and installation of the specified lamp according to the manufacturer's instructions. Replacement date must be written on lamp.

	Item	Unit
AB.02.02	**Service luminaire**	No

The unit of measurement shall be the number of luminaires opened and serviced In accordance with Clause AB 10.02.

The tendered rate shall include full compensation for the servicing of the luminaire, including washing, checking of seals, glands, lamp holders, cleaning of diffusers, tightening of fixing screws and bolts, corrosion protection and the checking of earthing continuity and aiming angle if applicable. All external luminaire conduit entries are to be sealed with silicone, which cost is included in this payment item.

The tendered rate shall further include for replacement of the luminaires internal wiring where applicable and the tightening of all connections

	Item	Unit
AB.02.03	**Replace luminaire**	No

The unit of measurement shall be the number of luminaires replaced.

The tendered rate shall include full compensation for the removal of the existing luminaire and for the supply and installation of the specified type of light fitting complete with lamp and control gear, according to manufacturer's instructions.

	Item	Unit
AB.02.04	**Replace light switch**	No

The unit of measurement shall be the number of light switches replaced.

The tendered rate shall include full compensation for the removal of the existing light switch and for the supply and installation of the specified type of light switch to manufacturer's instructions. Light switch face plate shall be fitted with an engraved Multi-layered phenolic plastic label as per Nosa-standard, cost of, which is included in rate.

	Item	Unit
AB.02.05	**Replace photo-electric switch**	No

The unit of measurement shall be number of photocell units replaced.

The tendered rate shall include full compensation for the supply, connecting and testing of the switch.
The rate shall further include full compensation for the cost of providing and installing all hardware, screws, wall plugs, 16 mm ø sprague and other material required to install the photo electric light switch in accordance with the manufacturer's specification.

The tendered rate shall further compensate for the supply and installation of the photocell inside a dummy B10 bulkhead.

	Item	Unit
AB.02.06	**Replace luminaire diffuser**	No

The unit of measurement shall be number of luminaire diffusers replaced.

The tendered rate shall include full compensation for the supply and installation of the specified type of diffuser, including fixing screws and clips.

	Item	Unit
AB.02.07	**Service light switch**	No

The unit of measurement shall be the number of light switches opened and serviced.

The tendered rate shall include full compensation for the servicing of the light switch, internal cleaning of the enclosure, spray painting, inspection of the contact points, switching mechanism, earthing, etc.

The tendered sum shall further include for replacement of any missing outlet covers and fixing screw and earth testing. Light switch face plate shall be fitted with an engraved Multi-layered phenolic plastic label as per Nosa-standard, cost of, which is included in rate.

	Item	Unit
AB.02.08	**Remove, clean, store and reinstallation of luminaire**	No

The unit of measurement shall be the number of light fittings removed, cleaned, stored and reinstalled.

The tendered rate shall include full compensation for the removal, disconnect, cleaning, storage (4 weeks) reinstallation, reconnection and testing of the luminaire.

The rate shall further include full compensation for the installation of 2 x 700 mm supporting timber members above the ceiling (114 x 38 Par SA Pine) and the mounting of 63 mm ø round conduit outlet box complete with 2 x 4 x 60 mm galvanised screws.

	Item	Unit
AB.02.09	**Replace Lamp Holder**	No

The unit of measurement shall be the number of lamp holders replaced.

The tendered rate shall include full compensation for the removal of the existing lamp holder and for the supply and installation of the specified type (ceramic) of lamp holder to the manufacturer's instructions.

	Item	Unit
AB.02.10	**Replace Luminaire internal components**	No

The unit of measurement shall be the number of SANS approved internal luminaire components replaced.

The tendered rate shall include full compensation for the removal of the defective component and for the supply, installation and testing of the specified type of component to the manufacturer's instructions.

AB.03 Small power and fixed appliances

	Item	Unit
AB.03.01	**Replace socket outlet**	No

The unit of measurement shall be the number of socket outlets replaced.

The tendered rate shall include full compensation for the removal of the existing socket outlet and the supply and installation of the specified type of socket outlet.

All socket outlets shall be supplied complete with cover plates and boxes where required. The tendered rate shall therefore include for the supply of the cover plates and fixing screws where applicable. Outlet face plate shall be fitted with an engraved, Multi-layered phenolic plastic label as per Nosa-standard, cost of, which is included in the rate.

	Item	Unit
AB.03.02	**Replace isolator**	No

The unit of measurement shall be the number of isolators supplied.

The tendered rate shall include full compensation for the supply and installation of the specified type of isolator or control unit.
The tendered sum shall further include for the provision of 4 wire, 3 phase connections to the fixed appliance. Isolator face plate shall be fitted with an engraved Multi-layered phenolic plastic label as per Nosa-standard, cost of, which is included in the rate.

	Item	Unit
AB.03.03	**Replace plug tops**	No

The unit of measurement shall be the number of plug tops replaced.

The tendered rate shall include full compensation for the supply and installation of the required type of plug top.

	Item	Unit
AB.03.04	**Replace conduit**	m

The unit of measurement shall be the linear meter of conduit supplied and installed.
The tendered rate shall include full compensation for the supply and installation of the specified type and size of conduit, including all fixing accessories.

	Item	Unit
AB.03.05	**Replace wiring channel**	m

The unit of measurement shall be number of linear meter of wiring channel replaced.

The tendered rate shall include full compensation for the supply and installation of the specified type of wiring channel with 6 x 60 mm fasteners, including the cover and all the necessary accessories.

	Item	Unit
AB.03.06	**Replace connection from isolator to fixed appliance**	No

The unit of measurement shall be number of connections made.

The tendered rate shall include full compensation for the removal of the existing old connection and the supply and installing of the connections to the fixed appliances.

	Item	Unit
AB.03.07	**Service socket outlet**	No

The unit of measurement shall be the number of socket outlets opened and serviced.

The tendered rate shall include full compensation for the servicing of the socket outlet , internal cleaning of the enclosure, inspection of the contact points, switching mechanism, if applicable, earthing, etc. Outlet face plate shall be fitted with an engraved, Multi-layered phenolic plastic label as per Nosa-standard, cost of, which is included in the rate.

The tendered sum shall further include for replacement of any missing outlet covers and fixing screw and earth testing.

Item	Unit

AB.03.08 **Service isolator** No

The unit of measurement shall be the number of isolators opened and serviced.

The tendered rate shall include full compensation for the servicing of the isolator , internal cleaning of the enclosure, inspection of the contact points, switching mechanism, earthing and connections to the fixed appliance. Isolator face plate shall be fitted with an engraved Multi-layered phenolic plastic label as per Nosa-standard, cost of, which is included in the rate.

The tendered sum shall further include for replacement of any damaged or missing outlet covers and fixing screw, connections to appliances including earth continuity testing.

Item	Unit

AB.03.09 **Replace power skirting** m

The unit of measurement shall be the linear metre of power skirting supplied and installed.

The tendered rate shall include full compensation for the removal of the existing power skirting, the supply and installation of the specified type and size of powerskirting including all accessories.

Item	Unit

AB.03.10 **Supply and install Aluminium alloy cable junction box**
No

The unit of measurement shall be the number of Aluminium alloy cable junction box supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the specified type of Pratley box.

Item	Unit

AB.03.11 **Supply and install draw boxes** No

The unit of measurement shall be the number of draw boxes supplied and installed.

The tendered rate shall include full compensation for supplying and installing the draw boxes including cover plates where no equipment is installed in the box.

Item	Unit

AB.03.12 **Supply and install draw box cover plates** No

The unit of measurement shall be the number of draw box cover plates supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the specified type and size of cover plates for draw boxes including the fixing screws.

	Item	Unit
AB.03.13	**Replace "stop-start" local control panel**	No

The unit of measurement shall be the number of "stop-start" local control panels supplied and replaced.

The tendered rate shall include full compensation for the supply and installation of "stop/start" local control panel including emergency stop button and 32A 3 pole contactor in an IP55 polycarbonate enclosure. The rate shall include an engraved Multi-layered phenolic plastic label indicating load and supply DB.

	Item	Unit
AB.03.14	**Test and service ceiling mounted fan**	No

The unit of measurement shall be the number of ceiling fans tested.

The tendered rate shall include full compensation for the servicing of the fan, disconnection, testing, inspection of the contact points, switching mechanism, earthing and re-connection of the ceiling fan.

	Item	Unit
AB.03.15	**Replace ceiling mounted fan**	No

The unit of measurement shall be the number of ceiling fans supplied and installed.

The tendered rate shall include full compensation for the disconnection of the damaged ceiling fan and for the supply, installation and connection of the new ceiling fan.

	Item	Unit
AB.03.16	**Service ceiling mounted fan control switch**	No

The unit of measurement shall be the number of control switches opened and serviced.

The tendered rate shall include full compensation for the servicing of the control switch, inspection of the contact points, switching mechanism, if applicable, earthing etc.

	Item	Unit
AB.03.17	**Replace ceiling mounted fan control switch**	No

The unit of measurement shall be the number of control switches replaced.

The tendered rate shall include full compensation for the supply and installation of the control switch.

The tendered sum shall further include for the provision of connection to the ceiling fan.

	Item	Unit
AB.03.18	**Replace domestic stove components**	No

The unit of measurement shall be the number of stove components.

The tendered rate shall include full compensation for the supply and installation of the specified component.

The rate shall further include the disconnection and removal of the faulty component and the installation and testing of the new component.

Item		Unit
AB.03.19	**Replace geyser components**	No

The unit of measurement shall be the number of geyser components.
The tendered rate shall include full compensation for the supply and installation of the specified component.

The rate shall further include the disconnection and removal of the faulty component and the installation and testing of the new component.

The rate shall also include the draining of the water from the geyser and refilling before testing.

Item		Unit
AB.03.20	**Supply and Install Stove**	No

The unit of measurement shall be the number of electrical four plate stoves with oven and warm drawer supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the stove including connection and testing after approval of the Engineer.

Item		Unit
AB.03.21	**Provide Certificate of Compliance**	No

The unit of measurement shall be the number of Certificate of Compliance obtained from local authorities and issued to the Engineer for all the buildings under the installation.

The tendered rate shall include full compensation for the testing and all associated equipment to complete the Certificate of Compliance and certification thereof.

AB.04 Earthing and bonding

Item		Unit
AB.04.01	**Supply and install earthing and bonding for the installation**	Lump sum

The tendered lump sum shall include full compensation for the provision of all material required for the earthing and bonding of the installation in accordance with the specification.

Item		Unit
AB.04.02	**Testing of the earth installation by a specialist contractor**	Lump sum

The tendered lump sum shall include full compensation for the testing of the earth installation by a specialist contractor approved by the Engineer.

	Item	Unit
AB.04.03	**Supply and install earth electrodes**	No

The unit of measurement shall be the number of earth electrodes supplied and installed.

The tendered sum shall include full compensation for the supply and installation of the specified type and size of earth electrodes including termination by means of approved clamps.

	Item	Unit
AB.04.04	**Provide cadweld joint**	No

The unit of measurement shall be the number of cadweld joints provided.

The tendered sum shall include full compensation for the supply and installation of the specified type and size of cadweld pyro joints.

	Item	Unit
AB.04.05	**Earth building roof structure**	No

The unit of measurement shall be the number of roof structures earthed.

The tendered sum shall include full compensation for the supply and installation of the specified type and size of earthwire and the termination there off onto a 1,2 m Cu earth electrode driven into the soil 1,8 m deep.

AB.05 Inspection of Electrical Installation

	Item	Unit
AB.05.01	**Inspection of building general electrical installation**	sum

The unit of measurement shall be the sum for the building inspected prior to commencement of the repair work phase.

The tendered sum shall include the visual and functional inspection and testing of all lights, switches, small power points and fixed appliances, to determine the extent of repairs or replacements required.
The rate shall further include the preparation of a schedule of items (report) requiring repairs or replacement, for approval by the engineer.

AB 11 MAINTENANCE OF THE INSTALLATION

AB 11.01 Monthly maintenance responsibilities for each installation including all units and components as specified, shall commence with access to the site. A difference shall be made in payment for the maintenance prior to and after practical completion of repair work. The contractor will as part of his maintenance obligations service all the equipment as part of his maintenance obligations at the start of the contract.

Maintenance responsibilities of the completed installation shall commence upon the issue of a certificate of practical completion for repair work, and shall continue for the remainder of the 36-month contract period.

AB 11.02 The following maintenance actions will be required under this contract::

AB 11.02.01 routine preventative maintenance
AB 11.02.02 corrective maintenance
AB 11.02.03 breakdown maintenance

These actions are defined in the Additional Specification SA – General Maintenance.

AB 11.03 The maintenance schedules and frequency of maintenance activities shall be developed under the maintenance control plan which will be instituted by the Contractor. The Contractor's responsibility in this regard is specified in the Additional Specification SA – General Maintenance.

AB 11.04 Scope of routine preventive maintenance

The routine maintenance work to be performed and executed shall include, but not be limited to the items listed below. These actions and findings shall be logged and reported on the relevant approved schedules and reports.

AB 11.04.01 Monthly maintenance

(a) Check operation of protective and monitoring devices.

(b) Verify operation of switching elements and meters.

(c) Check lamp operation

(d) Measure phase voltages and currents in distribution boards and record values in Record book

(e) Inspect and repair the following:

(i) any visible damage to the installation
(ii) setting of protective and monitoring devices
(iii) ensure presence of diagrams, instructions and similar information
(iii) ensure upkeep of the labelling of the distribution board, equipment, cabling and wiring
(iv) ensure presence of Nosa-type engraved labelling on face plates or bodies of light switches, socket outlets and isolators.

AB 11.04.02 Annual maintenance

(a) Service all luminaires, distribution boards, socket outlets, isolators, light switches, etc.

(b) Carry out all tests listed under section AB 04.02 above and record values in the Record book

(c) Witnessed testing of all earth leakage protection units on all socket outlet units.

(d) Visually inspect the following and repair if required:

(i) connection of cables and conductors including earthing and bonding.
(ii) presence of appropriate devices for isolation and switching.
(iii) correct connection of socket outlets, light switches, isolators, lampholders, etc.

AB 11.05 Maintenance work : Measurement and payment

Refer to clause SA 06 of the ADDITIONAL SPECIFICATION : SA GENERAL MAINTENANCE

TECHNICAL SPECIFICATION

BA ROOF COVERINGS

CONTENTS

BA 01 SCOPE

This specification covers the removal of existing roof coverings and waterproofing and the supply, delivery and installation of new roof coverings and water-proofing to various types of buildings.

Roof coverings shall mean the scope of work related to the removal of existing roof coverings, water-proofing and ancillary items, the supply and installation of new roof sheeting, roofing screws, purlins, flashings, rainwater goods, water-proofing, fascias and barge boards. This specification also includes minor work related to trusses, purlins, paintwork, minor plumbing work and water-proofing to concrete roofs.

BA 02 STANDARD SPECIFICATIONS

BA 02.1 GENERAL STANDARD SPECIFICATIONS

The latest edition, including all amendments to date of tender, of the following specifications, publications and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof:

PW 371-		Specification of Materials and Methods to be used, fourth edition, Oct 1993
SANS 1200HB	-	Cladding and Sheeting
SANS 1783-4	-	Softwood brandering and battens
SANS 935	-	Hot-dip (galvanised) zinc coatings
SANS 1273	-	Fasteners for sheet roof and wall coverings

BA 02.2 ADDITIONAL SPECIFICATIONS

Technical Specification BB: Carpentry and Joinery for Roofs and Ceilings
Technical Specification BC: Waterproofing of Concrete Roofs

BA 02.3 ADDITIONAL REQUIREMENTS FOR REPAIR OF PROFILED ROOF SHEETING (NON-CONCEALED FIXING AND CONCEALED FIXING)

BA 02.3.1 Roof sheeting

Existing roof sheeting shall either be replaced or to a small extent be repaired according to the Schedule of Quantities and as instructed by the Engineer. Where new sheeting is specified, the existing roof sheeting must be removed. Each day's removed sheeting shall be fully covered with new roof sheeting at the end of the day. Plastic sheeting or equivalent approved protection to minimize damage possibilities due to rain, etc and to protect the personnel and occupied buildings. The new roof sheeting shall be 0, 6 mm thick galvanised baked silicone polyester enamel paint (baked enamel) IBR or equivalent approved for roof slopes exceeding 15º. Concealed fixed type Galvanised baked enamel roof sheeting will in general be used to cover roofs with slopes not exceeding 15º. The sheeting must be laid in long lengths without end overlaps. The broad flutes must be turned up at the apex to form a dam, and turned down at the eaves to form a drip. Metal closers 0,8 mm thick galvanised (baked enamel), complete with polyclosers set in one run of silicone sealant, are required at apexes, ridges, side and head walls, etc. The Contractor shall take all necessary dimensions and measurements on site prior to manufacturing and installation. Z275 galvanising spelter shall be used and the Contractor shall provide SANS certificates of compliance to the Engineer. Various standard dark colours will be used for baked enamel finished roof sheeting, flashings, gutters and down pipes. In all cases the roofing must be laid strictly in accordance with the manufacturer's specifications.

In certain cases, existing roof sheeting that is removed from buildings, will be re-used to repair similar types of structures.

The following paragraphs in specification PW 371 must be specifically read in conjunction with this technical specification:

Paragraph 7.6, excluding 7.6.1(i), 7.6.2(a) and 7.6.2(e)
Paragraph 7.7, excluding 7.7.1, 7.7.5 and 7.19.1(a).

BA 02.3.2 Main fasteners to timber purlins: Galvanised/baked enamel IBR or equivalent approved sheeting

90 mm x no. 14 hexagon head (H/H) carbon steel (C/S) cadmium plated Posidriv or equivalent approved roofing screws with 29 mm diameter x 1,0 mm thick galvanised conical washers and poly-isobutyl grommet assembly must be used. Main fasteners for steel purlins are to be 65 mm long. Fasteners to be provided at alternating ribs and all side laps.

BA 02.3.3 Side lap fasteners: Galvanised/baked enamel IBR or equivalent approved sheeting

Stitching will be done with 25 mm x no. 14 H/H C/S posidriv or equivalent approved roofing screws @ 600 c/c maximum with 29 mm diameter x 1,0 mm thick galvanised

conical washers and poly-isobutyl grommet assembly. Provide 10 x 1, 6 mm thick butyl rubber sealer strip between sheets.

BA 02.3.4 **Flashings**

0, 8 mm thick baked enamel/galvanised flashings at ridge caps, side and head walls, drips, corners, etc, as described elsewhere. The minimum length of an overlap between flashings is 150 mm. Apply two runs of silicone sealant between flashings. Flashings to be stitched together with 25 mm x no. 14 H/H C/S posidriv or equivalent approved roofing screws with 29 mm diameter x 1, 0 mm thick galvanised conical washers at end laps and longitudinally @ 400 c/c maximum at ribs, etc. The Contractor shall take all necessary dimensions and measurements on site prior to manufacturing and installation.

BA 02.3.5 **Sealant**

Silicone sealant with an amine cure system with primer shall be used to waterproof all flashings and rainwater goods, viz. gutters and down pipes. Two runs of silicone shall be provided at end overlaps.

BA 02.3.6 **Pipe flashings**

EPDM/silicone pipe-through-roof flashings to diameter or equivalent approved pipe flashings shall be used to waterproof pipe protrusions through the roof sheeting. Installation shall be done strictly in accordance with the manufacturer's specification and shall include the application of EPDM/silicone pipe through roof flashing and sealant and fastening of flashing to surface with TEKS or equivalent approved self-drilling fasteners.

BA 02.3.7 **Insulation**

No insulation repairs are required. In certain cases insulation may be necessary to reduce heat load or to comply with hygiene requirements as in abattoirs. Refer to section 7 part 7.6.3 of PW 371.

Specification for non-visible roof insulation material:

Heavy grammage double sided reflective aluminium foil (heavy grade) laid on 1,6 mm diameter galvanised straining wires at 300 mm centres to the manufacturer's specification. The insulation shall be laid longitudinally over the purlins and lapped 150 mm at joints.

Specification for visible roof insulation material:

White thermal insulation low density polyethylene bubble and Aluminium foil backing fire retardant grade laid on 1,6 mm diameter white plastic (PVC) coated straining wires at 383 mm centres to the manufacturer's specification. The insulation shall be laid longitudinally over the purlins and lapped at joints.

BA 02.4 ADDITIONAL REQUIREMENTS FOR REPAIR OF PROFILED SIDE WALL CLADDING (NON-CONCEALED FIXING AND CONCEALED FIXING)

BA 02.4.1 Side wall cladding

Existing side wall cladding shall either be repaired or replaced in accordance with the Schedule of Quantities. Where new cladding is specified, the existing side wall cladding must be removed. Each day's removed cladding shall be fully covered with new cladding at the end of the day. The new side wall cladding shall be 0,6 mm thick galvanised (or baked enamel) IBR or equivalent approved. The cladding must be laid in long lengths without end overlaps. Metal closers 0,8 mm thick galvanised (or baked enamel), complete with polyclosers set in one run of silicone sealant, are required at gables, ridges, side and head walls, etc. The Contractor shall take all necessary dimensions and measurements on site prior to manufacturing and installation. Z275 galvanising spelter shall be used and the Contractor shall provide SANS certificates of compliance to the Engineer. Heavy duty profiled polycarbonate sheets shall be used for translucent sheeting. Various standard dark colours for baked enamel finished side wall cladding, flashings, gutters and down pipes will be used. In all cases the cladding must be laid strictly in accordance with the manufacturer's specifications.

BA 02.4.2 Main fasteners to timber girts: Galvanised/Galvanised baked enamel IBR (or equivalent approved) and profiled translucent sheeting

90 mm x no. 14 hexagon head (H/H) carbon steel (C/S) cadmium plated posidriv or equivalent approved roofing screws with 29 mm diameter x 1,0 mm thick galvanised conical washers and poly-isobutyl grommet assembly must be used. Main fasteners for steel girts are to be 65 mm long. Fasteners to be provided at alternating ribs.

BA 02.4.3 Side lap fasteners: Galvanised/Galvanised baked enamel IBR (or equivalent approved) sheeting

Stitching will be done with 25 mm x no. 14 H/H C/S posidriv or equivalent approved roofing screws @ 600 c/c with 29 mm diameter x 1,0 mm thick galvanised conical washers and poly-isobutyl grommet assembly. Provide 10 x 1,6 mm butyl rubber sealer strip between sheets.

BA 02.4.4 End overlaps

If unavoidable, the end overlap shall be 300 mm minimum between sheeting and sealed with two rows of silicone sealant between the sheets. Bolt the ribs in the overlap region with the profiled (polycarbonate) translucent sheeting with galvanised no. 14 gutter bolts, bonded washers and nuts through every alternative rib.

BA 02.4.5 Side overlaps: Vertical profiled translucent sheeting

Stitching will be done with 6 mm cadmium-plated cladding bolts and nuts x 25 mm long @ ± 300 c/c with 19 mm diameter x 1,0 mm thick galvanised conical washers and poly-isobutyl grommet assembly.

BA 02.5 RAINWATER GOODS

BA 02.5.1 Gutters

Standard size for houses:
100 x 75 x 0,8 thick standard baked enamel/galvanised non-supporting beaded gutter. Galvanised brackets to be provided at every truss. Brackets to be painted to specification in the Schedule of Quantities.
Alternatively standard 140 x 127 x 83 x 0,6 mm thick concealed fix profile sheeting baked enamel/galvanised fascia gutter with galvanised gutter clips can be used.

Typical size for other buildings:
125 x 100 x 0,8 thick standard baked enamel self-supporting beaded gutter.

Dark colours to Consultant's specification.

The following paragraphs in specification PW 371 must be read in conjunction with this technical specification:
7.15, 16.12 and 16.13.

The Contractor shall take all necessary dimensions and measurements on site prior to manufacturing and installation.

BA 02.5.2 Joints in gutters, valleys, etc

150 mm overlap sealed with an approved silicone and riveted together with 2 rows of sealed pop rivets. Linings to valleys and secret gutters, etc, shall have an overlap of 225 mm.

BA 02.5.3 Gutter accessories and ancillary items

End stops: 0,8 mm thick baked enamel/galvanised finished end stops joined to gutter on site and sealed as for joints in gutters.

Outlets: 0,8 mm thick baked enamel/galvanised finished outlets fixed to gutter with pop rivets and sealed with an approved silicone. Outlet to slip into down pipe.

Fascia straps: 25 mm wide x 1,0 mm thick galvanised straps at +/- 686 mm c/c.

Corner joints: Corner joints to be neatly mitred, pop riveted together and sealed with an approved silicone.

Sealant: Clear silicone sealant with amine cured system and primer shall be used to waterproof gutters and down pipes.

BA 02.5.4 Down pipes

Standard sizes:
100 x 75 x 0, 6 thick baked enamel/galvanised down pipes
100 x 100 x 0,8 thick baked enamel/galvanised down pipes

Dark colours to Consultant's specifications.

Down pipes to have double-seamed joints. Down pipes, shoes, offsets, etc, shall be joined together by means of 100 mm slip joints and pop riveted together.

The Contractor shall take all necessary dimensions and measurements on site prior to manufacturing and installation.

BA 02.5.5 Down pipe acessories

Brackets: Standard galvanised brackets shall be spaced at centres not exceeding 2,4 metres.

Brackets to be primed and painted with 2 coats of high gloss enamel.

Shoes, offsets and spreaders: Manufactured from 0,8 mm thick baked enamel/galvanised material, cut and mitred to suit. All joints to be sealed with an approved silicone sealant.

BA.02.5.6 General

The Contractor will be responsible for the stability of the supporting structure during and after removal of existing roof cladding and sheeting.

SANS 1200 HB "Cladding and Sheeting" will be applicable for the erection of all new roofs.

The Contractor must give a minimum 3 year guarantee for the watertight roof and workmanship. **The manufacturer must carry out inspections at regular intervals during the construction period. He must issue a certificate of acceptance and compliance on completion to the client.**

BA 03 MEASUREMENT AND PAYMENT

BA.03.1 DETAILS OF MATERIAL TO BE USED

For detail descriptions of materials, thicknesses, dimensions and ancillary items to be used, as specified in the various payment items of roof sheeting, cladding, flashings, etc; refer to the scheduled list below:

Flashings: Refer to Technical Specifications BA	
Roof:	
0,8 mm thick Galvanised baked enamel Ridge Flashing	462 mm girth (231 + 231), 3 x bends (2 are shallow bends). Fix flashing to roof sheeting with posidriv screws and washers. 150 mm overlap sealed with 2 rows of pop rivets and 2 rows of silicone; 2 rows of broad flute polyclosers bedded in silicone, 2 rows x 0,6 mm thick Galvanised baked enamel broad flute metal closers. Bend up trough to form a dam.
0,6 mm thick Galvanised baked enamel Eaves Closer	Fix standard serrated narrow flute eaves closer to timber purlin. Patch plaster and touch up paint work.
0,8 mm thick Galvanised Apex Trim	462 mm girth (231 + 231 vertical), 3 x bends (2 are shallow bends). Fix flashing to roof sheeting with posidriv screws and washers. 150 mm overlap fixed and sealed with 2 rows of pop rivets and 2 rows of silicone. 1 row of broad flute polycloser bedded in silicone, 2 rows x 0,6 mm thick galvanised broad flute metal closers. Bend up trough to form a dam.
0,8 mm thick Galvanised baked enamel Headwall Flashing	385 mm girth (231 + 154 vertical) headwall flashing, 2 x bends (1 is a shallow bend). Fix flashing to roof sheeting with posidriv screws and washers. 150 mm overlap fixed and sealed with 2 rows of pop rivets and 2 rows of silicone. 1 row of broad flute polycloser bedded in silicone, 1 row x 0,6 mm thick Galvanised baked enamel broad flute metal closer. Bend up trough to form a dam. 154 mm girth (114 + 25 + 15 lip @ 15º) Galvanised baked enamel counter flashing, 3 x bends (1 is a shallow bend). Counter flashing to overlap with headwall flashing with at least 75 mm. Cut 6 mm wide groove into brick wall for counter flashing. Prime joint and seal with an approved 6 x 6 mm poly-urethane sealant.
Extra over for cutting into brick wall	6 mm wide groove x 30 mm deep into brick wall. Clean groove from dust and prime groove.
0,8 mm thick Galvanised baked enamel Hip Flashing	462 mm girth (231 + 231), 3 x bends (2 are shallow bends). Fix flashing to roof sheeting with posidriv screws and washers. 150 mm overlap sealed with 2 rows of pop rivets and 2 rows of silicone. 2 rows of broad flute polyclosers bedded in silicone, 2 rows x 0,6 mm thick Galvanised baked enamel broad flute metal closers on rake. Bend up trough to form a dam.
0,8 mm thick Galvanised baked enamel Apron Flashing	462* mm girth (308 + 154* vertical, girt position determines final upstand length on site), 3 x bends (2 are shallow bends). Fix flashing to roof sheeting with posidriv screws and washers. 150 mm overlap sealed with 2 rows of pop rivets and 2 rows of silicone. 2 rows of broad flute polyclosers bedded in silicone, 1 row x 0,6 mm thick Galvanised baked enamel broad flute metal

	closer. Bend up trough to form a dam.
0,8 mm thick Galvanised baked enamel Eaves Flashing	462* mm girth (154 vertical + 308*, girt position determines final upstand length), 3 x bends (2 are shallow bends). Fix flashing to roof sheeting with posidriv screws and washers. 150 mm overlap sealed with 2 rows of pop rivets and 2 rows of silicone. 1 row each of broad and narrow flute polyclosers bedded in silicone, 1 row each x 0,6 mm thick Galvanised baked enamel broad and narrow flute metal closers. Turn down trough to form a drip. Overhang length of roof sheeting to be determined on site.
0,8 mm thick Galvanised baked enamel Gable Flashing (residential type)	308 mm girth (262 + 46 vertical), 3 x bends (2 are shallow bends). Fix flashing to roof sheeting with posidriv screws and washers. 150 mm overlap sealed with 2 rows of pop rivets and 2 rows of silicone. Flashing to be fitted tightly over gable fascia board. Provide one row of continuous silicone on rib.
0,8 mm thick Galvanised baked enamel Gable Flashing (industrial type)	462 mm girth (262 +200 vertical), 3 x bends (2 are shallow bends). Fix flashing to roof sheeting with posidriv screws and washers. 150 mm overlap sealed with 2 rows of pop rivets and 2 rows of silicone. 1 row x 0,6 mm thick Galvanised baked enamel broad flute metal closer on side wall cladding. Provide one row of continuous silicone on rib.

0,8 mm thick Galvanised baked enamel Side Wall Flashing	385 mm girth (231 + 154 vertical) side wall flashing, 2 x bends (1 is a shallow bend). Fix flashing to roof sheeting with posidriv screws and washers. 150 mm overlap fixed and sealed with 2 rows of pop rivets and 2 rows of silicone. 1 row of broad flute polycloser bedded in silicone (only for vertical side wall cladding). 154 mm girth (114 + 25 + 15 lip @ 15º) Galvanised baked enamel counter flashing, 3 x bends (1 is a shallow bend). Counter flashing (side wall is a brick wall) to overlap with side wall flashing with at least 75 mm. Cut 6 mm wide groove into brick wall parallel to roof sheeting for counter flashing. Prime joint and seal with an approved 6 x 6 mm poly-urethane sealant.
0,8 mm thick Galvanized Roof Overhang Barge Flashing	616 mm girth (286 + 300 vertical + 20 + 10 vertical) standard Craft-Lock barge flashing, 4 x bends (1 is a shallow bend). Fix flashing to roof sheeting with posidriv screws and washers, and to 250 x 25 wide x 2,5 thick with 25 mm lip galvanised bracket. The galvanised bracket to be screwed to rafter ends with 2 countersunk brass screws. 150 mm overlap fixed and sealed with 2 rows of pop rivets and 2 rows of silicone. 1 row of broad flute polycloser bedded in silicone, 1 row x Galvanised baked enamel broad flute metal closer bedded in a row of silicone. Bend up trough to form a dam.
0,8 mm thick Galvanised baked enamel Side Roof Overhang Flashing (carports)	616 mm girth (286 + 300 vertical + 20 + 10 vertical), 4 x bends (1 is a shallow bend). Fix flashing to roof sheeting with posidriv screws and washers, and to 250 x 25 wide x 2,5 thick with 25 mm lip galvanised bracket. The galvanised bracket to be screwed to timber rafter ends with 2 countersunk brass screws or to be site welded to steel purlins. 150 mm overlap fixed and sealed with 2 rows of pop rivets and 2 rows of silicone.
0,8 mm thick Galvanised Valley Flashing	770 mm girth (308 + 27 vertical + 100 wide gutter + 27 vertical + 308), 6 x bends (2 x shallow bends). Fix valley gutter to top of valley rafters with posidriv screws and washers (seal with silicone). Cut and bend valley gutter at main gutter with 25 mm down lip. 225 mm overlap fixed and sealed with 2 rows of pop rivets and 2 rows of silicone. 2 rows of narrow flute polyclosers in ribs bedded in silicone.

0,8 mm thick Galvanised Valley Side Wall Flashing	616 mm girth (308 + 27 vertical + 140 wide gutter + 141 vertical), 4 x bends (1 is a shallow bend). Fix valley gutter to top of valley rafter with Posidriv screws and washers (seal with silicone) and impact nails (6 mm dia x 60 long @ 200 c/c) to brick wall. Cut and bend valley gutter at main gutter with 25 mm down lip. 225 mm overlap fixed and sealed with 2 rows of pop rivets and 2 rows of silicone. 1 row of narrow flute polyclosers in ribs bedded in silicone. 154 mm girth (114 + 25 + 15 lip @ 15º) galvanised counter flashing, 3 x bends (1 is a shallow bend). Counter flashing (side wall is a brick wall) to overlap with side wall flashing with at least 75 mm. Cut 6 mm wide groove into brick wall parallel to roof sheeting for counter flashing. Prime joint and seal with an approved 6 x 6 mm poly-urethane sealant.
0,8 mm thick Galvanised baked enamel Flat Back Flashing	1200* mm wide (25 mm lips on sides bend down to angle of rib) x 925 mm girth, * width of roof monitors determine the final width of flat back flashing. Flat back flashing for full length between monitor and ridge. Fix flashing to roof sheeting with posidriv screws or sealed type Aluminium blind pop rivets. 150 mm overlap fixed and sealed with 2 rows of pop rivets and 2 rows of silicone. 1 row of broad flute polycloser bedded in silicone at bottom end of flat back flashing.
0,8 mm thick Galvanised baked enamel Wall Gutter	616 mm girth (154 vertical x 462 at slope), 1 x bend. Fix boundary/side valley gutter to top of valley rafter with posidriv screws and washers (seal with silicone) and impact nails (6 mm dia. x 60 long @ 200 c/c) to brick wall. 225 mm overlap fixed and sealed with 2 rows of pop rivets and 2 rows of silicone. 1 row x 0,6 mm thick galvanised narrow flute closers in ribs fixed to purlins with posidriv screws and washers; seal with silicone. 154 mm girth (114 + 25 + 15 lip @ 15º) Galvanised baked enamel counter flashing, 3 x bends (1 is a shallow bend). Counter flashing (side wall is a brick wall) to overlap with side wall flashing with at least 75 mm. Cut 6 mm wide groove into brick wall for counter flashing. Prime joint and seal with an approved 6 x 6 mm poly-urethane sealant.
0,8 mm thick Galvanised baked enamel Corner Piece Flashing (for monitors)	231 wide x 77 vertical x 462 long, shallow bend for horizontal portion. Fix flashing to roof sheeting with Posidriv screws or sealed type Aluminium blind pop rivets. Seal overlap with 2 rows of pop rivets and 2 rows of silicone. Provide broad flute polyclosers bedded in silicone in troughs.
Walls: (m)	
0,8 mm thick Galvanised baked enamel External Vertical Flashing	462 mm girth (231 + 231), 3 x bends (2 x shallow bends). Fix flashing to roof sheeting with Posidriv screws and washers. 150 mm overlap sealed with 2 rows of pop rivets and 2 rows of silicone.
0,8 mm thick Galvanised baked enamel Internal Vertical Flashing	462 mm girth (231 + 231), 3 x bends (2 x shallow bends). Fix flashing to roof sheeting with Posidriv screws with washers. 150 mm overlap sealed with 2 rows of pop rivets and 2 rows of silicone.
0,8 mm thick Galvanised Internal Vertical Flashing	462 mm girth (231 + 231), 3 x bends (2 x shallow bends), fix flashing to roof sheeting with Posidriv screws with washers. 150 mm overlap sealed with 2 rows of pop rivets and 2 rows of silicone.
0,8 mm thick Galvanised Drip	154 mm girth (64 vertical + 50 + 20 vertical + 20) standard drip flashing, 3 x bends. Fix flashing to girts or roof sheeting with sealed type Aluminium blind

Flashing	pop rivets or Posidriv screws with washers. 50 mm overlap sealed with one row of silicone and stitched together with sealed blind type pop rivets.
0,8 mm thick Galvanised baked enamel Window Flashings	154 mm girth 3 x bends. Different flashing details for sill, jamb and top of window. Contractor to provide details to Engineer for approval. One row of narrow flute polyclosers bedded in silicone above and below window frame. Fix flashings to girts or roof sheeting with Posidriv screws and washers or sealed type Aluminium blind pop rivets. 100 mm overlap sealed with 2 rows of pop rivets and 2 rows of silicone. Seal around window frame with silicone to waterproof flashings. 1 row x 0,6 mm thick Galvanised baked enamel broad flute metal closer for sill flashing.
0,8 mm thick Galvanised baked enamel Door Flashings	154 mm girth 3 x bends. Different flashing details for sill, jamb and top of window. Contractor to provide details to Engineer for approval. One row of narrow flute polyclosers bedded in silicone above and below window frame. Fix flashings to girts or roof sheeting with Posidriv screws and washers or sealed type Aluminium blind pop rivets. 100 mm overlap sealed with 2 rows of pop rivets and 2 rows of silicone. Seal around window frame with silicone to waterproof flashings. 1 row x 0,6 mm thick Galvanised baked enamel broad flute metal closer for sill flashing
0,8 mm thick Galvanised baked enamel Bull Nose Flashing	462 mm girth (262 +200 vertical), 3 x bends excluding curving (2 are shallow bends), Fix flashing to roof sheeting with Posidriv screws and washers. 300 mm max. overlaps (run outs) sealed with 2 rows of pop rivets and 2 rows of silicone. 1 row x 0,6 mm thick Galvanised baked enamel broad flute metal closer on side wall cladding. Provide one row of continuous silicone on rib. Contractor to measure radius on site prior manufacturing.
Roof Insulation: (m²)	
White Bubble Foil on white straining wires (abattoirs only)	Lay insulation strictly to manufacturer's specifications. Use 1,6 mm diameter white PVC coated straining wires @ 300 mm c/c max. Refer to clause 2.3.7 of Technical Specification BA: Roof Coverings.
420 RSA heavy duty reinforced reflective Aluminium foil	Lay insulation strictly to manufacturer's specifications. Refer to clause 2.3.7 of Technical Specification BA: Roof Coverings.
Rainwater Goods:(m)	
100 x 75 x 0,8 mm thick Galvanised baked enamel beaded non-supporting box gutter	Provide 25 x 1 mm thick galvanised fascia straps @ 686 c/c to support fascia of gutters; fix with 6 mm galvanised gutter bolts, nuts and washers. All accessories and ancillary items included. Roof sheeting troughs to be have drip bend.
100 x 75 x 0,6 mm thick Galvanised baked enamel down pipes; height < 5 m	Provide one down pipe for every 6 m of gutter length. For gutter length of 3 to 6 m, provide two down pipes. All accessories and ancillary items included.

125 x 100 x 0,8 mm thick Galvanised baked enamel self-supporting box gutter	Gutter to be braced back to the roof sheeting with a 25 x 1 mm thick galvanised fascia straps @ 686 c/c. The detail can only be applied to sheeting with a max. cantilever of 450 mm from first purlin. Roof sheeting troughs to be have drip bend.
125 x 100 x 0,8 mm thick Galvanised baked enamel down pipes	Provide one down pipe for every 6 m of gutter length. For gutter length of 4,5 to 6 m, provide two down pipes. All accessories and ancillary items included.
100 x 100 x 0,8 mm thick Galvanised baked enamel down pipes	Provide one down pipe for every 6 m of gutter length. For gutter length of 4,5 to 6 m, provide two down pipes. All accessories and ancillary items included.
Pipe Flashings: (No. and Dia.)	
EPDM/silicone pipe-through-roof flashings to diameter pipe flashings to diameter	For all residential type of buildings, pipe protrusions through roof sheeting will be eliminated by re-routing existing pipe work. For all other pipe protrusions: Use EPDM/silicone pipe-through-roof flashings to diameter no. 2 for pipe diameters 40 - 80 mm and EPDM/silicone pipe-through-roof flashings to diameter no. 4 for pipe diameters 80 - 150 mm. EPDM/silicone pipe-through-roof flashings to diameter flashings are made of E.P.D.M. rubber compound of a carbon black colour.
0,8 mm thick Galvanised baked enamel Cravat and Cowl Flashing to diameter	Refer to roof and wall details no 1 and 2. (Bound into the back of this document).

Pipework: (No.)	
Re-route existing pipes; diameter and number	Re-routing of roof void geyser pipework: Disconnect and remove existing overflow pupe from Latco - and or Safety Valve, supply and connect new 15-28mm dia polycop pipe to existing Latco - and or Safety Valve including all necessary fittings, adaptors, brackets, etc and re-route pipework in ceiling or roof void to protrude through external wall, including making good of external wall, irrespective of finish. Allow approximately 7m horizontal and 3m vertical pipework to ground level per geyser, complete with standard primer, one undercoat and two coats of super acrylic paint to exposed pipework to match existing paint system and colour. Ventilation pipework: Remove existing 100mm dia ventilation pipe section protruding through roof covering. Install 90° bend below roof level and re-route ventilation pipe to clear overhang. Install 90° reducing 100 x 50 bend and rise with 50mm dia pipe to 600mm. Install standard sewer pipe ventilation cowl on top of ventilation pipework. Pipe material must adapt to existing material of ventilation pipework. The bracketing and supports of the ventilation pipework shall be as per manufactuers specifications. Standard primer, one coat undercoat and two coats of super acrylic paint to exposed pipework to match existing paint system and colour.

BA.03.01 **DETAILS OF ROOF PAINT REPAIR WORK**

Specification of paint shall be an extremely durable weather and UV resistant coating system for Galvanised iron roofs or previously painted galvanised iron roofs.

A two coat system shall be used consisting of a two component recoatable polyurethane acrylic finish.

The mixing ratio of the dual pack enamel system shall be as per the manufacturer's specifications. Both components shall be stirred with a power mixer until homogeneous. The dual pack enamel system shall always be applied over a suitable primer and/or intermediate coats within the manufacture's specified over-coating intervals.

Contractor must ensure that the work is done by a competent person and must be approved by the Engineer before work may commence

SURFACE PREPARATION – PREVIOUSLY PAINTED

Remove all peeling paint by sanding, scraping or water cooled grinders fitted with reversible knotted wire brush. Care must be taken not to remove any sound galvanizing. Any unsound paint will fail at a later stage. Wash roof with Aquasolv degreaser, scotch brite pads and rinse thoroughly with clean water to ensure soluble chloride content <75mg per m^2. Ensure that all degreaser is properly washed off.

SURFACE PREPARATION - UNPAINTED GALVANISED

Wash roof with degreaser, scotch brite pads and rinse thoroughly with clean water. Ensure that all degreaser is properly washed off, to ensure soluble chlorine content <75mg per m^2.

APPLICATION

Apply one coat of a two component anti-corrosive strontium chromate epoxy primer by using airless spray. Allow 4 hours drying time. Apply a second coat if necessary to achieve the specified DFT of 25 – 35 microns.

Apply one coat of a dual pack polyurethane enamel system with acrylic finish by airless spray to achieve complete obliteration. Ensure that a single coat of wet film application of 88 – 135 microns is achieved. This will give a DFT of 50 – 75 microns. Application in high humidity environments (75% RH) may cause surface bloom.

GUARANTEE

The Contractor must give a written 5 year guarantee for the quality and workmanship of the paint work (fair wear and tear excepted). The Contract or shall be liable for any peeling or flaking paint applied by the Contractor and shall execute all such work of repair, rectification and making good of painted surfaces as may be ordered in writing by the Engineer. The manufacturer must carry out inspections at regular intervals during the construction period. He must issue a certificate of acceptance and compliance on completion to the client.

BA 03.2 SCHEDULED ITEMS

BA.01 Supply and install cladding and sheeting: ..... Unit: m^2

The area measured will be that of the exposed surface of the finished building as specified in, Subclause 8.1.1 of SANS 1200 HB.

Separate items will be scheduled for roof sheeting and side cladding, subdivided for each type of sheeting, cladding and finish, each profile and straight or curved sheets.

The rate shall cover the cost of supplying, delivering, storing on Site, handling, moving, installing and fixing the sheeting or cladding (finished or prepainted as scheduled) complete with all necessary fasteners (all sheeting, cladding and accessories are to be supplied by a South African based manufacturer and are subject to a three year written guarantee for water tightness and workmanship). The rate shall also cover the cost of cutting, notching, waste, all scaffolding, temporary supports, hoisting facilities and safety precautions (see Subclause 8.1.1 of SANS 1200HB).

BA.02 Forming cranks, bullnoses, etc: ..... Unit: m

Cranks, bullnoses, etc will be measured by length, with bullnoses to a maximum of 600mm radius and bend to maximum of 90°.

Separate items for cranks, bullnoses, etc, will be scheduled for each different type of sheeting, profile and finish.

The rate shall cover the cost of supplying, delivery, storing on Site, handling, moving, installing and fixing of cranks, bullnoses, etc and shall be measured as an extra over the

specified roof sheeting. The rate shall also cover the cost of cutting, notching, waste, all necessary scaffolding, temporary supports, hoisting facilities and safety precautions (see Subclause 8.1.2 of SANS 1200 HB).

BA.03 **Carefully remove existing cladding and sheeting:** **Unit: m^2**

The area measured will be that of the exposed surface of finished building (see Subclause 8.1.1 of SANS 1200 HB).

Separate items will be scheduled for roof covering and side cladding, without differentiating amongst different profiles, etc.

The rate shall cover the cost of removing of existing roof sheeting or side cladding inclusive of flashings and sundry items from timber or steel purlins, and the removal from site of all such material. The rate shall also cover the cost of any scaffolding, temporary supports, hoisting facilities etc as well as credit for the redundant material becoming the property of the Contractor.

The rate shall also cover all temporary necessary dust screens, sheets, plastic linings, etc laid horizontal or vertical inside existing roof spaces or voids on top of ceilings, trusses, etc to protect all contents inside the buildings while replacing or repairing the roof coverings.

BA.04 **Carefully remove and store existing cladding and sheeting:** **Unit: m^2**

The area measured will be that of the exposed surface of finished building (see Subclause 8.1.1 of SANS 1200 HB).

Separate items will be scheduled for roof covering and side cladding without differentiating amongst different profiles etc.

The rate shall cover the cost of removing of existing roof sheeting or side cladding inclusive of flashings and sundry items from timber or steel purlins, the temporary storage of the removed sheeting or cladding at a store area (position of store area to be indicated on site). The rate shall also cover the cost of any scaffolding, temporary supports, hoisting facilities etc.

The rate shall also cover all temporary necessary dust screens, sheets, plastic linings, etc laid horizontal or vertical inside existing roof spaces or voids on top of ceilings, trusses, etc to protect all contents inside the buildings while replacing or repairing the roof coverings.

BA.05 **Re-erect: Stockpilled cladding and sheeting:** **Unit: m^2**

The area measured will be that of the exposed surface off the finished building (see Subclause 8.1.1 of SANS 1200 HB).

Separate items will be scheduled for roof covering and side cladding without differentiating amongst different profiles, etc..

The rate shall cover the cost of preparing, re-erecting, handling, moving, installing existing stockpiled sheeting and cladding including new fixing fastners, etc complete. The rate shall also cover the cost of cutting, notching, waste, all scaffolding, temporary supports, hoisting facilities and safety precautions (see Subclause 8.1.1 of SANS 1200HB).

BA.06 **Supply and install sundry items, etc:** **Unit: m**

Flashing, ridging, etc will be measured by length.

Separate items will be scheduled for each type, finish and shape of sundry item.

The rate shall cover the cost of supplying, delivery, storing on Site, handling, moving, installing and fixing the relevant item complete with all fasteners and sundry items as stipulated in BA.02.3.4.

The rate shall also cover the cost of cutting, notching, waste and of all scaffolding, temporary supports, hoisting facilities and safety precautions (see Subclause 8.1.1 of SANS 1200 HB).

BA.07 **Supply and install roof insulation:** **Unit: m^2**

The area measured will be that of the exposed surface, no deductions being made for openings left or cut for protrusions such as those specified in Subclause 5.7 of SANS 1200 HB, or for ventilators and the like. Deductions will be made for windows and other openings of similar dimensions.

The rate shall cover the costs of supplying, delivery, storing on Site, handling, moving, installing and fixing complete with all necessary fasteners as specified in BA.02.3.7, and shall also cover cost of cutting, notching, waste and of all scaffolding, temporary supports, hoisting facilities and safety precautions (see Subclause 8.1.1 of SANS 1200 HB).

BA.08 **Supply and install rainwater goods:** **Unit: m**

Rainwater goods and similar lengths of constant profile will be measured by length.

Sundry items such as stop-ends, bends, shoes, etc are deemed to be included in the tendered rate per metre.

Separate items will be scheduled for each type, finish, shape and when relevant, profile of rainwater goods. The rate shall cover the cost of supplying, delivery, storing on Site, handling, moving installing and fixing the relevant goods complete with all necessary fasteners, etc as specified in BA.02.5 (all complete and subject to a three year written guarantee on watertightness and workmanship). The rate shall also cover the cost of cutting, notching and waste, and of all scaffolding, temporary supports, hoisting facilities and safety precautions (see Subclause 8.1.1 of SANS 1200 HB).

BA.09 **Carefully remove existing rainwater goods:** **Unit: m**

The length measured will be that of the exposed length of finished building.

No separate items will be scheduled for size, thickness, material, profile, galvanized or Galvanised baked enamel finished items.

The rate shall cover the cost of removing of existing rainwater goods inclusive of brackets and sundry items from timber or steel purlins and trusses, the cost of any scaffolding, temporary supports, hoisting facilities etc and the allowance of credit for material to become the property of the Contractor and to be removed from the site.

BA.10 **Miscellaneous items:**

(a) Measured by number:

(i) (Description of item) ..... Unit: No

(ii) Etc.

(b) Measured by linear metre:

(i) (Description of item) ..... Unit: m

(ii) Etc.

The unit of measurement shall be the number or metre as applicable to each item.

The tendered rates shall include full compensation for manufacturing or providing and installing each item complete as per BA.03.1.

BA.11 Roof rehabilitation: ..... Unit: m^2

The area measured will be that of the exposed surface of building as specified in Subclause 8.1.1 of SANS 1200 HB. Separate items will be scheduled for roof sheeting and side cladding, without differentiating between different profiles, finishings, fixing methods, etc.

The rate shall cover the cost for inspecting, removing existing and supplying and fixing new posidriv screws and mechanisms, sealants, sealer strips, etc complete.

The rate shall also cover the cost of cutting, waste, all scaffolding, temporary supports, etc all to the approval of the Engineer.

BA.12 Supply and install additional fixing screws, etc: ..... Unit: No

The unit of measurement will be the number of additional screws installed.

The rate shall cover the cost for removing defective fixing screws as indicated by the Engineer, and replacing aforesaid with new posidriv or equivalent approved fixing screws in similar previous positions.

No separate items will be scheduled for roof sheeting, side cladding or different profiles. Payment under this item shall not include the screws to be replaced under the roof rehabilitation item above.

BA.13 Carefully remove and re-erect ventilation units: ..... Unit: No

The unit of measurement will be number of ventilation units removed, temporarily stored and resized to similar positions.

The rate shall cover the cost for carefully removing existing ventilation units approximately 2,5m^2 in area from existing roof structures, temporary storage, servicing of existing ventilation units, cleaning, re-erecting later onto new roof sheeting (irrespective of type or profile of sheeting), new ventilation flashings and counter flashings, sealants, fixing screws, fasteners, etc complete. The rate shall also cover the cost for cutting openings into new sheeting for ventilation units, waste, all necessary scaffolding, temporary supports, hoisting facilities and safety precautions (see Subclause 8.1.1 of SANS 1200 HB).

BA.14 **Carefully remove and re-erect birdproofing:** **Unit: m^2**

The area measured will be that of the exposed surface to be covered with bird-proofing.

The rate shall cover the cost for carefully removing chicken wire bird-proofing stapled to each roof truss tie beam at roof overhang between beam-filling and fascia board, temporary storage, cleaning of bird-proofing, re-erecting later into similar previous position. The rate shall also cover the cost for cutting, fixing staples, waste, scaffolding, etc.

BA.15 **Prepare existing roof sheeting and repaint:** **Unit: m^2**

The area measured will be that of the exposed surface of roof sheeting painted (measured on flat area as for roof coverings.)

The rate shall cover the cost for removing existing paint and cleaning surfaces with an approved degreaser and scotch brite pads and rinsing thoroughly by means of pressure washing to receive one new primer coat and one coat dual pack poly-urethane enamel system with acrylic finish roof paint, supplying, delivery and applying new primer and finishing coat, etc., without distinguishing between roof sheeting, side cladding, profile, finish, etc., as specified in BA 03.02

The rate shall also cover the cost of waste, all necessary scaffolding, etc.

BA.16 **Replacement of existing roof tiles in patchwork:** **Unit: number**

The unit of measurement will be number of roof tiles removed, installation of new roof tiles similar to existing roof tiles.

The rate shall cover the cost for carefully removing existing roof tiles approximately 350mm x 350mm in area from existing roof structures, installation of new roof tiles and ridge flashings, sealants, fixing screws, fasteners, etc complete. The rate shall also cover the cost, waste, all necessary scaffolding, temporary supports, hoisting facilities and safety precautions.

TECHNICAL SPECIFICATION

BB CARPENTRY AND JOINERY FOR ROOFS AND CEILINGS

CONTENTS

BB 01 SCOPE

Carpentry and joinery shall mean the maintenance of materials and components such as removal of existing timber roof trusses, purlins, ceilings, etc, and the installation of new timber trusses and other timber roof members, structural beams, purlins, battens and ceilings. This specification does not include work related to roof coverings and paintwork, which are specified elsewhere.

This specification covers the corrective maintenance repairs of existing timber members in roof trusses, the removal and replacement of existing timber members from roof trusses and associated timber roof members and ceilings. This specification also covers the supply, delivery and installation of new timber trusses, purlins, battens and beams for various types of timber related structures and ceilings.

The complete scope of repair work shall be as described in BB 04: Detail of repair work.

Maintenance of this part of the installation shall be performed in accordance with Additional Specification SA: General Maintenance and the specific requirements included in this Technical Specification.

BB 02 STANDARD SPECIFICATIONS

BB 02.01 GENERAL STANDARD SPECIFICATIONS

The latest edition, including all amendments up to date of tender, of the following specifications, publications and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof:

PW 371-		Specification of Materials and Methods to be used (Fourth revision, October 1993)
SANS 10243	-	The design, manufacture and erection of timber trusses
SANS 266	-	Gypsum plasterboard
SANS 1783 - 2	-	Stress-graded softwood: general structural timber
SANS 1783 - 4	-	Softwood brandering and battens
SANS 803	-	Fibre-cement boards

BB 02.02 ADDITIONAL SPECIFICATIONS

Technical Specification BA: Roof coverings
Technical Specification BD: Walls
Technical Specification BJ: Paintwork

BB 03 VARIATIONS AND ADDITIONS TO STANDARD SPECIFICATIONS

BB 03.01 ADDITIONAL REQUIREMENTS FOR REPAIR OF TIMBER ROOF STRUCTURES

BB 03.01.01 Timber trusses

(a) Replacing timber trusses

The Engineer shall inspect timber trusses for defects and establish which timber trusses must be replaced.

Reasons for replacing trusses will include but not be limited to the following:

(i) Deflection exceeding acceptable limits;
(ii) Inadequacy in design, e.g. structural strength, structural instability, load conditions;
(iii) Decay of large portions of truss members (defective timber);
(iv) Large portions of truss members having so many defects e.g. cracked timber, corroded connector nail plates, etc, that it will be uneconomical to repair the defects.

(b) Repair of timber trusses

Repair work shall include but not be limited to the following:

(i) Strengthening of truss members, connections, splices and anchorage at supports;
(ii) Strengthening of truss members due to unforeseen loads, notching and cutting for services by other contractors;
(iii) Repair of truss members where large knots and wanes occur;
(iv) Replacing metal plate connectors in cases of corrosion, incorrect application of connector plates, incorrect size of connector plates, unsymmetrically fitted connector plates, connector plates with teeth flattened, minimum bite of less than 65 mm of a connector plate on a truss member;
(v) Replacing of decayed timber, particularly rafter ends at roof overhangs and at roofing screws. Timber subjected to insect attack and fungal decay should be treated with an appropriate preservative. Where there is a low risk of decay or insect attack, two coats of Creosote may be applied to the timber. Refer to clauses 8.1 and 8.2 in PW 371 for the preservation of wood in high-risk regions;
(vi) Replacing and/or repair of cracked timber members. Galvanised connector plates and metal straps may be considered;
(vii) Maximum slenderness ratio must be less than 180 for compression members that carry forces resulting from dead and live loads. Compression members 36 mm thick and longer than 1,8 m must have a continuous longitudinal runner centrally placed (or T-bracing) and properly connected and braced. For members that resist loads caused by wind, the slenderness ratio must be less than 250;
(viii) Plumb of trusses should not exceed 100 mm or total span/20 whichever is the least;
(ix) Exposed portions of the trusses shall be painted to match existing appearance.

The roof trusses shall be fully braced. The Engineer shall give instructions regarding the provision of bracing members to the roof system.

BB 03.01.02 Purlins (for sheeted roofs, battens for tiled roofs)

(a) Replacing timber purlins

The Engineer shall inspect timber purlins for defects and possible reuse. The Engineer shall establish which timber purlins need to be replaced.

Reasons for replacing purlins will include but not be limited to the following:

(i) Decayed timber, particularly at gable overhangs;
(ii) Broken, warped and brittle timber;
(iii) Worn-out roof screw holes;
(iv) Inadequacy in design, e.g. structural strength and excessive deflection due to large spans;
(v) Inappropriate spacing of purlins for the specific roof covering.

(b) Repair of timber purlins

Repair work shall include but not be limited to the following:

(i) For roof pitches under 45º the purlins shall be erected on edge (narrow edge).
(ii) All purlins shall be secured to rafters at each intersection in addition to nails. In roof voids a single 3,2 mm diameter galvanised wire tie bound twice with twisted ends or a galvanised bent plate connector shall be used for securing purlins to rafters. On roof overhangs only galvanised bent plate connectors shall be used for securing purlins to rafters.
(iii) Splices shall be staggered. Splices that do not conform to the requirements of clause 8.8 of PW 371, or clauses 8.5.1 and 8.5.2 of SANS 10234, must be repaired. Nailed galvanised plate connectors on either side of purlins are also acceptable.
(iv) Exposed portions of the purlins shall be painted to match existing appearance.

Skew nailing of purlins to trusses shall not be closer than 30 mm from the edge of the member.

BB 03.01.03 Structural timber

(a) Replacing structural timber

The Engineer shall inspect members of structural timber, i.e. beams and columns, for defects and shall establish which of these members must be replaced. Reasons for replacement will include but not be limited to the following:

(i) Deflection exceeding acceptable limits;
(ii) Inadequacy in design, e.g. structural strength, structural instability, load conditions;
(iii) Decay of a large portion of the member (defective timber);
(iv) Replacing of decayed timber, particularly at ends of beams.

(b) Repair of structural timber

Repair work shall include but not be limited to the following:

(i) Strengthening of members, connections, splices and anchorage at supports;
(ii) Strengthening of members due to unforeseen loads, notching and cutting for services by other contractors;
(iii) Exposed portions of structural timber shall be painted to match existing appearance;
(iv) Bolt connections shall be in accordance with the requirements of SANS 10163.

BB 03.01.04 Ceilings

New ceilings shall be installed in accordance with section 9 of PW 371.

(a) Brandering to ceilings

Brandering to ceilings shall be replaced where:

(i) Ceiling boards are replaced;
(ii) Brandering is broken, rotten and beyond any further use.

New brandering shall be provided in accordance with clause 9.4 of PW 371. The brandering shall continue over at least three bays and shall be staggered to ensure that splices do not all occur in one line. Brandering must be provided for light fitting support.

(b) Gypsum ceiling boards

Repairs to existing ceilings shall include the installation of new 6,4 mm thick gypsum ceiling boards with metal H-section jointing strips. The new ceiling boards shall be nailed to brandering with galvanised or cadmium-plated clout-headed nails.

Gypsum ceiling boards shall not be used in wet areas such as in ablutions, abattoirs, kitchens and bathrooms.

Ceiling boards shall be in long lengths, symmetrically arranged with smaller panels, closely butted and secured at 150 mm centres to brandering as specified.

Where it is necessary to replace ceiling boards onto existing brandering, new boards shall be installed by first drilling through and then securing with cadmium-plated flat headed wood screws, or alternatively by shot nailing to suit, to avoid unnecessary vibration or impact damage to adjacent elements.

Gypsum cove cornices 76 mm wide shall be provided where existing cornices are to be replaced.

Existing trap doors in ceilings shall be reused. If required, new 650 x 650 mm trap doors shall be installed.

No ceiling insulation must be provided unless specified.

Painting of the ceiling shall be done in accordance with Technical Specification BJ: Paintwork.

(c) Fibre cement ceiling boards

Fibre cement ceiling boards shall be installed in wet areas such as in ablutions, abattoirs, kitchens and bathrooms.

Fibre cement ceiling boards shall be 6 mm thick, complying with the requirements of SANS 803 and of the flat pressed type.

The boards shall be nailed to the brandering with 2 mm diameter galvanised or cadmium-plated clout-headed nails, spaced at 100 mm centres at edges of boards and 150 mm centres along the intermediate brandering. Ceiling boards shall be in long lengths, symmetrically arranged with smaller panels as required and closely butted.

Replacement of new ceiling boards onto existing brandering shall be done as described in BB 03.01.04(b) above.

Fibrous plasterboard cove cornices to ceilings shall be of 100 mm girth, provided by an approved manufacturer. Gypsum cove cornices 76 mm wide can be used in kitchens and bathrooms of houses. Powder-coated wall angles 25 mm wide shall be used for cornices in abattoirs.

Existing trap doors in ceilings shall be reused. If required, new 650 x 650 mm trap doors shall be installed.

Painting of the ceiling shall be done in accordance with Technical Specification BJ: Paintwork.

(d) Exposed T-system suspended ceilings

Repairs to existing suspended ceilings will include but not be limited to the following:

(i) Replace damaged panels with new ceiling boards;
(ii) Replace sections of damaged T-strips or H-strips;
(iii) Replace cornices;
(iv) Tension, fix and realign existing hangers;
(v) Install new hangers as required;
(vi) Clean ceiling boards, including washing of the ceiling boards with a mixture of water and sugar soap and wiping dry, or painting the ceiling boards.

(e) External gable fibre cement boards for side cladding

External tongued and grooved boarding shall be removed and replaced with 6 mm thick flat pressed fibre cement boarding. The boarding shall be fixed to new brandering as specified in this section. Provide painted 25 x 25 mm meranti quarter rounds at edges as required.

The boarding shall be painted in accordance with Technical Specification BJ: Paintwork.

BB 03.01.05 Fascia and barge boards

Repairs to fascia and barge boards shall include but not be limited to the following:

(a) Replace damaged and broken fibre cement fascia and barge boards.

(b) Replace missing, corroded and damaged H-profile jointing strips.

(c) Replace all nails with suitable length and diameter brass screws. Provide nylon plugs to timber where necessary.

(d) Align and fix existing fascia and barge boards.

(e) Paint fascia and barge boards in accordance with Technical Specification BJ: Paintwork. All sides including the edges must be painted.

(f) The roof covering shall cover the top edge of the fascia on gables.

BB 03.01.06 Timber trusses, purlins and battens

(a) Existing timber trusses and roof structure

(i) General

(1) The Contractor shall establish proper access and install adequate lighting to the roof voids to enable detailed inspections of structural deficiencies by the Engineer. Temporary scaffold planks shall be laid across bottom chords to allow access to all critical areas. After inspection, the extent of repairs is to be agreed with the Engineer.

(2) All completed work shall be inspected and approved by the Engineer.

(3) All new timber work shall comply with SANS 10163.

(4) Timber grade shall be S5 and replacement sizes are to match existing unless otherwise agreed.

(5) Repair details on attached sheets R1 to R3 shall form the basis for repairs. Any deviations from or variations to these details are to be approved by the Engineer. Any types of failure not covered by these details shall be discussed with the Engineer who will then issue the necessary repair instructions.

(ii) Procedures (watermarked and slightly rotten members)

(1) Watermarked and slightly rotten members need not be replaced or repaired if the following test indicate these members to be satisfactorily:

Using a 3,5 mm nail, make scratch marks in all these members to expose good unaffected timber. If scratch depth is 2 mm or less, it is acceptable and these members need only to be treated as described in (2) below.

(2) The members shall be wire-brush cleaned, free of any loose or deleterious material, then treated with 1 coat of creosote, or similar approved. Apply by brush to affected areas and 200 mm beyond, all to the manufacturer's specifications. Safety precautions shall be taken against possible health or fire hazards as specified by manufacturer.

(iii) Procedures (cracked and failed members)

(1) All members that are cracked right through will be regarded as failed members. Members with minor longitudinal cracks shall be repaired, following procedure 5 on sheet R3.

(2) The Contractor must allow for propping and/or bracing at failed members to ensure complete structural stability during repairs.

(3) Failed members as indicated in details 1 to 4 on sheets R1 to R3 shall be realigned by means of clamping with temporary backing pieces, after which repairs can proceed.

(4) Members that are damaged too badly to effect repairs will have to be replaced or doubled up to suit the circumstances.

(5) Once all repair work has been completed the Contractor must clean out the ceiling void, free of all rubbish, excess building material and all other foreign matter and make good any damage caused to ceilings, etc.

(6) Any alternative repair proposal shall be submitted in writing to the Engineer.

BB 04 DETAIL OF REPAIR WORK

The detail of the work is described in the Schedule of Quantities.

BB 05 MAINTENANCE

Note: There will be no maintenance work required for carpentry and joinery for roofs and ceilings in this contract.

This specification shall be read in conjunction with Additional Specification SA: General Maintenance.

All components forming part of this specification for carpentry and joinery for roofs and ceilings shall be maintained as part of the maintenance of installations as defined in Additional Specification SA: General Maintenance.

Maintenance shall include all repair work, replacing of components, routine inspections, fixing of defects or any other actions or rectifying measures necessary to maintain the perfect functional condition of carpentry and joinery for roofs according to the operation and maintenance manuals and as specified in this specification.

All timber trusses and members of timber roofs shall be preserved in a good condition, i.e. failure free, free from insect attack and decay due to exposure to moisture.

Maintenance on the carpentry and joinery for roofs shall also include all other actions related to (or resulting from) maintenance, such as:

- Cleaning of the site and ceiling voids of rubbish and dirt;
- replacing any element that has failed;
- tightening, fixing or replacing of loose fasteners, premature corrosion of galvanised items like screws, nail plates, etc.

Remuneration for maintenance of the complete carpentry and joinery for roofs shall be deemed included in the tendered monthly payment for maintenance of the applicable installation.

BB 06 MEASUREMENT AND PAYMENT

BB 06.01 MEASUREMENT AND RATES

BB 06.01.01 General inclusion of costs

Notes:

All material scheduled to be removed shall be deemed to be existing damaged materials in small or large sections. All such redundant material shall become the property of the Contractor and must be removed from site immediately.

All new material used for repair work shall be of approved equal quality, colours, profiles, thickness, etc and shall in all cases match the existing materials and shall be fixed (internally or externally) to existing material or surfaces.

All replacement, removal and repair work shall be done carefully as to not damage any adjacent or other material or work. Any damage to other or adjacent materials or areas caused by the negligence of the Contractor shall be repaired by him free of charge.

All work scheduled to be removed or taken out shall be deemed to include the cleaning and preparation of the remaining sections, areas, or work to receive the new material or work specified.

Repair work shall also include all cutting, grinding, cutting into, welding, bending, strengthening, drilling, etc to repair or to improve the items or areas as new and to match the existing.

Work scheduled to be realigned and refixed shall be deemed to include all necessary new additional materials, brackets, connector plates, bolts, pip rivets, nails, screws, spacer blocks, clamps, timber, and labour, etc to leave the items as new and totally functional.

All new work are measured net and shall include all cutting, lapping, waste, bending, fixing, corners, mitres, fixing screws, pip rivets, nails, adhesive, grout, putty, etc, as well as cleaning and preparation of surfaces not already prepared as part of removed items, etc.

Unless scheduled otherwise, new ceilings and ceilings in patchwork shall be fixed to existing brandering and the Contractor must take special care not to damage the existing brandering when removing damaged ceiling boards.

BB 06.02 SCHEDULED ITEMS

NEW WORK

BB.01 Structural timber:

(a) Plates (sizes indicated) ..... Unit: m

(b) Beams (sizes indicated) ..... Unit: m

(c) Joists (sizes indicated) ..... Unit: m

(d) Rafters (sizes indicated) ..... Unit: m

(e) Purlins (sizes indicated) ..... Unit: m

(f) Roof trusses complete (drawing number indicated) ..... Unit: number

(g) Etc

The unit of measurement shall be the metre of individual types of timber elements or number of complete trusses installed.

The tendered rates shall include full compensation for the supply of all materials, manufacture, cutting, waste, jointing, scaffolding, temporary supports, hoisting facilities and installation of the timber as specified, scheduled or shown on the Drawings.

BB.02 Ceilings:

(a) Ceiling boards, trapdoors, cornices, cover strips, etc (type and/or thickness indicated):

(i) Thickness, shape and description of applications ..... Unit: m^2, m, number

(ii) Etc for other thicknesses, shapes, etc

The unit of measurement shall be the number, metre or square metre of ceiling boards, trapdoors, cornices, etc installed complete as specified and scheduled.

The tendered rates shall also include full compensation for the construction of the ceilings, trapdoors, cornices, cover strips, etc including jointing strips, insulation blankets and brandering as specified.

BB.03 **Joinery:**

(a) Items measured by number:

(i) Doors, etc (type and size indicated) ..... Unit: number

(ii) Etc for other items measured by number

(b) Items measured by linear metre:

(i) Skirtings, rails, cover strips, quadrant beads, etc (size indicated) ..... Unit: m

(ii) Etc for other items measured by length

(c) Items measured by area:

(i) Eaves covering, etc (type and thickness indicated) ..... Unit: m^2

(ii) Etc, for other items measured by area

The units of measurement shall be the number, metre or square metre of each type and/or size of joinery item specified and installed complete.

The tendered rates shall include full compensation for the supply of all materials, manufacture, cutting, waste, fixing, scaffolding, temporary supports, hoisting facilities and installation of the joinery items.

Ironmongery to be included in the rates tendered for doors shall be as specified in the Technical Specification BD: Walls.

New joinery, will except where otherwise specified, be fixed or hung to existing material or surfaces.

ALTERATION WORK

BB.04 **Alterations and repairs to existing structures:**

(a) Indicate if repairs, alterations, removal or sealing, etc:

(i) Description of individual items to be repaired, replaced, altered, removed, sealed, etc ..... Unit: m^3, m^2, m, number

The unit of measurement for items repaired, replaced, altered, removed, sealed, etc shall be cubic metre, square metre, metre or number as scheduled. No distinction between sizes or profiles will be made for the removal of structural timber elements.

The tendered rates shall include full compensation for all costs to repair, refix, remove, cutting into, re-align, taking off, handling, temporary store, scaffolding, temporary supports, hoisting facilities and preparing existing remaining material or surfaces where applicable to receive new items as well as for credit for the redundant material becoming the property of the Contractor, etc as specified in the Standard and Technical Specifications and shall allow for all necessary labour, plant and new material needed for the repairs, replacement or alterations, etc to leave the scheduled items as new and to the approval of the Engineer. Refer also to the general inclusion of costs in BB.06.01.01."

BB.05 **Repairs to watermarked and slightly rotten timber roof members:** ..... **Unit: m**

The unit of measurement shall be the linear metre of timber roof members repaired as specified. No distinction will be made for size, type of member or position.

The tendered rate shall include full compensation for the complete repair work, wire brushing, creosote, etc as specified by the Engineer.

BB.06 **Repairs to damaged masonry, plastering and surface finishes:**

(a) Items measured by number:

(i) Description of item ..... Unit: No

(ii) Etc ..... Unit: m

(b) Items measured by linear metre:

(i) Description of item ..... Unit: No

(ii) Etc ..... Unit: m

The unit of measurement shall be the number or metre as applicable to each item.

The tendered rates shall include full compensation for the making good of masonry (stock or face bricks), beam-filling, plastering, painting, closing ends to troughs of sheet metal roof sheeting, repairs to structure at ends of rafters and purlins, protruding through brick walls, etc.

The tendered rate shall also cover the cost of cutting, notching and waste and of all scaffolding, temporary supports, etc.

BB.07 **Painting to top cords of timber trusses in roof voids:** ..... **Unit: m**

The unit of measurement shall be the metre.

The tendered rate shall include full compensation to prepare existing top cords (where applicable) to receive one coat creosote. No distinction will be made for size, type, new or existing members. The rate shall also cover the cost for waste, all scaffolding, etc.

BB.08 **Painting of existing members in overhangs:** ..... **Unit: m**

The unit of measurement shall be the metre.

Separate items will be listed for paint and/or creosote as specified.

The tendered rate shall include full compensation to prepare existing overhangs to receive paint or creosote as specified. No distinction will be made for size of existing members. The rate shall also cover the cost for waste, all scaffolding, etc.

TECHNICAL SPECIFICATION

BC WATERPROOFING OF CONCRETE ROOFS

CONTENTS

BC 01 SCOPE

This specification covers the corrective maintenance repairs of existing cement screeds and waterproofing, including all sundries, the removal of waterproofing and the supply, delivery, installation of new cement screeds, waterproofing and sundries for various types of concrete roofs.

Waterproofing shall mean the work to be carried out to repair/replace and maintain waterproofing materials and components, such as the repair/removal and maintenance of existing cement screeds and waterproofing and the installation of new cement screeds and waterproofing. This specification does not include work related to concrete work, plastering, gutters and downpipes specified elsewhere.

The complete scope of the repair work shall be as described in BC 04: Detail of repair work.

Maintenance of this part of the installation shall be performed in accordance with Additional Specification SA: General Maintenance, and the specific requirements included in this Technical Specification.

BC 02 STANDARD SPECIFICATIONS

BC 02.01 GENERAL STANDARD SPECIFICATIONS

The latest edition, including all amendments to date of the following specifications, publications and codes of practice, shall be read in conjunction with this specification and shall be deemed part to form part thereof:

PW 371- Specification of Materials and Methods to be used (Fourth revision, October 1993)
SANS 10021 - SANS code of practice: Waterproofing of buildings.

BC 02.02 ADDITIONAL SPECIFICATIONS

Technical Specification BE: Floors
Technical Specification BF: Structural concrete

BC 03 VARIATIONS AND ADDITIONS TO STANDARD SPECIFICATIONS

BC 03.01 ADDITIONAL REQUIREMENTS FOR REPAIR OF WATERPROOFING ON CONCRETE ROOFS

BC 03.01.01 Introduction

Section 6 Parts 6.4.1, 6.4.2 and 6.4.4 of PW 371 shall be adhered to when open concrete roofs are waterproofed. Existing waterproofing that leaks shall be replaced.

BC 03.01.02 General

Waterproofing materials shall be transported, handled and stored with care and laid strictly in accordance with the manufacturer's instructions. A clean, dry, smooth, firm and structurally adequate base with a fall of at least 1 in 50 (depending on the material selected) is required, with drainage to gutters and/or rainwater outlets on rood edges, as relevant. Attention shall be given to the detailed design of openings, projections, gutters, down pipes and finishes to make adequate provision for run-off water and to minimize blockages.

Corners and edges shall be covered or angle-rounded. Run-off over the edges of slabs shall be eliminated as this causes stains to the building. Fillets of 75 x 75 mm shall be provided at up stand corners.

The necessary gradient for waterproof membranes are normally provided on top of structures in low-density screeds and then finished, if necessary, with a cement/mortar topping. Screeds and toppings shall be of sufficient quality to provide a firm base. The following screed characteristics are suggested for waterproofing purposes:

(a) Compressive strength of at least 25 MPa at 28 days;

(b) Steel-trowel finish (light);

(c) Drying shrinkage of less than 0,2 % when tested in accordance with the testing conditions specified in SANS 836;

(d) Minimum screed thickness of 40 mm;

(e) Maximum moisture content of screeds:

  (i) Applications with a density of less than 500 kg/m^3 : 10 %

  (ii) Applications with a density exceeding 500 kg/m^3 : 7 %.

The screed should be cast or sawn into panels that do not exceed 9 m^2 to cater for drying shrinkage and to control cracking.

BC 03.02 MATERIALS

The more commonly used waterproofing materials are listed below, as well as some general comments on these materials. It is suggested that the manufacturers be consulted with regard to specific products. The Engineer's approval of the selected product shall be obtained prior to ordering.

BC 03.02.01 Bituminous materials

(a) Polymer modified bitumen membranes

(b) Reinforced bitumen emulsions.

BC 03.02.02 Plastomeric membranes

Plastics such as polyvinyl chloride (PVC) are applied as single-layer systems and are loose-laid or fully bonded. A high degree of skill is required for the laying of these membranes.

BC 03.02.03 Reinforced liquid applied systems

Membranes based on acrylic polymer (or modified acrylic polymers) binders, reinforced with woven polyester or polypropylene fabrics, perform well as waterproofing membranes and are durable. These fully bonded systems require detailed specifications and strict supervision during application to prevent malpractice.

BC 04 DETAILS OF REPAIR WORK

The Schedule of Quantities indicates approximate quantities of work. Detailed instructions will be issued during construction.

BC 05 MAINTENANCE

Note: There will be no maintenance work required for waterproofing of concrete roofs in this contract.

This specification shall be read in conjunction with Additional Specifications SA: General Maintenance.

All components that form part of the waterproofing of concrete roofs shall be maintained during the maintenance phase of the Contract.

Maintenance shall include all repair work, replacing of components, routine inspections, repairing of defects or other actions or rectifying measures required to maintain the perfect functional condition of waterproofing on concrete roofs in accordance with the operation and maintenance manuals and as specified. All roofs shall be kept leak-free and watertight.

Maintenance of the waterproofed concrete roofs shall include all related actions such as replacing/repairing loose and blistering waterproofing, including cracked waterproofing membranes, loose seams, painting of waterproofing membranes, and cleaning and removing rubbish from waterproofed concrete roofs.

Remuneration for maintenance of the complete waterproofing of concrete roofs shall be deemed included in the tendered monthly payment for the maintenance thereof.

BC 06 MEASUREMENT AND PAYMENT

BC.01 MEASUREMENT AND RATES

BC.01.01 General inclusion of costs

Notes:

New waterproofing material scheduled shall be deemed to include all preparation of existing concrete or waterproofed areas and jointing of new to existing material. Where new material is to join existing material, the new material shall be of the same type and system as the existing waterproofing system. All waterproofing shall come with a ten year written guarantee for water-tightness and the cost of such guarantee shall be deemed to be included in the applicable tendered rates.

BC.02 SCHEDULED ITEMS

NEW WORK

BC.02.01 Approved waterproofing system to:

(a) Description of waterproofing system:

(i) Area of application or description of detailed item ..... Unit : m², m, number

The unit of measurement shall be the square metre, meter or number of areas or items waterproofed as specified and scheduled.

The tendered rates shall include full compensation for the supplying, delivering, storing on site, handling, moving, applying or installing and fixing the waterproofing system complete with all necessary sundry items, such as forming turn-ups or turn-downs, any flashing strips, dressing waterproofing around pipes and into outlets and channels.

The tendered rates shall also cover the cost for cutting and waste and for scaffolding, hoisting facilities, etc. All turn-ups and turn-downs will be deemed to be included in the area measured for the waterproofing and will not be paid for separately.

ALTERATION WORK

BC.02.02 Remove existing waterproofing and sundry items:

(a) Description of waterproofing material to be removed and location .....Unit: m^2

(b) Etc, for other material and locations

The unit of measurement shall be square metre of material removed.

The tendered rate shall include full compensation for the removing of existing waterproofing, flashing strips, sundry items, etc.

BC.02.03 Prepare existing surfaces:

(a) Prepare existing concrete surface to receive new screed as specified .....Unit: m^2

(b) Prepare existing concrete or screeded surface to receive new waterproofing system .....Unit: m^2

The unit of measurement shall be the square metre of the exposed surface prepared to receive the new screed or waterproofing material.

The tendered rates shall cover the cost for preparing the existing surfaces as specified and scheduled in (a) and (b) to receive new screeds or waterproofing.

BC.02.04 Roof screeds: .....Unit: m^2

The unit of measurement shall be the square metre of exposed surfaces to be screeded.

The tendered rate shall include all costs for supplying, delivering, storing on site, handling, etc of the materials necessary for the screed, including mixing and laying of screeds to currents and falls and forming of sundry items such as fillets, etc complete. The tendered rate shall also cover the cost for forming of screeds around outlets, waste, and of all scaffolding, temporary supports, hoisting facilities, etc.

BC.02.05 **Repair bituminous based waterproofing system** ..... Unit : m²

The unit of measurement shall be the square metre of the horizontal and vertical surfaces of waterproofing repaired to the approval of the Engineer. All turn-ups and turn-downs will be deemed to be included in the area measured for the waterproofing and will not be paid for separately.

The tendered rate shall include all costs for supplying, delivering, storing on site, handling, moving, installing and fixing the waterproofing system complete with all necessary sundry items, such as flashing strips, dressing waterproofing around pipes and into outlets and channels. The tendered rate shall also cover the cost of cutting and waste and for scaffolding, hoisting facilities, etc.

TECHNICAL SPECIFICATION

BD WALLS

CONTENTS

BD 01 SCOPE

This specification covers the corrective maintenance repairs of existing interior and exterior walls including all related building elements such as plastering, partitioning, wall tiling, windows, doors, etc, which form an integral part of an installation.

In determining the remedy for any repair work, the Engineer must take the climatic conditions in which all building elements have to function into consideration. Allowance should be made accordingly for the strength and durability of all components in relation to their purpose and application.

This specification does not include any work related to paintwork as this is specified elsewhere.

The complete scope of repair work shall be in accordance with the section: Detail of repair work.

BD 02 STANDARD SPECIFICATIONS

BD 02.01 GENERAL STANDARD SPECIFICATIONS

The latest edition, including all amendments up to date of tender of the following specifications, publications and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof. All other relevant and applicable SANS regulations are also to be considered as minimum requirements, and in particular SANS 10400: The Application of the National Building Regulations.

PW 371		-	Specification of materials and methods to be used (Fourth revision, October 1993)
SANS	22	-	Glazed ceramic wall tiles and fittings
SANS	227	-	Burnt clay masonry units
SANS	545	-	Wooden doors
SANS	622	-	Gypsum cove cornice
SANC	680	-	Glazing putty for wood and steel sashes
SANS	727	-	Windows and doors made from rolled mill steel sections
SANS	10107	-	The fixing of glazed wall tiles
SANS	1236	-	Silvered glass mirrors for general use
SANS	1263	-	Safety and security glazing materials for buildings

BD 02.02 ADDITIONAL SPECIFICATIONS

Technical Specification BG: Metalwork
Technical Specification BH: Fittings
Technical Specification BJ: Paintwork

BD 03 VARIATIONS AND ADDITIONS TO STANDARD SPECIFICATIONS

BD 03.01 ADDITIONAL REQUIREMENTS FOR REPAIR OF PLASTERED AND UNPLASTERED WALL SURFACES

BD 03.01.01 Introduction

A detailed survey of all existing building elements may reveal the necessity for remedial work of varying degree. The Engineer shall make an assessment of all aspects that need to be addressed.

BD 03.01.02 Plastering: General

All plaster shall comply with the requirements of SANS Standard Specification 523 and section 14 of OW 371. All plastering shall be painted in accordance with Technical Specification BJ: Paintwork, or tiled according to this specification BD.

The Engineer shall inspect the plaster surfaces and establish which wall plastering must be repaired. Reasons for replacing existing plastering will include, but not limited to the following:

(a) Excessive plaster cracking
(b) Loose (delaminated) and spalling plaster
(c) Dusting
(d) Scaling and flaking
(e) Defective plaster mix.

All chases shall be marked out in straight lines and neatly cut on either side of the recess for the pipe/conduit with an angle grinder. The width of the removed plastering must extend at least 30 mm beyond the edge of the chasing. Pipes or conduits shall be fixed before commencing grouting and plastering.

After the pipe has been put in place, the void shall be filled with a non-shrink cement grout of 60 MPa compressive strength at 28 days. The chases shall then be covered by fixing with shot-fired nails a weld mesh strip (30 mm longway x 10 mm shortway x 0,5 mm thick expanded metal lath) before applying the final plaster.

BD 03.01.03 Plastering: Walls of wet areas

Where necessary, hack off and remove existing internal plaster to walls. The substrates must be prepared to be sound, free from cement, grout, laitance, loose or segregated materials, voids or flaws and substances that could interfere with bonding of the new plaster. This preparation work can be done by means of clipping away with a chisel, steel-wire brush and angle grinders to the satisfaction of the Engineer. Smooth concrete must be chipped mechanically to prepare for bonding of new plaster. Before plastering commences, the substrates must be well wetted with clean water.

Only approved ready-mixed or pre-mixed bagged plaster mortar with 10 MPa compressive strength or equivalent may be used for plastering. Mix a liquid waterproofing admixture in a dilution of one part by volume with ten parts by volume of clean water. The diluted admixture is added to the appropriate dry cement/sand mixture. The mortar shall be produced in such quantities that will be used within one hour after mixing. The finished plasterwork shall be of an even and smooth towel surface finish.

When dry, apply two coats of an approved water dispersed epoxy resin coating to the plastered surfaces of the walls that are to be painted.

BD 03.01.04 External plastering

The Engineer shall mark out areas that need to be renovated. The Contractor shall neatly cut with an angle grinder in straight lines the edges of the poor patches of plaster that must be removed.

The substrate of the brick walls must be prepared to be sound, free from cement grout, laitance, loose or segregated material, voids or flaws and substances that might interfere with the bonding of the new plaster.

The surface must not be powdery or crumbly, and must exhibit adequate tensile strength. The preparation work can be done by means of chipping away with a chisel, steel-wire brush and angle grinders to the satisfaction of the Engineer.

Smooth surfaces must be chipped to provide mechanical bonding for new plaster. Before plastering commences the substrate must be well wetted with clean water.

Only approved ready-mixed or pre-mixed bagged plaster mortar with 5 MPa compressive strength or approved equivalent may be used for plastering. The Contractor shall submit the design mix with the volume of water to be added to the mortar mix for approval by the Engineer. An approved bonding agent must be added to the mortar mix.

The mortar shall be produced in quantities that will be used within one hour after mixing. Care shall be taken not to mix old mortar into any new batch.

The finished plasterwork shall be of an even and smooth wooden trowel (surface finish with rounded edges at sharp corners) to the satisfaction of the Engineer. The plasterwork shall be cured for seven days by any approved method to prevent loss of moisture.

Three (3) test cubes per sampling shall be taken at a frequency for every 15 m^2 plaster area. Cube moulds for nominal size 100 mm complying with the requirements of SANS Method 863 must be used. Final instructions for sampling, moulding, cutting and testing will be issued to the Contractor on site.

BD 03.01.05 Rough-cast plaster

Rough-cast plaster shall be applied in two coats. The undercoat shall be composed of one part cement and five parts sand finished with a wooden float. The finishing coat shall be composed of one part cement and three parts stone aggregate that will pass through a 4 mm sieve. The finishing coat shall be flicked on with a machine before the undercoat has set to obtain an even texture to match the existing rough-cast plaster.

Where the undercoat has already been plastered, the undercoat shall be prepared to receive the finishing coat. The surface of the undercoat plaster shall be chipped adequately to form a key and wetted before the finishing coat is applied.

BD 03.01.06 Fine rough-cast plaster

Fine rough-cast plaster shall be as for rough-cast plaster but the finishing coat shall be composed of one part cement and three parts coarse sand.

BD 03.01.07 Internal plastering

The surface of internal plaster shall be steel trowelled to a smooth, even and true finish. External plaster shall be finished to a true and even surface with a wood float. All plaster surfaces shall be free from blemishes, cracks, blisters or other defects. Plaster shall return into reveals and soffits of openings, and all angles shall be true and straight with salient angles slightly rounded.

Plastering of a surface shall be executed in one operation, as no joint marks will be allowed. Plaster on walls shall not be less than 12 mm or more than 20 mm thick and plaster on concrete shall be not less than 10 mm or more than 15 mm thick, except where specifically specified otherwise.

Only approved ready-mixed or pre-mixed bagged plaster mortar with 5 MPa compressive strength or approved equivalent may be used for plastering. The Contractor must submit the design mix with the volume of water that will be added to the mortar mix to the Engineer for approval.

BD 03.02 PARTITIONS

All internal non-load-bearing walls shall be inspected and the Engineer shall determine whether partitioning such as laminated plastic particleboard, polyester painted steel, vinyl clad gypsum panels or any other demountable partitioning should be replaced.

Where partitioning must be relocated or replaced, such new partitioning shall be non-combustible, provide acoustical privacy and comply with SANS 10400.

All new partitions shall assemble into a rigid structure and all units shall be readily removable from either side without disturbing adjacent units.

All exposed trims for doorframes, glazing and skirting are to be of aluminium, or alternatively be painted in accordance with Technical Specification BJ: Paintwork.

The type of boarding and jointing or cover strips shall be in accordance with the Schedule of Quantities.

BD 03.03 WALL CRACKS

Wall cracks shall be evaluated to determine the nature and severity of the occurrence of the cracks. The Engineer shall inspect all plastered and unplastered walls and identify the underlying factors causing cracks. Repairs shall be carried out in accordance with the Particular Specifications.

BD 03.04 FACE BRICKS

Face bricks shall be inspected for dirt, efflorescence, staining, oil, paint, lichens and mosses, water, smoke and soot, rust, or damage caused by chemical reaction.

Where efflorescence appears, light brushing and hosing down with clean water is recommended for most cases. The brickwork must be saturated with clean water before applying any chemical and washed down with clean water afterwards. Cleaning can also be achieved with scrubbing, water jetting with cleaning agents and soaps, etc. Staining caused by non-water-soluble salts, such as vanadium, manganese and iron, shall be treated as follows:

(a) Remove vanadium staining by washing the wall with a solution of 100 g to 1 litre of water using caustic soda. (Use the corresponding secondary potassium salts where available, as these will be less likely to cause visible secondary efflorescence.) If secondary efflorescence occurs, wash it off with clean water.

(b) Manganese stains must be removed using proprietary brand chemical compounds based on hydrochloric acid with modifiers and sodium fluoride. These solutions should be applied using full strength as recommended by the manufacturer.

(c) Where rust/iron stains occur, wash the affected area with a solution of 50 g oxalic acid, 20 g sodium fluoride, 15 g citric acid in 1 litre of fresh, clean water. Apply the solution to a dry wall and leave it on the wall until the stain has dissolved. Wash down using a solution of 50 g bicarbonate of soda in one litre of water.

External environmental stains and smears caused by soot, smoke, industrial pollution and spillage of oil, paint and other compounds, including micro-organic growths such as fungi, lichens and mosses on brickwork, must be identified and dealt with in an appropriate and approved way.

Care shall be taken to test the effect of some of the chemicals and compounds for possible harmful effects on the colours of the brickwork and on adjacent materials, as well as for possible toxicity to human, animal and plant life. All cleaning procedures shall be carried out with full knowledge of all the potential dangers to human and animal health, and the appropriate safeguarding and precautionary measures shall be put in place.

BD03.04.01 APPLICATION OF SILANE / SILOXANE BASED WATER REPELLENT/IMPREGNATION

The surface to be treated shall be clean, sound and dry. It should be free from dust, dirt, loose particles and oily or greasy deposits.

The surface shall be dry to allow maximum penetration. No application shall be made for at least four days after rain.

In order to remove any loose particles, the walls shall be pressure-cleaned with water before application of the silane / siloxane based water repellent. After pressure cleaning of the walls, the walls shall be left to dry in sunny conditions for at least 4 days, and where dagha (cement) has come loose in the joints and left a void, dagha (cement) joint filling shall be prepared to match the existing colour and shall be replaced to match the existing. The Contractor shall submit a mix design of the dagha (cement) joint filling for approval before application.

The contractor shall arrange for walls to be inspected by the Engineer's Representative before application of the water repellent, but after pressure cleaning of the walls.

The water repellent should be applied by brush or through a low pressure knapsack sprayer. Application should commence from the highest point of the surface and work down the surface. Some run-down of the coating is permissible but should not exceed 250-300 mm. A second coat may be given but only after at least two hours drying time between coats.

Avoid working in full sunshine to achieve maximum penetration. Confine activities to the shadow side of the structures.

Application temperature shall be +/- 5o to +30o, and shall not be applied if rain is imminent.

The penetrating silane / siloxane based water repellent shall be applied to cover 3 – 5 m2 per litre per coat. The water repellent shall be applied in two coats.

The penetrating silane / siloxane based water repellent shall be applied in accordance with the instructions of the supplier.

BD 03.05 WALL TILING

BD 03.05.01 General

Tiling shall comply with the requirements of SANS Standard Specification 22 and section 15 of OW 371. The code of practice for the fixing of glazed wall tiles, SANS 10107 and the recommendations of the South African Ceramic Tile Manufacturer's Association (SACTMA) must be adhered to.

All tiled areas must be checked for damaged surfaces or to determine where tile adhesion to subsurface proves to be of non-satisfactory standard. In cases where tiled surfaces need to be redone, proper care shall be taken in removing all damaged tiles, as well as any adhesive remains on the subsurface.

Matching of existing size and colour should be pursued wherever possible.

BD 03.05.02 Glazed wall tiling

White glazed tiles 150 x 150 x 5 mm thick, first grade, must be laid in a cement-based powder adhesive, strictly in accordance with the manufacturer's specification. Drying periods for backgrounds and substrates must be strictly adhered to. All tiles must be correctly bedded. This can be achieved by using a 6 mm square notched wall trowel to spread the fixative to the required thickness of 6 mm. Bed the tiles dry and move them firmly into position, ensuring that they are in proper overall contact with the bed and form an even surface.

A minimum of 2 mm grouting joints shall be allowed between tiles. Under no circumstances should the tiles be butt-jointed. Do not fill joints between tiles until at least 24 hours after the tiles have been bedded. Ensure that the joints are free of tile adhesive residue and any foreign matter. Fill joints with waterproofed white cement. Existing joints must be cleaned and refilled with new white cement.

BD 03.05.03 Ceramic wall tiling

Glazed ceramic wall tiles 230 x 115 x 11, 5 mm thick, with grade 1 acid resisting quality finish are to be used. Apply an approved epoxy grout into the tile joints and finish off with a wetted nosing tool to a smooth glazed finish. Ceramic tiles include special tiles, such as bull nose and corner tiles. Repairs include replacing damaged tiles and pointing between tiles with an approved epoxy grout.

BD 03.05.04 Corner protectors

Install 75 x 75 x 5 mm thick aluminium angle corner protectors to external vertical wall corners for protection with 8 mm diameter impact nails x 80 mm long @ 300 mm c/c to a maximum height of 1,6 m. Seal the interface gap with approved silicone.

Install for abattoirs and dairies 75 x 75 x 3 mm thick stainless steel grade 304 angle corner protectors, polished to a No 2B finish with a grit 180, to external vertical wall corners. Fix the corner protectors with 8 mm diameter impact nails x 80 mm long @ 300 mm c/c to a height of 1,8 m. The interface gap must be sealed with an approved polyurethane sealant.

BD 03.05.05 Expansion joints

Expansion joints for glazed wall tiling shall be provided at 3,5 m centres maximum (vertically and horizontally). The joints shall be 5 mm wide. Prepare the joints by cleaning them thoroughly. The joints shall be primed and sealed with an approved one component 5 x 5 mm white polyurethane joint sealant.

Expansion joints for ceramic wall tiling shall be provided at 4 m centres maximum (vertically and horizontally). The joints shall be 10 mm wide maximum. Prepare the joints by cleaning them thoroughly. The joints shall be primed and sealed with approved one component 10 x 10 mm white polyurethane joint sealant.

BD 03.06 WINDOWS

BD 03.06.01 General

All windows shall be inspected to assess the level of workability, paying special attention to hinges, handles, stays, catches, etc. Should any window be found unsuitable due to damage to the frame, opening section or any other part thereof, such window shall be replaced.

The Engineer shall take great care to make sure that the appropriate waterproofing details are applied strictly to ensure adequate protection against any water penetration.

BD 03.06.02 Steel windows

The Engineer shall inspect for any deficiencies in residential and industrial type steel windows and cell windows. Where necessary, windows shall be serviced and repainted in accordance with Technical Specification BJ: Paintwork.

BD 03.06.03 Burglar bars to steel windows

Where manganese bars are incorporated in the fixed mullions of the windows, this shall be done in such a way that the bars are not wider apart than 15 cm/centre. The bars shall have at least a section of 30 x 16 mm, penetrating at least 100 mm in the lintels and sills. Heavy duty burglar bars shall be 15 mm diameter or 12 mm square. Loose burglar bars shall be site welded to the window frames.

BD 03.06.04 Timber windows

All wooden windows are to be inspected and treated according to the condition of the timber as stipulated in Technical Specification BJ: Paintwork.

BD 03.06.05 Aluminium windows

When working with mortar or plaster great care shall be taken to protect all aluminium sections from staining by applying a film protector or motor oil on the aluminium surface.

BD 03.07 GLAZING

BD 03.07.01 Glass

Cracked and broken glazing shall be replaced. The glazing and fixing of glass in buildings shall be carried out strictly in accordance with SANS Code of Practice 0137.

BD 03.07.02 Putty

Care shall be taken to remove all chipped, flaked or damaged putty. The Engineer shall indicate on site which putty must be replaced.

All new putty shall comply with the requirements of the SANS Standard Specification 680. The putty shall be delivered on the site in sealed containers marked with the SANS mark.

Type I putty as specified shall only be used for glazing in wood sashes and Type II only in steel sashes.

Paintwork on putty shall not commence until putty has properly dried out, which may necessitate the addition of an accelerating agent. The Contractor shall therefore take programming of trades in Port of Entry areas into consideration.

BD 03.08 DOORS

BD 03.08.01 General

All existing doors shall be inspected for the general condition and integrity of hinges, locking mechanisms, etc.

All steel doors shall comply with the requirements of SANS Standard Specifications 727 and 1129 and section 13 of OW 371.

All new external doors are to be fitted with 1½ pair heavy duty hinges.

Door signage, such as door numbers, etc, shall be in accordance with Technical Specification BH: Fittings, and the Schedule of Quantities.

Special attention shall be given to the condition of striker plates and hinges that need to be replaced, or properly secured where possible. Doors shall be painted to the requirements of Technical Specification BJ: Paintwork.

BD 03.08.02 Doors, sidelights and fanlights

All wooden stock doors shall comply with the requirements of SANS Standard Specification 545 and section 8, clauses 8.33 and 8.34 of OW 371.

BD 03.08.03 Flush doors

The Contractor shall inspect all doors, internal and external. Where any door needs to be replaced, such door shall be a 40 mm thick solid laminated door as specified for interior or exterior use and shall be capable of withstanding the raking, deflection, puncture and moisture resistance tests for the desired application.
Unless otherwise specified, face veneer shall be rotary cut, and shall be of the timber specified, or where doors are to be painted, shall be of timber suitable for painting. Painting shall be done in accordance with Technical Specification BJ: Paintwork, and the Schedule of Quantities.

Edge strips for concealing the vertical edges of doors shall be of the same timber as the face veneer and for single doors and hinge edges of double doors not be less than 10 mm thick, and for rebated meeting edges of double doors not less than 20 mm thick. The top and bottom edges of doors showing end grain shall be sealed with lacquer or other suitable material if the edges were disturbed in any way.

BD 03.08.04 Toilet doors in ablutions

Doors showing signs of erosion due to water penetration shall be either replaced or cut short 150 mm from finished floor level. If the existing semi-solid door panel is to be retained, it should be cut short 150 mm from the floor level. A 38 x 50 mm SAP insert must be glued and nailed in at the bottom edge. The steel frame must also be cut short and filled in with grout at the cut edges and fixed to the wall with 2 x 8 mm diameter heavy duty impact nails.

BD 03.09 IRONMONGERY

BD 03.09.01 General

All ironmongery shall comply with the requirements of section 11 of OW 371. All ironmongery shall be approved by the agent/representative before fixing. Articles shall be fixed with screws of similar metal and shall be eased, oiled, adjusted and left in perfect working order on completion.

All ironmongery shall be inspected to assess the level of workability, paying special attention to door handles, locks, door closers, door stops, door catches, fixing of these fittings, etc. Should any of these fittings be found unsuitable due to damage, corrosion, etc, they shall be replaced. Where existing holes in wood are worn out, these holes must be plugged with wood to receive the screws.

Toilet doors in ablutions must be fitted with approved D-type natural anodised aluminium pull handles and 150 x 150 mm plate. Install 15 mm diameter concealed steel roller ball catch with chromium-plated striker plate with circular hole for roller ball catch. Fix this plate to door frame with two aluminium pop rivets.

BD 03.09.02 Door locks

Each lock shall be provided with two keys and no key shall pass a second lock. All mortice locks, mortice latches and night latches, rim and cylinder rim night latches, and escutcheon for locks shall comply with the requirements of the SANS. The Contractor shall supply all screws, etc, required for completion of the work.

BD 03.09.03 Cupboard doors

Where required according to the Schedule of Quantities, built-in cupboard doors in sleeping quarters are to be provided with 2 x angle iron sections of 35 x 80 x 3 mm thick x 10 mm diameter hole for a padlock that must be fixed to the inside of the cupboard door.

Locker doors shall be provided with a 50 x 50 x 5 mm thick mild steel angle x 10 mm diameter hole for a padlock site welded to the locker.

BD 04 DETAIL OF REPAIR WORK

The detail of the work is described in the Schedule of Quantities.

BD 05 MAINTENANCE

No maintenance will be required for walls under this contract.

BD 06 MEASUREMENT AND PAYMENT

BD 06.01 MEASUREMENT AND RATES

BD 06.01.01 General inclusion of costs and specific specifications

Notes:

Where applicable, standard SANS 1200 measurement and payment items shall be used for Earthworks (Small Works) (1200 DA), Site Clearance (1200 C) and Concrete (Structural) (1200 G).

All material scheduled to be removed shall be deemed to be existing damaged materials in small or large sections. All such redundant material shall become the property of the Contractor and must be removed from site immediately.

All new material shall be deemed to be in patchwork and shall be of approved equal quality, colours, profiles, thickness, etc and shall in all cases match the existing materials and shall be fixed (internally or externally) to existing material, frames or surfaces.

All replacement, removal and repair work shall be done carefully as to not damage any adjacent or other material or work. Any damage to other or adjacent materials or areas caused by the negligence of the Contractor shall be repaired by him free of charge.

All work scheduled to be replaced shall be deemed to include for the careful removal of the damaged existing material as a whole or partly, as specified, for the cleaning and preparation of the remaining surface(s), frames, etc as well as for the new material scheduled or specified to replace the damaged material.

All work scheduled to be removed, hacked off, or taken out shall be deemed to include the cleaning and preparation of the remaining surfaces, areas where material were removed, or remaining work to receive new material or work specified.

Repair and service work shall also include all removing, cutting, grinding, cutting into, welding, bending, strengthening, drilling, tightening, fastening, oiling, greasing, adjusting and providing missing or damaged screws or bolts, etc to repair and service or to improve the items or areas as new and to match the existing. The servicing of windows will be measured in number irrespective of the type of window or the amount of opening sashes present in the overall window size. The rates tendered for servicing of windows or similar items shall be deemed to include for servicing all opening sashes and the total overall frame. The rates tendered for servicing of doors or gates shall include the service of all locks, handles etc.

Work scheduled to be realigned and refixed shall be deemed to include all necessary new additional materials, brackets, connector plates, bolts, pip rivets, nails, screws, spacer blocks, clamps, timber, and labour, etc to leave the items as new and totally functional.

All new work are measured net and shall include all cutting, lapping, waste, bending, fixing, corners, mitres, fixing screws, pip rivets, nails, adhesive, grout, putty, etc, as well as cleaning and preparation of surfaces not already prepared as part of removed items, etc. The supply and installation of new window handles, pegs, stays, etc as well as the service of windows shall include for sealing all bolts and screws of handles, stays, etc with epoxy after fixing or tightening into positions.

The removal of doors, gates or windows shall include for the removal of all existing locks, handles, striking plates, etc but exclude the hinges, etc, which shall be used for the new replaced items. All repair work (excluding paintwork) around and in the

thresholds of new door frames, gates or windows build into existing brickwork in new or existing positions shall be deemed to be included in either the rates tendered for the new replacement item or the removal payment item of the frame, window, etc.

The new doors to toilets and wet areas as specified shall be fitted with rubber door stops, D-profiled pull handle and backplate sets, 15 mm roller ball catches with striking plates and all other ironmongery needed to install the doors complete. All new ironmongery shall be measured and paid for separately.

The new doors to offices, etc, as specified shall be fitted with rubber door stops, 4 lever mortice locksets with handle sets to match existing, striking plates and all other ironmongery needed to install the doors complete. All new ironmongery shall be measured and paid for separately.

All ironmongery installed on the project shall bear the SANS approved trademark and codes. Samples of all ironmongery scheduled must be according to the samples of the Department of Public Works and samples must be handed to the engineer for approval before ordering the material.

All brickwork shall include for damp proofing membranes, galvanized brickwork reinforcement to every third course, wire ties and wall anchors as needed.

Tile work to walls shall include all cutting, spacers, waste, jointing, mitres, corners, epoxy grout and joint filler.

Ordering of certain specified material ie NCI industrial type wall tiles needs special and urgent attendance and should be ordered timeously as to prevent any construction delays.

All new glass mirrors shall be silvered float glass copper backed mirrors with polished edges all round and shall, unless otherwise scheduled, be fixed to walls with chromium plated dome capped mirror screws with rubber buffers.

Specific specification : Repairs to galvanised IBR roofs

Repairs to the workshops and store room roofs will include the following work and all work must be carried out in accordance with the Technical Specification BA: Roof Coverings.

(a) Inspect the roof for defects.

(b) Fasten loose nuts on hook bolts.

(c) Replace damaged and/or severely corroded washers (allow for ± 30% of all washers to be replaced). The remainder of the existing washers must be painted with an approved rust converter and a grey colour pure acrylic paint system.

(d) Insert sealer strips on all loose side laps.

(e) Stitch side laps together with Leak Plugs for IBR roof cladding (2 between every hook bolt; purlins are spaced at approximately 1,86 m c/c).

(f) Install new 0,8 mm thick apex trim at the workshops for the length of each bay size 616 mm girth (286 + 300 vertical + 20 + 10 vertical) with Craft-Lock type apex trim fixing brackets. The apex trim 4 x bend (1 is a shallow bend) and fixed to roof sheeting with stitching screws and washers, and to 260 mm vertical x 140 mm (at slope) x 25 mm wide x 2,5 mm thick with 25 mm lip galvanised bracket. The galvanised bracket to be screwed and fixed to roof cladding in trough with 2 galvanised gutter bolts. The spacing of the brackets is 1029 mm. 150 mm overlap fixed and sealed with 2 rows of pop rivets and 2 rows of silicone. Bend up trough to form dam.

(g) Side wall flashings: Inspect existing flashings. All loose flashings must be sealed with two rows of silicone and stitched together with no.10 stitching screws. Counter flashing to be sealed with silicone in brick wall. Existing sealant to be removed. Prepare groove to manufacturer's specifications to receive new joint sealant.

(h) Ridge flashings: Inspect existing flashings. All loose flashings must be sealed with two rows of silicone and stitched together with no.10 stitching screws.

(i) Holes (small diameter) in cladding to be sealed with Leak King plugs.

(j) Replace existing galvanised gutters and down pipes with new 125 x 100 x 0,8 mm thick Chromadek gutters with 100 x 100 x 0,8 mm thick galvanized baked enamel rainwater down pipes spaced at approximately 6 to 7 m intervals.

Specific specification : Repairs to concrete gutter at workshops

(a) The existing ± 305 mm x 400 mm deep concrete box gutters must be waterproofed with a fully bonded waterproofing system to Technical Specification BC: Waterproofing. Prepare the existing cement screed surface by cleaning it and replacing decayed cement screed with new screed. The waterproofing membrane must be dressed over the top ends of the concrete upstand beams of the gutters and down into down pipes. All sharp concrete corners must be chamfered adequately to suit waterproofing membrane requirements.

(b) The existing expansion joints in the box gutter must be cleaned and prepared to receive joint sealant. The edges of the concrete must be chamfered to comply with waterproofing manufacturer's requirements. Insert 35 mm diameter low density, non-cross-linked, closed cell, expanded poly-ethylene foam backing cord for 25 mm wide joint. Prime joint and seal joints with 25 mm wide x 15 mm thick approved poly-urethane joint sealant applied strictly according to manufacturer's specifications. The top surface of the joint sealant must be recessed adequately into joint to allow for a closed cell polyethylene foam strip that will accommodate movement of the waterproofing membrane.

Dressing to expansion joint will comprise of additional strips of reinforced waterproofing membranes that are lapped and sealed to manufacturer's specifications. The Contractor must submit detail for approval to the Engineer prior installation.

Specific specification : Repairs to roller shutter doors at workshops

(a) Replace the whole bottom T-bar including the bottom ± 17 galvanised slats of the existing roller shutter doors with a new galvanised T-bar (bottom rail) with neoprene weather strip. The Contractor must measure the width of the door (approximately 3000 mm) and the opening width of the wicket door prior ordering the new bottom T-bar and new galvanised slats (± 76 mm high x 1,2 mm thick). When the new bottom T-bar has arrived on site, the Contractor must remove the existing bottom T-bar and slats and slide in the new T-bar and slats.

(b) Provide and insert end locks on the ends of door curtains.

(c) Repairing shall include fixing of missing bracket bolts, screws and pins, brackets, fittings such as locks, loose rachet and pawls, and brackets. Loose bracket bolts that have broken out of walls shall be replaced with 175 mm long x 12 mm diameter threaded rods that must be anchored to the walls with an approved epoxy grout.

(d) Repairing bent and fixing of damaged steel plates of canopy covers.

(e) Repairing gearbox, gear handle, drive shaft, pinions and bevel gears.

Specific specification: Servicing and adjustments to roller shutter doors

(a) All other door components shall be serviced, adjusted, repaired and replaced, but not restricted to, for the full repair of the complete door installation to a smooth working condition. The door sizes is approximately 3000 mm wide x 3500 mm high. The existing interlocking slats are 76 mm wide.

(b) Servicing shall include cleaning and oiling of hinges, rollers, bearings, gears, channel guides and locks. Interlocking slats of the roller shutter curtains shall only be washed with a high-pressure water jet and detergent to remove all dirt, grease, etc.

(c) Adjusting, fixing and realigning of door guides. The existing channel guides, approximately 76 mm wide shall be bent straight to allow free and smooth movement of the roller shutter door slats. The Engineer shall give the necessary instructions where severely damaged channel guides must be replaced.

(d) Adjusting and balancing torsion springs, barrel collar and counter balance.

Specific specification : Welding of thin steel plates

Thin steel plates covering the external side of doors must be welded to the door frame members. The existing paint must be removed from the welding areas prior to site welding. A coded or experienced welder must submit the proposed welding procedure to the Engineer for approval. The aim of the site welding is two fold, viz to fix the steel plate to the frame and secondly, to prevent water ingress into the inside of the door. The perimeter of the individual plate sections of the door must be sealed with continuous impervious welds.

Specific specification : Repairs and replacements to agricultural kraals

Replace diamond mesh fence:

Existing diamond mesh shall, where indicated by the Engineer, be removed and replaced with new diamond mesh fence. The new galvanized diamond mesh shall be stretched and properly tied to the fencing wire. The diamond mesh or wire netting shall be secured by means of soft binding wire at 1,2 m centres along the top and bottom straining wires and at 3 m centres along each of the other fencing wires unless otherwise specified.

Diamond mesh

(a) Diamond mesh (chain-link) fencing shall comply with the requirements of SANS 1373. The edge-finish shall be both sides clinched or barbed.
(b) The nominal diameter of the wire shall be 2,5 mm and the mesh size shall be 40 mm x 40 mm.

(c) The wire shall be fully galvanized

Tensioning fence wires:

All fencing wire shall be carefully strained and hung without sag, and with true alignment, care being exercised not to strain the wire so tightly that it will break, or that end, corner, straining or gate posts will be pulled up. Each strand of fencing wire shall be securely fastened in the correct position to each post with soft galvanised binding wire.

Smooth wire:

(a) Smooth wire shall comply with the requirements of SANS 675 and shall be of the types specified below:

(b) Straining wire shall be 4,0 mm diameter and fully galvanized.

(c) Fencing wire shall be high tensile grade, 2,24 mm diameter wire fully galvanized.

(d) Tying wire shall be 2,5 mm diameter, mild steel, galvanized wire for tying fencing wire to standards and droppers, and 1,6 mm diameter, mild steel, galvanized wire for tying netting and mesh wire to fencing wire.

BD 06.02 SCHEDULED ITEMS

NEW WORK

BD.01 Doors and windows:

(a) (Type of doors, windows, locks, etc and material indicated):

(i) Description of item..... Unit : number

The unit of measurement shall be the number of doors, windows, locks, etc installed complete as specified.

The tendered rates shall include full compensation for the manufacturing and installation of the steel or natural anodised aluminium doors, windows, locks, frames, etc complete with hinges, handles, locks, barrel bolts, retaining devices, door stops, stays and any other work necessary to complete the work as specified, scheduled or as shown on the Drawings. The tendered rates for windows shall also include full compensation for glazing, window sills and damp-proof sheeting as specified or to match existing.

BD.02 Wall panelling:

(a) Description of material to be used:

(i) Description of item and/or position to be fixed ..... Unit m, m^2, number

The unit of measurement shall be the number, metre, etc for each item as scheduled.

The tendered rates shall include full compensation for all costs of material, waste, labour, plant, transport, delivery, access, scaffolding, fuel, etc to install the material as specified and to match the existing to the Engineer's approval.

BD.03 Joinery:

(a) Items measured by number:

(i) Doors, etc (type and size indicated).....Unit: number

(ii) Etc for other items measured by number

(b) Items measured by linear metre:

(i) Skirtings, etc (type and size indicated)..... Unit: m

(ii) Etc for other items measured by length

(c) Items measured by area:

(i) Eaves covering, etc (type and thickness indicated) .....Unit: m^2

(ii) Etc, for other items measured by area

The units of measurement shall be the number, metre or square metre of each type and/or size of joinery item specified.

The tendered rates shall include full compensation for the supply of all materials, manufacture, cutting, waste, fixing and installation of the joinery items.

BD.04 Ironmongery, steelwork, glass, wall finishings, etc:

(a) Measured by number:

(i) (Description of item) .....Unit: number

(ii) Etc

(b) Measured by linear metre:

(i) (Description of item) ..... Unit: m

(ii) Etc

(c) Measured by area:

(i) (Description of item) ..... Unit: m^2

(ii) Etc

The unit of measurement shall be the number, metre or square metre as applicable to each item.

The tendered rates shall include full compensation for manufacturing, providing and installing each item to new or existing steel, wood or plaster complete as per specifications, drawings, descriptions as scheduled or as the existing and shall include for all labour, material, waste, plant, transport, delivery, access, scaffolding, fuel, etc to the Engineer's approval.

ALTERATION WORK

BD.05 Alterations and repairs to existing structures:

(a) Indicate if repairs, replace, alterations, removal or sealing, etc:

(i) Description of individual items to be repaired, altered, removed, sealed, etc .....Unit: m^3, m^2, m, number

The unit of measurement for items repaired, replaced, altered, removed, sealed, etc shall be the cubic metre, square metre, metre or number for each item as scheduled.

The tendered rates shall include full compensation for all costs to repair, replace, refix, remove, cutting into, re-align, taking off, temporary store, etc as specified in the Standard and Technical Specifications and shall allow for all necessary labour, plant and new material needed to do the specified work and to leave the scheduled items as new and to the approval of the Engineer. Refer also to the general inclusion of costs in BD 06.01.01.

TECHNICAL SPECIFICATION

BE FLOORS

CONTENTS

BE 01 SCOPE

Floors shall mean the scope of work to maintain materials and components such as removal of existing floors and installation of new floor coverings, skirtings, screeds, concrete floors and paving. This specification does not include work related to metalwork and paintwork, which are specified elsewhere.

This specification covers the removal of existing floor coverings, screeds and concrete surface beds, the repair of existing floor coverings, screeds and concrete surface beds. This specification also covers the supply, delivery and installation of new floor coverings, screeds and concrete surface beds for various types of buildings.

The complete scope of repair work shall as described in BE 04: Detail of repair work.

BE 02 STANDARD SPECIFICATIONS

BE 02.01 GENERAL STANDARD SPECIFICATIONS

The latest edition, including all amendments up to date of tender of the following specifications, publications and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof:

PW 371		-	Specification of Materials and Methods to be used (Fourth edition, October 1993)
SANS	281	-	Hardwood block and strip flooring
SANS	581	-	Semi-flexible vinyl floor tiles
SANS	786	-	Flexible vinyl flooring
SANS	978	-	Wood mosaic flooring
SANS	10070	-	The laying of thermoplastic and similar types of flooring
SANS	10043	-	The laying of wood floors
SANS	10186	-	The laying of textile floor coverings
SANS	1449	-	Ceramic wall and floor tiles

BE 02.02 ADDITIONAL SPECIFICATIONS

Technical Specification BF: Structural concrete
Technical Specification BG: Metalwork

BE 03 VARIATIONS AND ADDITIONS TO STANDARD SPECIFICATIONS

BE 03.01 ADDITIONAL REQUIREMENTS FOR REPAIR OF FLOORS

BE 03.01.01 Floor coverings

Existing floors shall be inspected to determine the extent of any damaged floor areas. The existing floors and other building elements shall be protected from damage during the progress of any repair work and on completion shall be cleaned and handed over in a perfect condition. Only skilled workmen experienced in laying any type of floor finishes shall carry out the work.

BE 03.01.02 Preparation of floor slab and surface beds for new floor screeds

The existing concrete screed shall be removed in patches designated by the Engineer.

All laitance on the surface of the existing surface bed must be removed completely. Mechanised plant such as scabblers or abrasive blasters must be used. The Contractor shall take all necessary precautions to keep dust pollution to a minimum inside the building during the breaking out and removing of existing concrete screeds, as well as during the preparation of the existing concrete surface bed.

After the mechanical cleaning of the slab surface to expose the coarse aggregate, all dust and debris must be removed, and the surface must be thoroughly wetted and kept wet for at least 12 hours before application of the new concrete screed.

BE 03.01.03 Surface preparation of existing floor screeds for new floor coverings

The following procedure is suggested where vinyl tiles were laid with bitumen adhesive:

(a) The Engineer will specify the where existing vinyl tiles are to be removed.

(b) The bitumen must be removed mechanically and/or chemically. Remove as much bitumen and other contamination as possible by scraping. Bitumen can be heated to soften it.

(c) Sweep or vacuum sub-floor thoroughly to remove dust and grit.

(d) An approved solvent based degreasing and cleaning compound can be used to remove the bitumen chemically. The Contractor shall ensure the safety of the workers and the building against possible fire.

(e) The concrete surface must be smoothened. Even the surface with Pavelite or approved equivalent before laying the new vinyl tiles. The Pavelite must be applied in accordance with the manufacturer's specifications.

(f) Vacuum clean the floor surface again before the adhesive is applied to lay the vinyl tiles.

BE 03.01.04 Cement screed

Cement screed shall be carried out in accordance with clause 14.18 of PW 371. The Engineer shall determine which existing cement screeds are to be replaced. The cement screed shall have a maximum thickness of 30 mm. Where required the cement screed shall be modified with an approved alkali compatible acrylic emulsion by preparing the cement screed with a mixture of the latex and water in the required ratio.

Before the new screed is applied, remove all surface water from the slab. Apply a bond coat to the slab/surface bed, consisting of a 1:1 mix of cement and clean fine sand with just enough water to provide the consistency of slurry. Mix in equal parts an approved alkali compatible acrylic emulsion specially modified for use in cement mortars with water, and add Portland cement to form the slurry. Spread the bond coat evenly using a stiff fibre brush. Do not leave standing pools. Place screed in good time (before the bond coat dries out). The screed must be laid and compacted in one layer.

Curing should commence as soon as the finishing operations have been completed and should be continued for at least 7 days. The Engineer must approve the method of curing.

Joints must be formed in the screed at all existing contraction and expansion positions, as well as at intermediate positions at 3 m spacing maximum.

BE 03.01.05 Concrete screeds

(a) General

Concrete screeds shall have a minimum thickness of at least 50 mm. The Engineer shall determine the areas of which the concrete screeds need to be replaced.

Only ordinary Portland cement, CEM 1 42,5 in accordance with SANS ENV 197-1, shall be used.

Coarse aggregate maximum size:	10 mm
28-day cube strength:	35 MPa.

The use of an approved plasticizer is recommended to reduce the water content of the mix to the absolute workable minimum.

The mix design must be submitted to the Engineer in advance for approval.

Four sets of six test cube samples shall be taken for every factory for the testing of the compressive strength of the concrete.

(b) Concrete floor hardener

Concrete natural non-ferrous aggregate floor hardeners shall strictly be applied in accordance with the manufacturer's specification and under his supervision. Note: The Contractor shall furnish a certificate of compliance, together with a written guarantee after completion.

(c) Compressive strength

At 7 days:	50 MPa
At 28 days:	70 MPa

All other aspects of the construction of new concrete screeds shall be adhered to as specified in Technical Specification BF: Structural concrete.

BE 03.01.06 Laying of material (ceramic excluded)

The laying of vinyl and similar flooring material in tile and sheet form and the fixing of plastic skirtings, nosings, etc, shall be carried out in accordance with SANS 1043 and section 10, clause 10.3 of PW 371.

The laying of wood block and wood mosaic flooring shall be carried out in accordance with SANS 1043 and section 10, clause 10.2 of PW 371.

The laying of textile floor coverings shall be done in accordance with SANS 10186.

Vinyl floor tiles shall be laid with continuous joints in both directions. Tiles shall be cut with a "jointer" at saw and expansion joints. Tiles laid over these types of joints will not be permitted. Only latex-resin type adhesive shall be allowed to glue tiles to the concrete screed or surface bed.

BE 03.01.07 Granolithic screed finish

Granolithic screed finish to floors, treads of steps, thresholds and similar surfaces, unless otherwise specified, shall not be less than 25 mm thick. The granolithic screed shall be composed of three parts granite, or other approved hard stone chips, or approved hard, coarse sharp washed granitic or quartzite sand, half part clean sand and one part of cement, hand or mechanically trowelled to a true and smooth surface. No dry cement powder, grout or wet slurry mix shall be applied to the surface.

New granolithic screed shall be laid before the concrete surface bed or floor matures in order to allow for proper binding. If this is not possible, then the top of the surface bed or floor shall be hammered, chipped and then cleaned with a wire brush and a coat of neat cement grout applied immediately before the granolithic is laid.

The granolithic shall be laid in panels not exceeding 6 m² in area and jointed to lines of panels with V-joints. The joints between the panels shall coincide with joints in the concrete surface bed or floor.

Granolithic finish to stair risers, sides of curbs and other vertical surfaces shall, unless otherwise specified, not be less than 12 mm thick.

All granolithic work shall be done by experienced workmen only and shall be protected from damage caused by rain or other extreme weather for 12 hours after being laid. Protection shall be provided against too rapid drying whilst hardening by means of covering with wet sacks or other suitable material. The screed shall also be protected from damage and discoloration during the progress of the remaining work.

Edges of granolithic floor butting against different floor finishes and edges of margins, etc, shall be true and sharp, and shall be protected by fixing temporary wood strips which shall remain in position until the laying of the adjoining floor has commenced.

Where a non-slip granolithic floor finish is required, the granolithic shall be laid as specified above. Alundum grit shall then be sprinkled over the surface at the rate of 1 kilogram per square meter, lightly tamped in and allowed to set.

BE 03.01.08 Vinyl floor finishes

Existing floors should be inspected and where vinyl tiles need to be replaced, such tiles shall comply with the requirements of SANS 786, and be 300 x 300 x 2 mm thick unless otherwise specified. The flooring shall be of marbled pattern and of an approved colour (to be specified by the Engineer).

Vinyl floor tiles or sheets shall be laid with an adhesive recommended by the manufacturer. All the preparation and work in connection with the laying and fixing of the specified flooring and vinyl skirtings shall be done in accordance with SANS 1070 and to the satisfaction of the Engineer.

The flooring shall, where necessary, be cut and neatly fitted against adjoining floors, thresholds, etc. Where required the Contractor shall carefully remove existing timber floor skirtings and/or quarter rounds for re-use where vinyl tiles are laid against walls. Reinstate skirtings and/or quarter rounds.

Vinyl floor tiles shall, unless otherwise specified, be laid with continuous joints in both directions and vinyl floors shall, unless otherwise specified, be in standard widths with cut sheets at sides of floors as necessary, all to the entire satisfaction of the Engineer.

The vinyl flooring and skirtings shall be covered up and protected from damage during the progress of remaining work and on completion be cleaned and, unless otherwise specified, polished with the type of polish recommended by the manufacturer of the vinyl flooring.

BE 03.01.09 Skirtings

Loosened hardwood skirtings must be cleaned and where necessary removed and/or replaced by 76 x 19 (or 25 mm) mm thick hardwood skirting with one rounded top edge plugged to the wall. Painting shall be in accordance with Technical Specification BJ: Painting.

In selected areas skirtings shall be 100 mm high x 6 mm thick unglazed ceramic tiles glued to walls with an approved cement grout. The Engineer shall specify these areas.

Vinyl cove skirtings shall be of approved manufacture and colour and, unless otherwise specified, be 70 mm high.

BE 03.01.10 Sealing of vinyl flooring

The newly laid tiles shall, after four days, be scrubbed with a diluted neutral detergent/stripper complying with SANS 825 and rinsed thoroughly. After the floor has dried, apply two coats polymer/acrylic sealer combination containing a minimum of 22 % solids using an applicator pad. Ensure that the surface has set hard before allowing traffic on the floors.

BE 03.01.11 Wood block floors

(a) Replacement of wood block floors

Where required, wood blocks that must be replaced shall, unless otherwise specified, be Clear Grade, Class H with nominal sizes of 75 mm wide, 225 mm long and 20 mm thick, and shall comply with the requirements of SANS 281. Wood blocks that are loose must be re-laid using an approved hot or cold adhesive after the old bitumen has been removed and the surface prepared.

The moisture content of the blocks shall be as specified in the above-mentioned specification, and the blocks shall be treated with timber preservative as specified. The blocks shall, unless otherwise specified, be laid to a basket pattern with an approved hot or cold adhesive and shall be sanded on completion all in accordance with the SANS Code of Practice, SANS 1043 and to the satisfaction of the Engineer

Wood block floors shall be covered up and protected from damage during the progress of the remaining work, and unless otherwise specified, a sealer shall be applied to the final sanded surface and then polished all in accordance with the above-mentioned Code of Practice.

(b) Partial repairs to parquet floors

Only severely loose wood blocks identified by the Engineer shall be repaired. The Contractor shall carefully remove the wood blocks for re-use. Scraping and any other suitable means shall be used to remove the old bitumen. The concrete surface bed or cement screed shall be cleaned from dust and bitumen residue as specified in BE 03.01.02. If the concrete or cement screed is in a poor condition, the poor patches shall be removed according to BE 03.01.04. The Contractor will be allowed to use rapid hardening cement grouts to reduce drying time of concrete and cement screeds in order to suit the working programme. The screeds must be laid at such a level as to enable the workmen to lay the cleaned wood blocks at the same level as the surrounding wood flooring blocks. The cleaned blocks shall be laid in a basket pattern (or the same existing pattern) with approved hot or cold bitumen at the same level as the surrounding blocks. Missing blocks must be replaced.

BE 03.01.12 Sealing of timber floors

Existing timber floors must be mechanically belt-sanded to remove all traces of existing sealer in strict compliance with SANS 1043. Where necessary, existing flooring, skirtings and quarter rounds should be temporarily removed. Before applying the new wooden floor sealer, ensure that the surfaces are dry, sanded smooth and free from varnish or oil. Vacuum the dust from the prepared floor surfaces.

Apply three coats of clear, lead free wooden floor sealer with preservative and anti-fungicidal properties according to the manufacturer's specification.

Apply the first coat until an even glossy, wet surface is achieved. Leave to dry thoroughly. Apply at least two other coats in the same way, and finally a fourth and final coat. It is proposed that the Contractor first do a trial section to satisfy himself that he can handle this procedure. The final appearance of the wooden floor must be smooth and have a uniform non-gloss finish.

Reinstate skirtings and quarter rounds.

BE 03.01.13 Tiling (general)

Tiles shall be solidly bedded and jointed in cement mortar and, unless otherwise specified, joints shall be 6 mm wide.

The joints in all tiling are to be continuous in both directions. The pointing is to be carried out by well pressing in half-dry cement mortar. Under no circumstances may liquid cement grout be used for pointing.

All tiling shall be properly covered and shall be protected against any possibility of staining, discolouring or any other damage.

At completion, all tiling is to be exposed, checked for damage, repaired where necessary and cleaned off with soft soap and cold water and left in a perfect condition. The application of oil on tiling is not allowed.

BE 03.01.14 Ceramic and quarry floor tiles

(a) General requirements

The Engineer shall determine which tiles need replacement. The existing floor screed and floor tiles must be removed in patches and/or areas as determined by the Engineer.

Ensure that the base for floor tiling is rigid, stable and level unless required to have a fall in one or more direction(s). The surface preparation and cement screed (if required) are described in BE 03.01.03 and BE 03.01.04 respectively.

When proprietary brand adhesives are being used for fixing ceramic floor tiles it is essential that the surface to which the tiles are to be fixed is clean, dry, flat and true.

Lay approved unglazed ceramic split floor tiles (230 x 115 x 11,5 mm thick and of a selected or matching colour) in professional floor grouting with 8 - 10 mm wide joints. The floor grout must be applied with a 10 mm square notched floor trowel evenly over an area not exceeding 1 metre at a time. Coved skirting tiles including external and internal skirting corners must be laid against walls in abattoirs. Setting out must be done correctly. The finished installation must be level plumb and true unless specified otherwise. In abattoirs the floor tiles must be laid to specified falls.

Mortar beds for dust-pressed tiles and quarry tiles shall be formed with a slurry of 1:1 cement and clean fine sand to a thickness of about 3 mm on an area not exceeding 1 metre at a time. The joints will be 6 - 8 mm wide depending on the size of the tile.

The tiles must be laid in professional cement-based powder adhesive, strictly in accordance with the manufacturer's specifications. The Code of Practice for the fixing of tiles in accordance with SANS 1449 and the recommendations of the South African Ceramic Tile Manufacturer's Association (SACTMA) shall be followed. Important points to be taken into consideration is are summarised below:

(i) Sufficient time must be allowed between building operations.
(ii) Drying periods for backgrounds and substrates must be strictly adhered to.
(iii) No tiling may commence prior to the prescribed time.
(iv) All tiles must be correctly bedded. The tiles must be properly bedded into a fixative that is spread evenly to the required thickness using a square notched rubber mallet (10 mm for ceramic tiles). Bed the tiles dry and move firmly into position, ensuring that they are in proper overall contact with the bed, and form an even surface.
(v) A minimum of 6 - 10 mm grouting joints must be allowed between extruded and split tiles (3 mm minimum for pressed tiles). Ensure that the joints are free of tile adhesive and any foreign matter.
(vi) Tiling installation: Setting out and finished installation must be done correctly.

(b) Filling of joints

Do not fill joints between tiles until at least 24 hours after the tiles have been bedded. Before applying the joint epoxy grout ensure that the joints are free of tile adhesive residue and any foreign matter. Apply the approved epoxy grout into the tile joints. The finishing-off must be completed with a wetted nosing tool or spatula so that a smooth glazed surface finish can be achieved. Application of the epoxy grout must be done strictly in accordance with the manufacturer's specifications. Finally, the tiles must be thoroughly cleaned.

BE 03.01.15 Movement joints in tiling

(a) General requirements

Movement joints are to be provided in tile work due to moisture expansion, thermal expansion and contraction, and crack control at existing expansion joints in the surface bed.

(i) Provide movement joints in the tile work, screed and bedding down to the concrete surface bed or slab. The spacing of these joints depends on the position of existing joints, column and wall layouts and slab thickness. The maximum spacing of joints should be limited to 30 times the slab (surface bed) thickness or 4,5 m, whichever is the lesser. The length-to-width ratio of tile panels should be limited to between 1,0 and 1,5.

(ii) Provide isolation joints around the perimeter of the floor, around columns, walls and other fixed structural elements.

(iii) Joints shall be aligned with no offsets. Irregular shape tile panels must be avoided. Where included angles are unavoidable, it should be less than 60 degrees.

(iv) The width of the joint shall be 6 mm minimum and 10 mm maximum. Provide an approved closed-cell expanded polyethylene foam joint filler with a hinged temporary blocking piece in the movement joints. The size of the blocking piece must be the same as the joint width.

(b) Joint sealing

The joints shall be prepared and primed prior the application of the joint sealant.

The liquid sealant in joints shall be an approved one part grey polyurethane sealant with a shore hardness of A45 and an elongation of 400 %. The manufacturer's specifications must be strictly followed.

BE 02.02 PAVING

Repairs to paving shall include the improvement of existing paving, drainage channels and the replacement of paving that can not be repaired. Different paving types exist, e.g. concrete, precast paving segmental and regular blocks, bricks and slasto. This specification only covers pedestrian paving around buildings.

The Engineer shall identify the paving areas that are to be repaired. Defects to paving will include but not be limited to the following aspects:

(a) Failure of sub-base material and subsidence of sub-soil due to excessive water erosion;
(b) Broken and severely damaged paving;
(c) Distorted and disturbed paving;
(d) Drainage problems, eg ponding of water on the paving and in drainage channels, incorrect falls, etc;
(e) The omission of edge restraint;
(f) Intrusion of weed or hostile root penetration.

BE 03.02.01 Preparing foundation

If the sub-base and/or sub-grade have failed, this soft and unstable material shall be replaced. Existing paving must be carefully removed and stack for re-use. The new earth filling shall be of inert material, having a maximum plasticity of 10, free from large stones, etc, spread, leveled, watered and compacted in layers not exceeding 150 mm thick to a density of 95% of modified AASHTO density. Cement stabilization to improve the existing sub-grade may be considered to improve the characteristics of the material. The blocks shall be laid true to line, levels and grade on a 25 mm thick layer of approved bedding sand. The bedding sand must not be used to fill hollows in an uneven sub-grade or sub-base surface. Where specified, plastic sheeting must be provided below the bedding sand layer. Refer also to BE 03.02.06.

The Contractor shall be responsible for carrying out all necessary process control tests on the density and moisture content of the completed sub-grade, sub-base, etc, to ensure that the required compaction is being attained.

BE 03.02.02 Laying of segmental block paving

The existing blocks shall be preselected for re-use. Broken and severely damaged paving blocks shall be replaced. New paving blocks shall comply with SANS 1058 Class 30 compressive strength. All blocks shall be laid true to line and level. Care shall be taken to ensure that joint lines are straight and square. The blocks shall have a minimum thickness of 60 mm.

After laying the blocks, the paving shall be compacted by means of vibrating plate compactor with joints between the blocks filled in, after compaction, by sweeping in fine sand. The jointing sand shall have a pass of 1,18 mm sieve and contain 10-50 % material passing the 75 micron sieve. The sand shall be free of all soluble salts or contaminants likely to cause efflorescence or staining.

Areas against curbs, manholes, etc, that require infilling and which exceed 25 % of a full block unit shall be filled with units cut to size using a mechanical or hydraulic guillotine, bolster or angle grinder. Infill areas constituting less than 25 % of a full block area and are of 25 mm minimum dimension shall be filled with 25 MPa concrete. Smaller areas shall be filled with 1:4 cement mortar.

BE 03.02.03 Laying face brick pavers, precast concrete blocks and slasto

The existing blocks shall be preselected for re-use. Broken and severely damaged paving blocks shall be replaced. All blocks shall be laid true to line and level. Care shall be taken that joint lines are straight and square. Slasto shall be laid in the same pattern to match existing.

After laying the blocks, the paving shall be compacted by means of vibrating plate compactor. Clean the top of the blocks before and after compaction. Thoroughly wet compacted area after compaction and leave 24 hours to dry. The joints between the blocks must be filled in, after compaction, with a 1:4 cement mortar. The joints shall be pointed with a steel tool to a smooth surface finish.

BE 03.02.04 Laying of cast in-situ concrete paving and drainage channels

Severely cracked and/or damaged concrete paving and drainage channels shall be replaced. The Engineer shall indicate which panels and sections of drainage channels are to be removed. Cutting out will be done with an angle grinder or saw cutting machine. Concrete panels must be removed in sizes where the ratio of the sides does not exceed 1:1,5. The foundation material must be improved as specified in BE 03.02.01.

New concrete panels and drainage channels must be cast with a compressive strength of 25 MPa. Concrete paving to the specified thickness must be finished off with a smooth wood trowel surface finish or must match the existing surface finish. Edges must be finished off with a steel nosing tool with a radius of 5 mm. Expansion joints must be provided where specified. Drainage channels must be cast in lengths not exceeding 1 metre. Channels must be finished off to have a smooth steel trowel finish.

BE 03.02.05 Precast concrete edge beams, curbs and channels

Edge restraints shall be installed before paving commences. Edge restraints may be cast in-situ, or consist of precast units. Precast edge blocks shall have dimensions of 75 mm wide x 300 mm deep. Cast in-situ beams with 25 MPa concrete shall have dimensions of 300 x 300 mm and cast in lengths on exceeding 1 meter.

Precast concrete curbs and channels shall comply with SANS 927, generally in 1 meter lengths and finished smooth from the mould on exposed surfaces. Curbs and channels shall be bedded on and jointed in 1:3 cement mortar and pointed with keyed joints. Bases to curbs shall be Class B prescribed mix of unreinforced concrete.

BE 03.02.06 Weed control

Two types of weed killing shall be carried out:

(a) Mixing weed killer to sub-base for rehabilitated paving;
(b) Spraying existing paving excluding concrete paving.

After the base course has been approved and the curbing completed, the prepared base must be treated with a soil applied herbicide with long residual action for the control of broad leaf weeds and grasses, containing active ingredient Bromacil, at a rate of 4 kg/m². Plastic sheeting with a thickness of 375 micron shall be laid to prevent the penetration of grass underneath the segmental paving.

BE 03.02.07 Site clearance

Excess sand and all other debris shall be removed before the pavement is opened to traffic. The site shall be left in a tidy condition.

BE 04 DETAIL OF REPAIR WORK

The detail of the scope of work is described in the Schedule of Quantities.

BE 04 MAINTENANCE

No maintenance will be required for floors under this contract.

BE 06 MEASUREMENT AND PAYMENT

BE 06.01 MEASUREMENT AND RATES

BE 06.01.01 General inclusion of costs and specific specifications

Notes:

Where applicable, standard SANS 1200 measurement and payment items shall be used for Earthworks (Small Works) (1200 DA), Site Clearance (1200 C) and Concrete (Structural) (1200 G).

All material scheduled to be removed shall be deemed to be existing damaged materials in small or large sections. All such redundant material shall become the property of the Contractor and must be removed from site immediately.

All new material shall be deemed to be in patchwork and shall be of approved equal quality, colours, profiles, thickness, etc. and shall in all cases match the existing materials and shall be fixed (internally or externally) to existing material or surfaces.

All replacement, removal and repair work shall be done carefully as to not damage any adjacent or other material or work. Any damage to other or adjacent materials or areas caused by the negligence of the Contractor shall be repaired by him free of charge.

All work scheduled to be removed, hacked off or taken out shall be deemed to include the cleaning, removing of contact glue or bitumen and preparation of the remaining

surfaces, areas where material were removed, or remaining work to receive new material or work specified.

Repair work shall also include all cutting, grinding, cutting into, welding, bending, strengthening, drilling, etc. to repair or to improve the items or areas as new and to match the existing.

Work scheduled to be realigned and re-fixed shall be deemed to include all necessary new additional materials, brackets, connector plates, bolts, pip rivets, nails, screws, spacer blocks, clamps, timber, and labour, etc. to leave the items as new and totally functional.

All floor surfaces scheduled to be cleaned and sealed shall include for stripping the floors from any fats, grime, dirt, oil and other deposits. Replacement of grout to ceramic and clay floor tiles shall also be included where necessary as per the tendered rate. Sealing of vinyl floor tiles shall be done in accordance with Technical Specification BE 03.01.10.

All new work are measured net and shall include all cutting, lapping, waste, bending, fixing, corners, mitres, fixing screws, pip rivets, nails, adhesive, grout, putty, etc, as well as cleaning and preparation of surfaces not already prepared as part of removed items, etc.

Tile work to floors shall include all cutting, spacers, waste, jointing, mitres, corners, epoxy grout and joint filler.

Ordering of certain specified materials ie industrial type extruded/split ceramic floor tiles needs special and urgent attendance and should be ordered timeously as to prevent any construction delays.

BE 06.02 SCHEDULED ITEMS

NEW WORK

BUILDING WORK

BE.01 **Floor screeds:**

(a) (Thickness indicated) .....Unit: m^2

(b) Etc. for other thicknesses

The unit of measurement shall be the square metre of floor screed laid, as specified, on floors, steps or areas shown on the Drawings or as designated by the Engineer.

The tendered rates shall include full compensation for the construction of the floor screeds, including the supply of all materials, mixing, laying, finishing, the forming of nosings, readings, skirtings, etc.

BE.02 **Joinery:**

(a) Items measured by number:

(i) Doors (type and size indicated .....Unit: number

(ii) Etc. for other items measured by number

(b) Items measured by linear metre:

(i) Skirtings (size indicated)..... Unit: m

(ii) Etc. for other items measured by length

(c) Items measured by area:

(i) Eaves covering (type and thickness indicated) .....Unit: m^2

(ii) Etc. for other items measured by area

The units of measurement shall be the number, metre or square metre of each type and/or size of joinery item specified.

The tendered rates shall include full compensation for the supply of all materials, manufacture, cutting, waste, fixing and installation of the joinery items.

BE.03 **Floor tiling and finishes, etc:**

(a) Measured by number:

(i) (Description of item) ..... Unit: number

(b) Measured by linear metre:

(i) (Description of item) .....Unit: m

(c) Measured by area:

(i) (Description of item) .....Unit: m^2

The unit of measurement shall be the number, metre or square metre as applicable to each item.

The tendered rates shall include full compensation for manufacturing, providing and installing each item complete as per specifications, drawings, descriptions as scheduled or as the existing and shall include for all labour, material, waste, plant, transport, delivery, access, scaffolding, fuel, etc. to the Engineer's approval.

ALTERATION WORK

BE.04 **Alterations and repairs to existing structures:**

(a) Indicate if repairs, alterations, removal, cleaning or sealing, etc:

(i) Description of individual items to be repaired, altered, removed, sealed, etc ..... Unit: m^3, m^2, m, number

The unit of measurement for items repaired, altered, removed, sealed, etc. shall be cubic metre, square metre, metre or number as scheduled.

The tendered rates shall include full compensation for all costs to repair, refix, remove, clean and seal, cutting into, realign, taking off, temporary store, etc. as specified in the Standard and Technical Specifications and shall allow for all necessary labour, plant and new material needed to leave the scheduled items as new and to the approval of the Engineer. Refer also to the general inclusion of costs in BE 06.01.01.

TECHNICAL SPECIFICATION

BF STRUCTURAL CONCRETE (REPAIRS)

CONTENTS

BF 01 SCOPE

This specification covers the repair of existing structural concrete elements and the supply, delivery and implementation of the repair procedures for the various types of buildings.

Structural concrete shall mean the scope of work to repair and maintain all structural concrete components such as walls, columns, stairs and suspended slabs. Joint repairs also form part of this specification. This specification does not include work related to metalwork and paintwork that are specified elsewhere.

The complete scope of repair work shall be according to the section: Detail of repair work.

Maintenance of this part of the installation (the works) shall be performed according to the Additional Specification: General Maintenance and the specific requirements to be included in this Technical Specification.

BF 02 STANDARD SPECIFICATIONS

BF 02.01 GENERAL STANDARD SPECIFICATIONS

The latest edition, including all amendments up to date of tender of the following specifications, publications and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof:

OW 371	-	Specification of Materials and Methods to be used Fourth Edition, Oct. 1993
SABS 1200 G	-	Concrete (Structural)
SABS 1200 GA	-	Concrete (Small works)
SABS 1200 GB	-	Concrete (Ordinary buildings)
SABS 1200 GE	-	Precast Concrete (Structural)
SABS 1200 GF	-	Prestressed concrete
SABS 0100	-	Structural use of concrete
SABS 110	-	Sealing compounds for the building industry, two-component, polysulphide base
SABS 1077	-	Sealing compound for the building and construction industry, two-component, polyurethane-base
SABS 1254	-	Sealing compounds for the building industry, oleo-resinous base, for interior and exterior use.
SABS 1305	-	Sealing compounds for the building industry, one-component, siliconed-rubber-base

BF 02.02 ADDITIONAL SPECIFICATIONS

Technical Specification BC: Waterproofing
Technical Specification BD: Walls
Technical Specification BE: Floors
Technical Specification BG: Metalwork
Technical Specification BK: Water Retaining Structures
Joint materials manufacturer's specifications (they shall take precedence over others)
Concrete repair materials manufacturer's specification (they shall take precedence over others)

BF 02.03 REQUIREMENTS FOR REPAIR OF STRUCTURAL CONCRETE

BF 02.03.01 Concrete repair

All existing structural concrete to be inspected to determine the extent of damage and repair work required. All remedial concrete work to be classified into the following categories by the Engineer:

- Surface Concrete Repair
  Cosmetic repair of concrete surfaces where no reinforcing is exposed, where cover to reinforcement is not a problem (non-aggressive environment) and for non-structural repairs.

- Mild to Moderate Concrete Repair
  When the reinforcing is exposed and the extent thereof is small compared to the size of the element under consideration.

- Severe Concrete Repair
  Where the front of the reinforcing is exposed in large areas or reinforcing is exposed totally. Generally when the defective areas have adverse structural implications.

The above categories do not apply to off-shutter concrete, which will be treated on merit.

Any structural concrete elements that are damaged to such an extent that they can not be classified under severe concrete repair, will be treated on merit. Detailed instructions will be issued during repair/maintenance for the rehabilitation of such structural concrete elements.

BF 02.30.02 Surface Concrete repair procedure

The following procedure, or similar approved by the Engineer to be used:

- Remove all loose and defective material and clean around affected area to expose aggregate.

- Saw-cut 10mm vertically around edges of repair area and break out concrete within to avoid tapered feathering.

- Wet area well, approximately 30 minutes before commencement of repair.

- Apply an approved shrinkage compensated cementitious repair mortar in strict accordance with the manufacturer's specifications.

- The repaired surface to be cured by covering with plastic sheeting and keeping wet for 48 hours or as otherwise specified.

BF 02.03.03 Mild to Moderate Concrete repair procedure

The following procedure, or similar approved by the Engineer to be used:

- Remove all loose and defective material and break out to a minimum depth of 10mm.
- Saw-cut 10mm vertically around edges of repair area and break out concrete within, to avoid tapered feathering.
- Ensure that concrete is free from laitance, oil, grease etc and is sound, firm and clean.
- Exposed reinforcing to be wire brushed clean and free of all rust and then coated with an approved single component epoxy zinc primer.
- The concrete to be thoroughly wetted and kept wet for a minimum of 12 hours before applying remedial product, loose standing water to be removed prior to application of repair mortar.
- Apply an approved shrinkage compensated cementitious repair mortar in strict accordance with the manufacturer's specifications.
- The repaired surface to be cured by covering with plastic sheeting and keeping wet for 48 hours or as otherwise specified.

BF 02.03.04 Severe Concrete repair procedure

The following procedure or similar approved by the Engineer to be used:

- Propping of structure may be necessary during repair period.
- Chop around defective area removing all loose and suspect material taking care not to damage the existing reinforcing.
- Exposed reinforcing to be wire brushed clean and free of all rust and then coated with an approved single component epoxy zinc primer.
- The damaged area to be chopped rectangular in shape to expose the sound aggregate, and feathered edges to be saw-cut vertically and broken out to a minimum depth of 10mm.
- Ensure that the cavity is clean, dry and free of any debris.
- Apply an approved epoxy resin repair compound strictly in accordance with the manufacturer's specifications.
- In certain cases, which will be treated on merit, cementitious repair mortars as specified in BF 02.3.3, will be permitted.

BF 02.03.05 Concrete cracks

All existing concrete to be inspected to determine the extent and damage due to cracking of concrete. The cause of cracking is to be established to determine the correct remedial action to be taken. The Engineer will determine the extent of repair work required, which will in most cases, require individual specifications to suit.

BF 02.03.06 **Concrete crack repair procedure**
(Generally used where cracking could adversely affect the structure)

The following procedure, or similar approved by the Engineer to be used:

- The surface over the entire length of the crack should be wire brushed to remove laitance or any other deleterious materials from the concrete.
- If the surface of the concrete is unsound, chase a vee cut into the crack.
- All debris to be removed.
- Drill holes into the crack. The size, depth and centres etc. as specified for the crack injection product to be used. Blow out holes free of drill dust.
- Install injection nipples into the holes as specified. Allow for air release holes.
- Seal the face/s with an approved epoxy.
- Pump in approved epoxy liquid to suit crack size/width.
- The above repair system to be done strictly in accordance with the manufacturers specifications and requirements, and must be carried out by approved specialists or suitably trained persons.

BF 02.03.07 **Cleaning of Concrete**

Concrete surfaces which have been soiled, stained, marked etc., and are aesthetically displeasing to the eye, must be cleaned to as close as possible, to new condition. Approved water-soluble cleaners and/or acid etching cleaners must be used strictly in accordance with manufacturers specifications.

BF 02.03.08 **Expansion joints**

Existing horizontal and vertical expansion joints to be inspected to determine the extent of damage to the joints. The existing expansion joints and other building elements shall be protected from damage during the progress of any repair work of expansion joints and on completion shall be cleaned and handed over in a perfect condition. Only skilled workmen experienced in the preparation for and application of the remedial products shall carry out the work.

The extent of the expansion joint remedial work to be determined by the site Engineer.

BF 02.03.09 **Expansion joint remedial procedure**

The following procedure to be used for remedial work to expansion joints. The site Engineer to confirm the remedial procedure required for each application and all workmanship is subject to his approval.

- Remove all damaged sealant from expansion joint.
- Joint former/filler to be inspected and if in poor condition, must be removed.
- Remove all loose materials mechanically to ensure a sound, clean and dry concrete surface.
- Where required, the sides of the concrete joint to be cut smooth and straight with an angle grinder or diamond saw.
- Where required, the edges of the expansion joints to be provided with a fillet. Engineer to determine on site.

- Install a non-bituminous, non-extruding resilient joint filler where existing joint former/filler was removed.

- Install a closed cell resilient foam cord or release film or bond breaking tape before applying sealant.

- A primer coat to be applied to all surfaces, brushed well into the faces of the joint.

- Install a single component fast curing polyurethane joint sealer strictly according to the manufacturers specifications.

- All materials to be submitted to the Engineer for approval prior to installation.

BF 03 DETAIL OF REPAIR WORK

The Schedule of Quantities shows approximate quantities of work. Detailed instructions will be issued during construction.

BF 04 MAINTENANCE

[Note: There will be no maintenance work required for structural work in this contract.]

This specification must be read in conjunction with the Additional Specification: General Maintenance.

All components forming part of the structural concrete shall be maintained as part of the maintenance of installations as defined in the Additional Specification: General Maintenance, during the maintenance phase of the contract.

Maintenance shall include all repair work, replacing of components, fixing of defects or any other actions or rectifying measures necessary to maintain perfect functional condition of structural concrete according to the Operation and Maintenance Manuals and as specified in this specification. All structural concrete shall be kept in a good condition.

Maintenance on the structural concrete shall also include all other actions related to (or springing forth from) maintenance, such as:

- Replacing of loose or spalled concrete.

- Premature deterioration of concrete.

- Cleaning of wall and floor joints.

- Maintenance of expansion joints in structural concrete.

Remuneration for maintenance of the complete structural concrete shall be deemed included in the tendered monthly payment for maintenance of the installation under which it falls.

BF 05 MEASUREMENT AND PAYMENT

Refer to Technical Specification BK Measurements and Payments: Building work.

TECHNICAL SPECIFICATION

BH FITTINGS

CONTENTS

BH 01 SCOPE

Fittings shall mean the scope of work to perform corrective maintenance repairs to materials and components related to cupboards, shelving, signage and counters.

The complete scope of repair work shall be as described in BH 04: Detail of repair work.

BH 02 STANDARD SPECIFICATIONS

BH 02.01 GENERAL STANDARD SPECIFICATIONS

The latest edition, including all amendments up to date of tender of the following specifications, publications and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof:

PW 371	-	Specification of Materials and Methods to be used (Fourth edition, October 1993)
SANS 929	-	Plywood and composite board
SANS 1099	-	Hardwood furniture timber
SANS 1783-3	-	Softwood timber for industrial use
SANS 1385	-	Kitchen cupboards of steel, composite board and timber

BH 02.02 ADDITIONAL SPECIFICATIONS

Technical Specification BD: Walls
Technical Specification BG: Metalwork
Technical Specification BJ: Paintwork

BH 03 VARIATIONS AND ADDITIONS TO STANDARD SPECIFICATIONS

BH 03.01 ADDITIONAL REQUIREMENTS FOR REPAIR OF FITTINGS

BH 03.01.01 Built-in cupboards

The Engineer shall inspect all cupboards for defects and shall establish which components are to be replaced or repaired. Reasons for replacement will include, but not be limited to:

(a) Severely chipped or damaged block board;
(b) Severely chipped or damaged decorative laminates;
(c) Inadequacy of design, eg strength of hinges, failure of door furniture, etc;
(d) Corroded steel elements.

Fixing of defects will include repairing or replacing damaged, corroded and worn-out fittings, eg door handles, knobs and hinges, door catches and holders, door locks, cupboard door vents, drawer slide rails, drawer handles, knobs and locks. Moving parts shall be serviced by cleaning, oiling, tightening loose screws, reinstating missing screws or aluminium pop rivets, etc. Refer to BD 03.08 and BD 03.09 of Technical Specification BD: Walls, for repairs or replacements of cupboard doors and ironmongery.

BH 03.01.02 Kitchen cupboards

Kitchen cupboards shall be inspected for defects. Defects will include repairing or replacing damaged, corroded and worn-out fittings, eg door handles, knobs and hinges, door catches and holders, door locks, cupboard door vents, drawer slide rails, drawer handles, knobs and locks. Moving parts shall be serviced by cleaning, oiling, tightening loose screws, reinstating missing screws or aluminium pop rivets, etc. Where the baked enamel of steel cupboards is scratched and worn off, the steel surface shall be sanded and painted with an approved gloss epoxy paint to match the existing colour. Severely corroded or damaged steel cupboards shall be replaced with approved new steel cupboards complying with SANS 1385, with the baked enamel complying with SANS 783 Type II.

Damaged kitchen cupboards manufactured from composite board with laminated plastic covering shall be repaired where possible by gluing loose laminated plastic covering or replacing components with new similar matching finished elements.

Damaged kitchen cupboards manufactured from timber shall be repaired by replacing cracked and broken timber components. Painted surfaces shall be varnished with water-resistant varnish (with matching stain) or painted with approved polyurethane paint. Refer to Technical Specification BJ: Paintwork.

All cupboards shall be properly screwed and fixed to walls and floors with suitable corrosion resistant screws and plastic plugs, washers, etc.

Work tops and sinks against walls shall be sealed with an approved white one part polyurethane sealant. The sealant shall be applied strictly according to the manufacturer's specifications. Old worn-out and damaged sealant shall also be replaced. Drop-in sink bowls shall also be sealed with this approved polyurethane sealant. Where the possibility exists that water can penetrate composite board, these joints in the worktops shall also be sealed.

BH 03.01.03 Shelving

The stability of shelves must be checked to determine the occurrence of sagging. Where required, provide adequate support for the specific application, eg steel tubing struts, additional timber bearers, steel brackets, etc.

Broken timber shelving shall be replaced with approved wrought hardwood or solid laminated pine varnished or painted to specification. Composite board will not be permitted. Shelves shall be in single lengths. Heads of nails and brass countersunk screws in exposed faces of joinery shall be sunk and pelleted.

BH 03.01.04 Signage

Safety signs shall comply with the requirements of SANS 1186 (1997).
The Engineer shall survey all signage and list those items that prove to be illegible. Signs that need to be replaced shall be done in the same fashion and material as to match similar signs in the same application. The size of the signs shall be as shown on the schedules.

Where required proper and appropriate signage must be provided for door numbers, room size and room description. The size, colour, position on the door, wall, etc., height above floor level of the lettering shall be instructed by the Engineer on site or shown on the schedules. The lettering must be stencilled on to the doors and walls.

All other fire protection signage will be provided for hydrants, hose reels, etc, shall be provided under separate contract.

BH 03.01.05 Counters

The Engineer shall inspect all counters and counter tops for defects and shall establish which components are to be replaced or repaired. Special attention shall be given to the condition of hinges at service hatches.

All joinery liable to be damaged shall be covered with temporary coverings to the satisfaction of the Engineer and special care shall be taken to protect surfaces that are to be varnished.

Where necessary, timber counters shall be sanded down, uneven surface spots filled with an approved wood filler, all blemishes removed and then finished off in order to restore the wood to its original state.

Steel tops that have been damaged excessively shall be replaced.

BH 04 DETAIL OF REPAIR WORK

The detail of the scope of work is described in the Schedule of Quantities.

BH 05 MAINTENANCE

No maintenance will be required for fittings under this contract.

BH 06 MEASUREMENT AND PAYMENT

BH 06.01 MEASUREMENT AND RATES

BH 06.01.01 General inclusion of costs

Notes:

All material scheduled to be removed shall be deemed to be existing damaged materials in small or large sections. All such redundant material shall become the property of the Contractor and must be removed from site immediately.

All new material shall be deemed to be in patchwork and shall be of approved equal quality, colours, profiles, thickness, etc and shall in all cases match the existing materials and shall be fixed (internally or externally) to existing material or surfaces.

All replacement, removal and repair work shall be done carefully as to not damage any adjacent or other material or work. Any damage to other or adjacent materials or areas caused by the negligence of the Contractor shall be repaired by him free of charge.

All work scheduled to be removed or taken out shall be deemed to include the cleaning and preparation of the remaining sections, areas, or work to receive the new material or work specified.

Repair and service work shall also include all removing, cutting, grinding, cutting into, welding, bending, strengthening, drilling, tightening, fastening, oiling, greasing, adjusting, and providing missing or damaged screws or bolts, etc to repair or to improve the items or areas as new and to match the existing. The service of cupboard doors and drawers shall be deemed to include for servicing all locks, hinges, glides, tracks, etc.

Work scheduled to be realigned and refixed shall be deemed to include all necessary new additional materials, brackets, connector plates, bolts, pip rivets, nails, screws, spacer blocks, clamps, timber, and labour, etc to leave the items as new and totally functional.

All new work are measured net and shall include all cutting, lapping, waste, bending, fixing, corners, mitres, fixing screws, pip rivets, nails, adhesive, grout, putty, etc, as well as cleaning and preparation of surfaces not already prepared as part of removed items, etc.

The removal of doors, gates or windows shall include for the removal of all existing locks, handles, striking plates, etc but exclude the hinges, etc, which shall be used for the new replaced items. All repair work (excluding paintwork) around and in the thresholds of new door frames, gates or windows build into existing brickwork in new or existing positions shall be deemed to be included in either the rates tendered for the new replacement item or the removal payment item of the frame, window, etc.

The new doors to toilets and wet areas as specified shall be fitted with rubber door stops, D-profiled pull handle and backplate sets, 15 mm roller ball catches with striking plates and all other ironmongery needed to install the doors complete. All new ironmongery shall be measured and paid for separately.

The new doors to offices, etc, as specified shall be fitted with rubber door stops, 4 lever mortice locksets with handle sets to match existing, striking plates and all other ironmongery needed to install the doors complete. All new ironmongery shall be measured and paid for separately.

All ironmongery installed on the project shall bear the SANS approved trademark and codes. Samples of all ironmongery scheduled must be according to the samples of the Department of Public Works and samples must be handed to the engineer for approval before ordering the material.

BH 06.02 SCHEDULED ITEMS

NEW WORK

BH.01 Joinery:

(a) Items measured by number:

(i) Timber cupboard doors, shelves, complete cupboards, etc (type and size indicated) .....Unit: number

(ii) Etc for other items measured by number

(b) Items measured by linear metre:

(i) Timber rails, planks, frames, shelves, etc (size indicated) .....Unit: m

(ii) Etc for other items measured by length

(c) Items measured by area:

(i) Pinning boards, shelves, work tops, etc (type and thickness indicated) .....Unit: m^2

(ii) Etc, for other items measured by area

The units of measurement shall be the number, metre or square metre of each type and/or size of joinery item specified.

The tendered rates shall include full compensation for the manufacturing and supplying of all materials, for transport, labour, cutting, waste, fixing, screws, bolts, clamps, etc and installation of the joinery items.

BH.02 **Steelwork:**

(a) Items measured by number:

(i) Steel cupboard or locker doors, shelves, complete cupboards, etc (type and size indicated).....Unit : number or units

(ii) Etc, for other items measured by number

(b) Items measured by linear metre:

(i) Steel rails, shelves, frames, etc (size indicated) ..... Unit : m

(ii) Etc, for other items measured by length

(c) Items measured by area:

(i) Shelves, plates, etc (type and thickness indicated) .....Unit : m^2

(ii) Etc, for other items measured by area

The unit of measurement shall be the number, metre or square metre of each type and/or size of steelwork item specified.

The tendered rates shall include full compensation for the manufacturing, supplying of all materials and transport, and for all labour, cutting, welding, waste, fixing and installation of the steelwork items complete with a red oxide or equal approved steelwork primer or baked enamel paint finishing as specified.

ALTERATION WORK

BH.03 **Alterations and repairs to existing fittings:**

(a) Indicate if repairs, alterations, removal or sealing, etc:

(i) Description of individual items to be repaired, altered, removed, sealed, etc .....Unit: m^3, m^2, m, number

The unit of measurement for items repaired, altered, removed, sealed, etc shall be cubic metre, square metre, metre or number as scheduled.

The tendered rates shall include full compensation for all costs to repair, refix, remove, cutting into, realign, taking off, temporary store, etc as specified in the Standard and Technical Specifications and shall allow for all necessary labour, plant and new material needed to leave the scheduled items as new and to the approval of the Engineer. Refer also to the general inclusion of costs in BH 06.01.01.

TECHNICAL SPECIFICATION

BJ PAINTWORK

CONTENTS

BJ 01 SCOPE

This specification covers the painting/repainting and maintenance of new and existing building components and maintenance thereafter for various types of buildings and structures.

Paintwork shall mean the scope of work related to the preparation, painting and maintenance of new and existing building components. This specification does not include work related to galvanising of steelwork, which is specified elsewhere.

The complete scope of paintwork shall be as described in BJ 04: Detail of repair work.

BJ 02 STANDARD SPECIFICATIONS

BJ 02.01 GENERAL STANDARD SPECIFICATIONS

The latest edition, including all amendments up to date of tender of the following specifications, publications and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof:

SANS 515 - Decorative paint with a non-aqueous solvent base for interior use
SANS 630 - Decorative high gloss enamel for interior and exterior
SANS 631 - Decorative oil gloss paint for interior and exterior use
SANS 633 - Emulsion paints for interior decorative purposes
SANS 634 - Emulsion paints for exterior use
SANS 678 - Primers for wood for interior and exterior use
SANS 681 - Undercoats for paints
SANS 683 - Roof paints (relevant sections)
SANS 723 - Wash primer (metal etch primer)
SANS 801 - Epoxy-tar paints
SANS 887 - Varnish for interior use
SANS 926 - Two-pack zinc-rich epoxy primer
SANS 1227 - Textured wall coatings, emulsion base, for interior and exterior use
SANS 1319 - Zinc phosphate primers for steel
SANS 10064 - Preparation of steel surfaces for coating
OW 371 - Specification of Materials and Methods to be used (Fourth edition, October 1993): Section 18

BJ 02.02 ADDITIONAL SPECIFICATIONS

Technical Specification BG: Metalwork
Paint manufacturers' specifications. These specifications shall take precedence over all others.

BJ 03 VARIATIONS AND ADDITIONS TO STANDARD SPECIFICATIONS

BJ 03.01 ADDITIONAL REQUIREMENTS FOR PAINTWORK

BJ 03.01.01 General

a) Quality control

i) Application of all paints must be supported by the relevant paint manufacturer's technical quality control systems with regard to preparation, application, film thickness, colour/pigmentation, mixing, etc.

ii) The Contractor must submit his programme to the Engineer well in advance, particularly where high-risk surface applications (sheet metal roofs, etc) are concerned, in order to keep the manufacturer's technical personnel informed. Paint application may not commence until the manufacturer has inspected the surface preparation and given written approval thereof to the Engineer.

b) Paint systems

i) All paint shall be delivered to the site in the unopened containers on which the manufacturer's name and trademark appear.

ii) All materials for paintwork shall comply with the requirements for standards from the country from which it originated and shall be approved by the Engineer.

iii) The Contractor shall submit copies of the paint manufacturer's specifications, recommendations and datasheets to the Engineer for approval.

iv) The coating system shall be from one manufacturer unless otherwise specified. The paint manufacturer's instructions shall be strictly adhered to.

v) Paints, etc, shall be suitable for application on the surfaces on which they are to be applied and various coats must be compatible with each other. Those paints used externally shall be of exterior quality or suitable for exterior use.

c) Guarantee

i) The Contractor must give a 3 year written guarantee for the quality and workmanship of the paint work (fair wear and tear excepted). The Contractor shall be liable for any peeling or flaking paint applied by the Contractor and shall execute all such work of repair, rectification and making good of painted surfaces as may be ordered in writing by the Engineer. The manufacturer must carry out inspections at regular intervals during the construction period. The Manufacturer must issue a certificate of acceptance and compliance on completion to the client.

BJ 03.01.02 General preparation of new and existing work

All walls and ceilings, etc, shall be thoroughly cleaned prior to commencement of painting and the premises kept clean and free from dust during painting operations. Protect all surfaces not to be painted against spotting and spilling. Clean down and make good as necessary. Locks, door handles and similar fittings or fixtures shall be removed (or masked) and refitted on completion of painting.

(a) Plaster

(i) All surfaces, sills, ceilings, etc, shall be thoroughly dry before painting operations are started. Porous surfaces must be sealed with the appropriate sealer, thinned if necessary, before applying the paint system.

(ii) Exterior surfaces: Any cracks shall be scraped out and filled with an approved filler or patching plaster and rubbed down flush; the whole surface shall be well brushed down to remove all loose dust and powdery material before applying the first coat of the specified paint system.

(iii) Interior surfaces: All cracks, blow holes, etc, shall be filled with suitable stopping and rubbed down flush. The whole surface shall be smoothed to an even finish and dusted down. Any grease marks, crayon marks, etc, shall be cleaned off with sugar soap and thoroughly rinsed with clean water. The surface shall be thoroughly dry before painting operations are started.

(iv) Ceilings: Ceilings shall be brushed down and free of all dust and powdery materials. Cover strips and cornices shall be stopped where necessary and rubbed down smooth. All nail heads shall be primed, stopped and rubbed down flush. The surface shall then be wiped or brushed free of all loose or powdery materials before applying the recommended paint system.

(v) Fibre cement: Fibre cement surfaces shall be cleaned down and primed with an approved sealer and undercoat.

(b) Metalwork

(i) Iron and steel: New iron and steel metalwork shall be cleaned with an approved degreaser and the most effective method available (shot or sand blasting, mechanical wire brushing, hand wire brushing) used to remove all rust and millscale. Any salt deposits resulting from a marine or industrial environment shall be removed by washing with water prior to priming.

(ii) Galvanised surfaces: New galvanised surfaces shall be well cleaned to remove all traces of oil and dirt with galvanised iron cleaner and rinsed with clean water.

(c) Woodwork

New woodwork shall be brushed down and the surface prepared as follows:
Knots shall be given a coat of an approved patented knotting. The surface shall be primed overall and all holes shall be filled. The surface shall then be rubbed down with glass paper until smooth and even. Woodwork that needs to be oiled, stained or varnished shall be free of all stains, pencil marks and other surface discolourations and blemishes and shall be stopped with tinted stopping and rubbed down.

(d) General

(i) Colours: All colours and tints are to be submitted to the Engineer for approval. Sample colours are to be prepared in all cases for the final coat and all work must be finished to colour approved by the Engineer. Where necessary, universal undercoat must be tinted to a shade lighter than the finishing coat.

(ii) Doors and windows: All doors and opening sections of windows must be left ajar after painting or varnishing until the paint is perfectly dry.

(iii) Protection and cleaning off: All necessary precautions are to be taken for the protection of all finished work and other trades during painting, and all ironmongery shall be removed where possible prior to the commencement of painting and re-fixed after completion. All paint spots, stains, etc, are to be cleaned off floors, walls, glass, etc, after completion.

BJ 03.01.03 Paint specifications for various components

(a) Fibre cement (ceilings)

(i) New work

(1) Interior

Ceilings to wet areas (ablutions, kitchens and laundries):

- Polyurethane alkyd enamel:
  Prepare and apply one coat synthetic copolymer primer. Stop with interior crack filler, seal crack filler with above primer. Apply two coats of polyurethane alkyd enamel interior quality paint.
- Universal fungicidal additive:
  To be added to above in proportions specified by the manufacturer. This additive will only be required in specific cases.

(2) Exterior

Preparation: Clean down to remove all dirt and grease, etc, fill nail-heads with exterior crack filler and sand down to a smooth and even surface.

Finishing coat (emulsion): Apply two coats of super acrylic copolymer PVA emulsion or polyurethane alkyd enamel.

(ii) Renovation (existing) work

(1) Interior

Ceilings previously painted, in good condition:

Preparation: Clean down to remove all dirt and grease, etc, fill nail-heads, cracks and defects with interior crack filler and sand down to a smooth and even surface.

Finishing coat (emulsion): Apply two coats of super acrylic copolymer PVA emulsion or polyurethane alkyd enamel.

Ceilings previously painted, in poor condition (to be finished in an emulsion system):

Preparation: Remove all loose and flaking paint, clean down to remove all dirt, grease, etc, prime nail-heads with zinc phosphate primer for steel. Apply one coat of primer to existing ceiling boards diluted with 20 % turpentine. Fill nail-heads, cracks and defects with interior crack filler and sand down to a smooth and even surface. Seal all repaired areas with above-mentioned primer.

Finishing coat: Apply two coats of super acrylic copolymer PVA.

Ceilings to wet areas:

Preparation as above, but to be followed by one coat synthetic copolymer primer and two final coats polyurethane alkyd enamel interior quality paint (with fungicidal additive, only if specified).

In cases where fungicidal attack is prevalent the prepared surface must be washed down with antiseptic solution, followed by sodium hyperchlorite and allowed to react for 15 minutes before washing down with water. Once dry, primer and finishing coats may be applied.

(2) Exterior

Not applicable.

(b) Woodwork truss/rafters (overhangs)

(i) New work

(1) Interior

Not applicable.

(2) Exterior

- Egg-shell/High-gloss enamel:
  Prepare and touch up knots with spirit soluble resin type knotting. Apply one coat of primer for wood. Stop with wood filler where necessary. Apply one coat of universal undercoat. Apply two coats of enamel.

- Creosote coating:
  Prepare surface to be clean, dry and sound Apply on coat of creosote wood treatment coating.

(ii) Renovation (existing) work

(1) Interior

Not applicable.

(2) Exterior

Woodwork truss/rafters (overhangs) previously painted, in good condition (to be painted in egg-shell/high-gloss enamel):

Preparation: Clean down and sand to a smooth finish. Spot prime where necessary with primer for wood. Allow 24 hours drying. Stop with wood filler.

Undercoat: Apply one coat of universal undercoat. Allow 24 hours drying.

Finishing coat: Apply two coats of enamel paint.

Woodwork truss/rafters (overhangs) previously painted, in poor condition (to be finished in egg-shell/high-gloss enamel):

Preparation: Remove existing paint and sand down thoroughly. Touch up knots and resinous areas with knotting.

Primer: Apply one coat of universal undercoat. Allow 24 hours drying. Stop with wood filler and sand to a smooth finish.

Undercoat: Apply one coat of universal undercoat. Allow 24 hours drying.

Finishing coat: Apply two coats of enamel paint.

Creosote coating:

Preparation: Prepare surface. Apply two coats creosote wood treatment coating.

(c) Metalwork - steelwork and miscellaneous metal work (including general pipework)

(i) New work

(1) Interior

Unpainted:

Prepare and apply one coat zinc phosphate primer for steel. Apply one coat of universal undercoat. Apply two coats of high gloss enamel paint.

Shop-primed:

Touch up damaged primer with zinc phosphate primer for steel. Apply one coat of universal undercoat. Apply two coats of high-gloss enamel paint.

Cast-iron waste pipes:

Prepare and remove as much bitumen as possible. Apply one coat of aluminium paint. Apply one coat of universal undercoat. Apply two coats of high-gloss enamel paint.

(2) Exterior

Unpainted:

Prepare and apply one coat zinc phosphate primer for steel. Apply one coat of universal undercoat. Apply two coats of high-gloss enamel or oleoresinous aluminium paint (where applicable).

Shop-primed:

Touch up damaged primer with zinc phosphate primer for steel. Apply one coat of universal undercoat. Apply two coats of high-gloss enamel or oleoresinous aluminium paint (where applicable).

Cast-iron waste pipes:

Prepare and remove as much bitumen as possible. Apply one coat of universal undercoat. Apply two coats of high gloss enamel or oleoresinous aluminium paint (where applicable).

(ii) Renovation (existing) work

(1) Interior

Previously painted metalwork, in good condition (steel windows, door frames, miscellaneous steelwork, etc):

Preparation: Wash down with sugar soap and rise with clean water. Sand lightly and apply one coat universal undercoat.

Finishing: Apply two coats high-gloss enamel.

Previously painted metalwork, in poor condition:

Preparation: Remove all existing paint by means of scraping or wire brushing and sanding. Tightly adhering paint that cannot be removed may remain and be overcoated. Remove all signs of rust back to bright metal by sanding with emery cloth. Wash down with an approved degreaser, rinse with clean water to remove all traces thereof and allow to dry. Treat rusted areas with a water-based rust converter.

Primer: Apply one coat of zinc phosphate primer for steel. Allow overnight drying.

Undercoat: Apply one coat of universal undercoat. Allow overnight drying.

Finishing coat: Apply two coats high-gloss enamel. Allow overnight drying between coats.

Previously painted metalwork, to remove all previous paint to original surface:

Preparation: Remove all existing paint by means of scraping or wire Brushing, grinding and sanding Remove all signs of rust back to bright metal by sanding with emery cloth. Wash down with an approved degreaser, rinse with clean water to remove all traces thereof and allow to dry. Treat rusted areas with a water-based rust converter.

Primer: Apply one coat of zinc phosphate primer for steel. Allow overnight drying.

Undercoat: Apply one coat of universal undercoat. Allow overnight drying.

Finishing coat: Apply two coats high-gloss enamel. Allow overnight drying between coats.

(2) Exterior

Previously painted metalwork, in good condition:

Preparation: Wash down with sugar soap, followed by light sand-papering. Rinse with clean water.

Undercoat: Apply one coat of universal undercoat. Allow 24 hours for drying.

Finishing coat: Apply two coats of high-gloss enamel or oleoresinous aluminium paint (where applicable).

Previously painted metalwork, in poor condition:

Preparation: Remove all existing paint by means of scraping or wire brushing and sanding. Tightly adhering paint that cannot be removed may remain and be overcoated. Remove all signs of rust back to bright metal by sanding with emery cloth. Wash down with an approved degreaser, rinse with clean water to remove all traces thereof and allow to dry. Treat rusted areas with a water-based rust converter.

Primer: Apply one coat of zinc phosphate primer for steel. Allow for 24 hours drying.

Undercoat: Apply one coat of universal undercoat. Allow for 24 hours drying.

Finishing coat: Apply two coats of high-gloss enamel or oleoresinous aluminium paint (where applicable).

Previously painted metalwork, to remove all previous paint to original surface:

Preparation: Remove all existing paint by means of scraping or wire Brushing, grinding and sanding Remove all signs of rust back to bright metal by sanding with emery cloth. Wash down with an approved degreaser, rinse with clean water to remove all traces thereof and allow to dry. Treat rusted areas with a water-based rust converter.

Primer: Apply one coat of zinc phosphate primer for steel. Allow overnight drying.

Undercoat: Apply one coat of universal undercoat. Allow overnight drying.

Finishing coat: Apply two coats high-gloss enamel. Allow overnight drying between coats.

(3) Aggressive environments

Not applicable.

(d) Gypsum board (ceilings, etc)

(i) New work

(1) Interior (dry areas)

- Super acrylic PVA:
  Prepare and apply one coat synthetic copolymer primer for gypsum board diluted with 20 % turpentine. Stop with interior crack filler, seal crack filler with above-mentioned primer. Apply two coats of super acrylic copolymer PVA paint.

(2) Exterior (dry areas)

- Super acrylic PVA:
  Prepare and supply one coat of synthetic copolymer primer for gypsum board diluted with 20 % turpentine. Stop with interior crack filler, seal crack filler with above-mentioned primer. Apply two coats of super acrylic copolymer PVA paint.

(ii) Renovation (existing) work

(1) Interior

Previously painted gypsum board with PVA in good condition:

Preparation: Wash down with sugar soap to remove all dirt, grease, etc, and rinse off with clean water. When dry, make good all cracks and defects with interior crack filler and sand to a smooth and even surface.

Finishing coat: Apply two coats super acrylic copolymer PVA.

Previously painted gypsum board, in poor condition:

Preparation: Clean down. Remove all paint by sanding and scraping.

Primer: Allow overnight drying. Make good cracks and holes with crack filler. Seal crack filler with above primer and allow to dry.

Finishing coat (emulsion): Apply two coats of super acrylic copolymer PVA.

(2) Exterior

Not applicable.

(e) Cement plaster (walls) and concrete surfaces

(i) New work

(1) Interior

- Polyurethane alkyd enamel (in wet areas, kitchens, etc):
  Prepare and apply one coat bonding liquid, followed by one coat of synthetic copolymer primer for new plaster. Apply one coat of polyurethane alkyd enamel paint.

- Acrylic emulsion:
  Same as above, but apply acrylic emulsion with smooth velvet sheen interior quality paint.

- Gloss enamel:
  Same as for polyurethane alkyd enamel, but apply two coats high-gloss enamel.

- Super acrylic PVA:
  Prepare and apply one coat of synthetic copolymer primer. Apply two coats of super acrylic copolymer PVA.

- Semi-gloss pure acrylic finish:
  Prepare and apply one coat of synthetic copolymer primer. Apply one coat of pure acrylic paint.

(2) Exterior

- Pure acrylic:
  Prepare and apply one coat of alkali resistant synthetic resins bonding liquid. Stop with exterior crack filler. Apply one coat of copolymer primer. Apply one final coat of pure acrylic paint.

- Pure acrylic with Teflon:

Preparation, priming and application as above.

- Super acrylic PVA:
  Prepare and apply one coat of synthetic copolymer primer. Apply two coats of super acrylic copolymer PVA.

- Acrylic emulsion (external textured):
  Preparation as above, followed by two coats textured exterior acrylic emulsion, allowing one hour drying time between coats.

(ii) Renovation (existing) work

(1) Interior

Previously distempered:

Preparation: Remove all distemper with a peeling agent. Rinse with clean water. Allow 48 hours to dry. Fill cracks and defects with interior crack filler. Sand down to a smooth and even surface.

Primer: Apply one coat of bonding liquid, allow a minimum of 24 hours and maximum of 72 hours for drying. Final primers as specified in BJ 03.01.03(e)(i).

Finishing coat: Apply similar paints to suit as specified in BJ 03.01.03(e)(i).

(2) Exterior

Previously painted cement plaster (walls) and surfaces, in good condition:

Preparation: Wash down thoroughly with sugar soap. Rinse with clean water. Fill with suitable exterior crack filler. Sand smooth.
Prime with one coat bonding liquid

Finishing coat: Apply similar paints to suit as specified in BJ 03.01.03(e)(i).

Previously painted cement plaster (walls) and surfaces, in poor condition (ie peeling, crazing, etc, not previously limewashed):

Preparation: Remove all paint and fill with suitable exterior crack filler.

Priming coat: Prime with one coat bonding liquid, allow to dry for a minimum of 24 hours and a maximum of 72 hours.

Finishing coat: Apply similar paints to suit as specified in BJ 03.01.03(e)(i).

(f) Fibre cement board (fascias and ceilings)

(i) New work

(1) Interior

New and wet asbestos sheets shall be allowed to dry out before painting is commenced.

Ceiling boards must be well primed on both sides with an approved sealer/undercoat before fixing.

- Super acrylic PVA:
  Prepare and apply one coat of sealer/undercoat. Prime nail heads with metal primer. Stop with filler. Apply two coats of super acrylic copolymer PVA.

(2) Exterior

New and wet asbestos sheets shall be allowed to dry out before painting is commenced.

Fascia boards and barge boards shall be well primed on both sides and edges painted with sealer/undercoat before fixing.

All sides of fascia boards must receive final coatings.

- Super acrylic PVA:
  Prepare and apply one coat sealer/undercoat. Prime nail heads with zinc phosphate metal primer. Stop with filler. Apply two coats of super acrylic copolymer PVA.

(ii) Renovation (existing) work

(1) Interior

Previously painted fibre cement board with emulsion paint, in good condition:

Preparation: Clean down thoroughly to remove any signs of dirt or grease. Fill all screw heads with a flexible resistant filler after screw heads have been primed.

Finishing: Apply two coats of super acrylic copolymer PVA paint.

Previously painted fibre cement board in poor condition:

Preparation: Remove previous paint coatings with super paint stripper. Thoroughly wash down with sugar soap and rinse with clean water. Prime nail and screw heads with zinc phosphate metal primer. Allow to dry.

Primer: Apply one coat of synthetic copolymer primer to all surfaces including back and edges, allow to dry. Fill all screw heads with weather resistant filler, allow to dry, sandpaper smooth and touch up with primer.

Finishing: Apply two coats of super acrylic copolymer PVA paint.

(2) Exterior

Previously painted fibre cement board with emulsion paint in good condition:

Preparation: Clean down thoroughly to remove any signs of dirt or grease. Fill all screw heads with a flexible weather resistant filler after screw heads have been primed.

Finishing: Apply two coats of super acrylic copolymer PVA paint.

Previously painted fibre cement board, in poor condition:

Preparation: Remove previous paint coatings with super paint stripper. Thoroughly wash down with sugar soap and rinse with clean water. Prime nail and screw heads with zinc phosphate metal primer. Allow to dry.

Primer: Apply one coat of sealer/undercoat to all surfaces including back and edges, allow to dry. Fill all screw heads with weather resistant filler. Allow to dry and sandpaper smooth. Touch up with primer.

Finishing: Apply two coats of super acrylic copolymer PVA paint.

(g) Galvanised iron roof (also gutters and rainwater pipes)

(i) New work

(1) Interior

Not applicable.

(2) Exterior

Galvanised iron - roofs: Water-based pure acrylic emulsion paint:

Scrub down thoroughly with degreaser, followed by a cleaner for galvanised iron. Rinse off thoroughly and ensure that all traces of cleaner have been removed and that the surfaces are free of any grease and oil. Apply one coat of galvanised metal primer. Allow to dry for 5 hours. (Must be overcoated within 24 hours maximum.) Apply one coat of water-based pure acrylic emulsion paint with non-fading pigment.

Galvanised iron - roofs: Mat acrylic roof paint:

Scrub down thoroughly with degreaser, followed by a cleaner for galvanised iron. Rinse off thoroughly and ensure that all traces of cleaner have been removed and that the surface is free of any grease and oil. Apply two coats of mat acrylic roof paint.

Galvanised iron - gutters and rainwater pipes: Gloss enamel:

Scrub down thoroughly with degreaser, followed by a cleaner for galvanised iron. Rinse off thoroughly and ensure that all traces of cleaner have been removed and that the surface is free of any grease and oil. Apply one coat of primer for galvanised iron. Allow to dry for 5 hours. (Must be overcoated within 24 hours maximum.) Apply two coats of gloss enamel paint with non-fading pigment.

(ii) Renovation (existing) work

(1) Interior

Not applicable.

(2) Exterior

Previously painted galvanised iron, in good condition:

Preparation: Thoroughly scrub down with fibre scrubbing brushes and sugar soap and rinse with clean water.

Finishing coat: Apply one coat water-based pure acrylic emulsion paint with non-fading pigment.

Unpainted or previously painted galvanised iron, in poor condition (ie flaking, peeling and rusting):

Preparation: Remove all previous paint coatings with steel wire brushes, plumber's egg-shaped lead scrapers, and coarse floor sandpaper. Remove all traces of rust with emery cloth back to bright metal and apply approved rust converter. Thoroughly scrub down using galvanised iron cleaner and rinse with clean water.

Primer: Apply one coat of galvanised metal primer. Allow a minimum of 5 hours and a maximum of 72 hours for drying.

Finishing coat: Apply one coat of water-based pure acrylic emulsion paint with non-fading pigment.

(h) Timber (doors, cornices, window frames, counters, skirtings, etc)

(i) New work

(1) Interior

- Polyurethane alkyd enamel (wet areas, kitchens, etc):
  Prepare knots with spirit soluble resin type knotting. Prime with primer (sanding sealer) for wood. Fill imperfections where necessary with wood filler. Apply one coat of universal undercoat. Apply two coats of polyurethane alkyd enamel.

- High-gloss/egg-shell enamel:
  Prepare knots with spirit soluble resin type knotting. Prime with primer (sanding sealer) for wood. Fill imperfections where necessary with wood filler. Apply one coat of universal undercoat. Apply two coats of enamel.

- Gloss/suede varnish (interior quality solvent based):
  Prepare knots with spirit soluble resin type knotting. Fill imperfections with wood filler. Sand surfaces to a smooth finish in grain direction and dust off.
  Thin first coat down in a ratio of 3 parts varnish to 1 part mineral turpentine and apply. Allow to dry for 24 hours. Apply two full-strength final coats with 24 hours drying time between applications.

(2) Exterior

- High-gloss/egg-shell enamel:
  Prepare with spirit soluble resin type knotting. Apply one coat of primer for wood. Fill where necessary with wood filler. Apply one coat of universal undercoat. Apply two coats of high gloss enamel.

- Gloss/suede varnish (exterior quality ultraviolet resistant solvent based):
  Prepare knots with spirit soluble resin type knotting. Fill imperfections with wood filler. Sand surfaces to a smooth finish in grain direction and dust off.
  Thin first coat down in a ratio of 3 parts varnish to 1 part mineral turpentine and apply. Allow to dry for 24 hours. Apply two full-strength final coats with 24 hours drying time between applications.

(ii) Renovation (existing) work

(1) Interior

Previously painted woodwork, in good condition (to be finished in polyurethane alkyd enamel):

Preparation: Wash sown with sugar soap to remove all dirt, grease, etc, then rinse off with clean water. Sand down to a smooth and mat surface. Make good cracks and defects with wood filler and after 24 hours drying, sand down again.

Finishing coat: Apply two coats of polyurethane alkyd enamel. Allow 24 hours for drying between coats.

Previously varnished woodwork in good condition (to be finished with interior quality varnish):

Repair defects with wood filler. Sand surfaces to a mat finish and apply two final coats varnish with 24 hours drying time between applications.

Previously painted woodwork in poor condition (to be finished with high-gloss/egg-shell enamel):

Preparation: Remove all paint, varnish and stain with super paint stripper. Wash down thoroughly with sugar soap and rinse with clean water. When surface is completely dry, sand down and apply one coat of spirit soluble resin type knotting to all knots. Fill all cracks and defects with wood filler and after 24 hours of drying, sand down to a smooth and even surface. Apply one coat oleoresinous wood primer. Apply one coat universal undercoat.

Finishing coat: Apply two final coats enamel.

Previously stained and varnished or painted woodwork in poor condition (to be finished in polyurethane alkyd enamel):

Preparation: Remove all paint, varnish and stain with super paint stripper. Wash down thoroughly with sugar soap and rinse with clean water. When surface is completely dry, sand down and apply one coat of spirit soluble resin type knotting to all knots. Fill all cracks and defects with wood filler and after 24 hours of drying, sand down to a smooth and even surface. Apply one coat oleoresinous wood primer.

Finishing coat: Apply one coat polyurethane alkyd enamel.

Previously varnished woodwork in poor condition (to be finished with interior quality varnish):

Remove all varnish with paint stripper. Wash down to dry completely. Further preparation and applications as for BJ 03.01.03(h)(i): New work - interior.

(2) Exterior

Previously painted woodwork, in good condition (to be repainted with high-gloss/egg-shell enamel):

Preparation: Clean down and sand to a smooth finish. Spot prime where necessary with oleoresinous wood primer. Allow 24 hours for drying. Stop defects with a flexible weather resistant wood filler.

Undercoat: Apply one coat of universal undercoat. Allow 24 hours drying.

Finishing coat: Apply two coats of enamel.

Previously varnished woodwork in good condition (to be finished with exterior quality ultraviolet resistant solvent based varnish):

Preparation and application as for similar interior item above.

Previously stained and varnished or painted woodwork, in poor condition (to be finished in high-gloss/egg-shell enamel):

Preparation: Remove all paint, varnish and stain with super paint stripper. Wash down thoroughly with sugar soap and rinse with clean water. When surface is completely dry, sand down and apply one coat of spirit soluble resin type knotting to all knots. Fill all cracks and defects with wood filler and after 24 hours drying, sand down to a smooth and even surface. Apply one coat oleoresinous wood primer. Apply one coat universal undercoat.

Finishing coat: Apply two final coats of enamel.

Previously stained and varnished or painted woodwork, in poor condition (to be finished in polyurethane alkyd enamel):

As for similar interior item above.

Previously varnished woodwork in poor condition (to be finished with exterior quality ultraviolet resistant solvent based varnish):

Preparation and application as for similar interior item above.

(i) Concrete and cement surfaces - floor paint

(i) New work

Exterior and interior

Preparation: Remove laitance, residual cement spillage, etc, by means of carborundum grinding and vacuum clean to remove all dust. Remove oil, grease or any other surface contaminants with degreaser and wash off with clean water. Allow to dry. The floor must have less than 5 % moisture content before painting may be done.

Finishing coats: Apply two coats of an alkali resistant solvent based stoep (modified alkyd) paint. The first coat may be thinned with 25 % mineral turpentine. Sixteen hours drying time must be allowed between coats.

(ii) Renovation (existing) work

Exterior and interior

Previously painted concrete and cement surfaces, in good condition:

Preparation: Remove any loose and flaking paint by means of carborundum grinding, back to firm feathered edges. Remove any polish, grease, oil and other contaminants with degreaser, wash clean and allow to dry. Sand old paint to a mat finish and vacuum clean to remove all dust.

Finishing coats: Apply two coats as for new work above.

Previously painted concrete and cement surfaces, in poor condition:

Strip completely by suitable means and treat as for new work above.

(j) Cement plaster or facebrick walls and concrete surfaces where damp penetration is evident

(i) Renovation

Exterior and interior

Preparation: Remove all damaged paintwork, efflorescence, loose friable material, etc, back to bare and sound substrate. Repair all damaged surfaces with suitable approved materials to match original surface.

Surfaces may remain damp and in some cases will require additional wetting, depending on the particular coating used.

Damp sealing coats: Apply two coats approved synthetic polymer modified water barrier coating in strict accordance with the particular product manufacturer's specifications. Allow 24 hours between coats unless otherwise specified.

Finishing coats: Apply decorative finishing coats to suit, as in BJ 03.01.03(e).

BJ 04 DETAIL OF REPAIR WORK

The detail of the scope of work is described in the Schedule of Quantities.

BJ 05 MAINTENANCE

No maintenance will be required for paintwork under this contract.

BJ 06 MEASUREMENT AND PAYMENT

BJ 06.01 MEASUREMENT AND RATES

BJ 06.01.01 General inclusion of costs and specific specifications

Notes:

All material scheduled to be removed shall be deemed to be existing damaged material. All such redundant material shall become the property of the Contractor and must be removed from site immediately.

All new material shall be deemed to be in patchwork and shall be of approved equal quality, colours, profiles, thickness, etc and shall in all cases match the existing materials and shall be applied (internally or externally) to existing material or surfaces.

All removal and repair work shall be done carefully as to not damage any adjacent or other material or work. Any damage to other or adjacent materials or areas caused by the negligence of the Contractor shall be repaired by him free of charge.

All work scheduled to be removed or taken out shall be deemed to include the cleaning and preparation of the remaining sections, areas, or work to receive the new material or work specified.

Repair work shall also include all cutting, grinding, cutting into, welding, bending, strengthening, drilling, etc to repair or to improve the items or areas as new and to match the existing.

Work scheduled to be realigned and refixed shall be deemed to include all necessary new additional materials, brackets, connector plates, bolts, pip rivets, nails, screws, spacer blocks, clamps, timber, and labour, etc to leave the items as new and totally functional.

All new work are measured net and shall include all cutting, lapping, waste, bending, fixing, corners, mitres, fixing screws, pip rivets, nails, adhesive, grout, putty, etc, as well as cleaning and preparation of surfaces not already prepared as part of removed items, etc.

All paintwork shall include for surface preparation, cleaning, primer(s), undercoat(s) and final coat(s) as specified by the manufacturers and in the Technical Specifications. Scheduled items in the Schedule of Quantities are mainly brief descriptions of the final coat(s) to identify the paint system as specified in the Specifications.

Most steel surfaces such as gratings, screens, gates, doors, mesh, louvres, burglar proofing, windows, etc are measured both sides on the net flat overall area of the item. Paint to roof covering and side cladding, etc are measured wet on the flat overall area of the items and not along the girth of the sheeting. All final re-measurements for payment purposes will be done on the same principles.

Rates tendered for paintwork shall be deemed to include for all "line cutting" between different colours of paint specified by the Engineer in dados, skirtings, etc.

Rates tendered for paintwork on ceilings and cornices shall be deemed to include for paint on cover and jointing strips.

Rates tendered for paintwork on ceilings, wall panelling, divisions, etc shall be deemed to include for timber door frames, jointing and cover strips, skirtings, cornices, quadrant beads, etc if painted with the same specified paint material and in the same colour schemes.

Where specified to be painted in contrasting colours, varnished or with a different paint material the paintwork on the door frames, skirtings, cornices, beads, cover strips, etc will be measured and paid for separately per linear metre.

Specific specification for floor paint

Preparation:

The concrete floor must have less than 3% moisture before painting is attempted. Remove laitance, residual cement spillage, etc by Carborandum grinding. Vacuum clean to remove all dust. Remove oil, grease, or any other surface contaminants with degreaser. Allow to dry thoroughly before painting.

Paint system:

Apply one coat of an alkali resistant solvent based stoep (modified alkyd) paint. The first coat may be thinned with approximately 25% mineral turpentine to aid penetration.

Apply one finishing coat of an alkali resistant solvent based stoep (modified alkyd) paint.

Protection of existing furniture, carpets, finishings, cupboards, etc during paint procedures

Protection, sheets and screens:

All existing finishings, carpets, floors, furniture, etc shall be carefully handled, moved when instructed within the specific room, building or area to be painted, covered with sheets, screens or other approved methods to protect the items or finishings against damage or spilled paint spots or stains. Any damage caused to the mentioned existing items shall be rectified or replaced by the Contractor without additional payment.

The costs of sheets, covers, screens and all labour to address the above shall be deemed to be included in the tendered rates for the individual payment items or in the general preliminary cost items. No claims by the Contractor in this regard will be entertained.

BJ 06.02 SCHEDULED ITEMS

NEW UNPAINTED SURFACES:

BJ.01 Paint to new unpainted surfaces:

(a) Description of surface:

(i) Brief description of final paint type:

(a) Description of application area or item to be painted ..... Unit: m^2, m, number

(b) Etc, for other areas or items

The unit of measurement shall be the number, metre or square metre as applicable to each item.

The tendered rates shall include full compensation for manufacturing, providing and applying each item complete as per specifications, drawings, descriptions as scheduled or as the existing and shall include for all labour, material, preparation

work, waste, plant, transport, delivery, access, scaffolding, fuel, miscellaneous items and material, etc to the Engineer's approval.

PREVIOUSLY PAINTED SURFACES:

BJ.02 **Paint to previously painted surfaces:**

(a) Description of surface:

(i) Brief description of final paint type:

(a) Description of application area or item to be painted..... Unit: m^2, m, number

(b) Etc, for other areas or items

The unit of measurement shall be the number, metre or square metre as applicable to each item.

The tendered rates shall include full compensation for manufacturing, providing and applying each item complete as per specifications, drawings, descriptions as scheduled or as the existing and shall include for all labour, material, preparation work, waste, plant, transport, delivery, access, scaffolding, fuel, miscellaneous items and material, etc to the Engineer's approval.

PREVIOUSLY PAINTED SURFACES IN POOR CONDITION:

BJ.03 **Paint to previously painted surfaces in poor condition:**

(a) Description of surface:

(i) Brief description of final paint type:

(a) Description of application area or item to be painted ..... Unit: m^2, m, number

(b) Etc, for other areas or items

The unit of measurement shall be the number, metre or square metre as applicable to each item.

The tendered rates shall include full compensation for manufacturing, providing and applying each item complete as per specifications, drawings, descriptions as scheduled or as the existing and shall include for all labour, material, preparation work, waste, plant, transport, delivery, access, scaffolding, fuel, miscellaneous items and material, etc to the Engineer's approval.

PREVIOUSLY PAINTED SURFACES TO REMOVE ALL PREVIOUS PAINT TO ORIGINAL SURFACE:

BJ.04 **Paint to previously painted surfaces to remove all previous paint to original surface**

(a) Description of surface:

(i) Brief description of final paint type:

(a) Description of application area or item to be painted ..... Unit: m^2, m, number

(c) Etc, for other areas or items

The unit of measurement shall be the number, metre or square metre as applicable to each item.

The tendered rates shall include full compensation for manufacturing, providing and applying each item complete as per specifications, drawings, descriptions as scheduled or as the existing and shall include for all labour, material, preparation work, waste, plant, transport, delivery, access, scaffolding, fuel, miscellaneous items and material, etc to the Engineer's approval.

TECHNICAL SPECIFICATION

CB STORMWATER DRAINAGE

CONTENTS

CB 01 SCOPE

This specification covers the materials, equipment, methods, testing and work required for the corrective maintenance and servicing of existing stormwater drainage systems. It covers both surface and underground drainage systems.

CB 02 STANDARD SPECIFICATIONS

CB 02.01 GENERAL STANDARD SPECIFICATIONS, REGULATIONS AND CODES

The latest edition, including all amendments up to date of tender, of the following specifications, publications and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof:

PW 371 - Specification of Materials and Methods to be used
SANS 1200 DB - Earthworks (pipe trenches)
SANS 1200 DK - Gabions and pitching
SANS 1200 G - Concrete (structural)
SANS 1200 LB - Bedding (pipes)
SANS 1200 LE - Stormwater drainage
SANS 1200 MK - Kerbing and channelling

CB 02.02 OCCUPATIONAL HEALTH AND SAFETY ACT OF 1993

All regulations and statutory requirements as laid down in the latest edition of the Occupational Health and Safety Act of 1993: Construction Regulations, 2003 as promulgated in Government Gazette No 25207 and Regulation Gazette No 7721 of 18 July 2003 shall be adhered to.

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CB 02.03 MANUFACTURERS' SPECIFICATIONS, CODES OF PRACTICE AND INSTALLATION INSTRUCTIONS

All equipment and materials shall be installed, serviced and repaired strictly in accordance with the manufacturers' specifications, instructions and codes of practice.

CB 02.04 MUNICIPAL REGULATIONS, LAWS AND BY-LAWS

All municipal regulations laws, by-laws and special requirements of the Local Authority shall be adhered to unless otherwise specified.

CB 03 OPERATING AND MAINTENANCE MANUALS

No operating and maintenance manuals will be developed for this section.

The contractor shall use the Maintenance Control Plan (see SA Maintenance) to schedule routine preventative maintenance activities.

CB 04 EXECUTION OF REPAIR WORK

CB 04.01 GENERAL

The Contractor shall investigate and inspect all areas of the installation to confirm the extent of the repair work required and shall report to the Engineer. The Engineer will thereafter indicate any areas to be repaired and shall instruct the Contractor with regard to the repair work to be done.

At the start of the repair and maintenance contract all the systems and installations shall be repaired as specified in the Particular Specification. This repair work shall include but not be limited to the details specified in the Particular Specification.

All repair work shall be executed using approved materials and equipment suitable to the systems and/or installations they serve.

All materials and equipment shall comply fully with the requirements as specified for each installation.

The said repair work shall be executed in accordance with the relevant codes of practice, standards, regulations, municipal laws and by-laws, manufacturer's specifications and codes of practice and all additional and particular specifications included in this document.

All new, materials and systems shall be furnished with a written guarantee with a defects liability period of twelve (12) months from date of completion of repair work. These guarantees shall be furnished in favour of the Department of Public Works. On completion of the required and specified repair work the systems, installations and equipment shall be commissioned and handed over to the satisfaction of the Engineer.

Repair work items for the stormwater drainage systems shall be categorised under the following headings:

(a) Prefabricated culvert installation and repair of existing culverts and structures;

(b) Cleaning of prefabricated culverts;

(c) Concrete channel construction and repair of existing channels;

(d) Cleaning of concrete drains and channels;

(e) Cleaning of earth channels;

(f) Construction and repair of brickwork inlet structures;

(g) Provision of lockable storm water grid inlets;

(h) Cleaning of pipelines.

CB 04.02 PREFABRICATED CULVERT INSTALLATION AND REPAIR OF EXISTING CULVERTS AND STRUCTURES

This section covers the work in connection with the construction of prefabricated pipe and portal culverts and stormwater structures such as manholes, grid inlets and the like.

It also covers the removal and replacement of damaged and broken prefabricated culverts, as well as repairs to existing culverts and stormwater structures.

CB 04.02.01 Construction

Prefabricated culverts shall be constructed or replaced in accordance with the specifications at the locations indicated by the Engineer.

(a) Excavation

The width of the excavation shall be sufficient to allow the proper laying, bedding and backfilling of culverts. The widths of the excavation for each type and size of culvert shall be as set out in SANS 1200 DB.

The depth of the excavation for each type and size of culvert shall depend on site conditions and the amount by which the excavation is to exceed the proposed level of the invert of the culvert and shall be sufficient to allow the type and thickness of bedding material instructed by the Engineer.

Where excavation is to be carried out through asphalt premix or concrete, the asphalt/concrete shall be cut neatly and vertically with approved sawing equipment before the asphalt/concrete is removed.

Excavations shall commence from the outlet end of culverts to be installed.

(b) Classification of excavation

All excavations shall be classified as follows for payment purposes:

(i) Hard material

Material which cannot be excavated except by drilling and blasting, or with the use of pneumatic tools or mechanical breakers, and boulders exceeding 0,10 m^3 shall be classified as hard material.

Where more than 40 % of any material (by volume) consists of boulders each exceeding 0,10 m^3 in size, the material shall be classified as hard material.

(ii) Soft material

All material not classified as hard material shall be classified as soft material.

Notwithstanding the above classification, all material excavated from previously constructed fills, subgrades and subbases shall be classified as soft material.

(c) Disposal of excavated material

Where excavated material does not comply with the requirements for backfilling material as specified or is surplus to backfilling requirements, such excavated

material shall be removed from the site and disposed of.

Material suitable for use in the works, however, shall be used as prescribed.

(d) Removal of damaged culverts

Where indicated by the Engineer damaged sections of prefabricated culverts shall be completely removed and replaced with new units.

Excavation shall be carried out as described for new culvert installation and the excavated material shall be, if suitable, preserved for backfilling. The damaged culvert units shall be disposed of.

(e) Laying of concrete pipe culverts

Concrete pipe culverts shall be laid on class A or B bedding as directed by the Engineer. The inside of the culverts shall be smooth and without any displacement and all pipes shall be laid true to line and level with a minimum slope of 2 % or as directed by the Engineer.

(i) Class A bedding - see SANS 1200 LB

(ii) Class B bedding - see SANS 1200 LB

(iii) Rock foundation

Where rock, shale or hard material is encountered on the bottom of excavations a bed of fine material as required for class B bedding shall be placed before laying the pipe.

(iv) Concrete casing

Where ordered by the Engineer a pipe shall be encased in concrete according to the Engineer's instructions.

(f) Laying of concrete portal culverts

Portal culverts shall be laid on prefabricated floor slabs. A layer of fine-grained material of at least 75 mm thick shall be placed on the bottom of the excavation, levelled, compacted and trimmed to line and grade to form a bed to receive the precast slabs.

The portal portions of portal culverts shall be placed accurately and symmetrically on the floor slabs with a thin layer of mortar of one part of cement and six parts of sand between the contact surfaces to ensure a firm and uniform support.

(g) Extension of existing culverts

Where existing culverts require extension or where damaged sections are replaced the new sections shall be placed at the same grade and, where it joins the existing structure, at the same level as the existing structure.

Any sections of existing wing walls, approach slabs and head walls which may obstruct any new work shall be demolished and removed. The demolition and reconstruction of new inlet and outlet structures shall be paid for under the relevant sections in the specification.

(h) Construction of culverts in half widths in existing roads

To allow the free flow of traffic at all times the culverts shall be constructed in half widths. The downstream section shall be constructed first and the end of the excavation adjoining the traffic lane shall be properly supported to prevent displacement from occurring.

(i) Repairing of cracks and joints

Where instructed by the Engineer cracks in existing culverts and culvert joints which have opened shall be caulked with material specified in the Particular Specification.

(j) Backfilling of prefabricated culverts

The backfill material shall be material selected from the excavation mixed with 80 kg Portland cement with every cubic metre of excavated material.

Generally the backfill material shall be a sandy material, but may contain larger particles up to 38 mm and shall have a plasticity index not exceeding 12.

In the case of concrete pipe culverts on class B bedding the backfilling material shall be tamped in under the flanks of the culverts to provide a uniform bedding, all to the satisfaction of the Engineer.

Backfilling alongside and over the culverts to the underside of the pavement layers shall be placed at optimum moisture content and compacted to a minimum of 90 % of modified AASHTO density in layers not exceeding 150 mm after compaction. Where approved by the Engineer, testing may be done with a dynamic cone penetrometer (DCP). The average penetration rate recorded after every 5 blows for each layer shall not exceed 50. The full depth of a layer shall be tested.

Backfilling shall be carried out simultaneously and equally on both sides of a culvert to prevent unequal lateral forces from occurring and the ends of culverts shall be protected to prevent the backfill material from spilling beyond the required levels.

(k) Reinstatement of pavement layers

Unless otherwise instructed by the Engineer the pavement layers shall be reinstated as follows:

(i) Selected layers shall be of at least a G5 quality and shall be compacted to at least 93 % of modified AASHTO density.

(ii) Material for the subbase layers shall be stabilized with 3 % cement and compacted to 95 % of modified AASHTO density, and shall be at least a G5 quality.

(iii) The material for the base layer shall be stabilized with 5 % cement and compacted to at least 97 % of modified AASHTO density, and shall be at least a G3 quality.

(iv) The surfacing layer shall consist of a medium continuously graded asphalt compacted to 94 % of Marshall density. The thickness of the surfacing layer shall be at least 25 mm. A 60 % cationic emulsion shall be applied at 0,4 litre/m² to the top of the base layer before the surfacing layer is placed.

The soil cement shall be mixed on site with suitable concrete mixers and the water and cement contents shall be carefully controlled.

(l) Repair of stormwater manholes, grid inlets and the like

Repair work will be undertaken on the structures indicated on the drawings, or as directed by the Engineer. All repair work will comply with the construction and quality requirements of SANS 1200 LE.

CB 04.02.02 Quality standard

Culverts shall be constructed true to lines and levels with the inside smooth and without any displaced joints.

CB 04.02.03 Materials

The prefabricated culvert units shall be factory produced by a reputable manufacturer of these units and shall comply with the following requirements:

(a) Prefabricated concrete pipe culvert units

Prefabricated concrete pipe culvert units shall comply with the requirements of SANS 677. Pipes with ogee joints shall be provided, unless otherwise specified. Pipes subjected to traffic loadings shall be class 100 D; all other pipes shall be class 50 D.

(b) Portal prefabricated concrete culvert units

Portal prefabricated concrete culvert units shall comply with the requirements of SANS 986.

(c) Other types of prefabricated culverts

If required, other types of prefabricated culverts will be specified in the Particular Specification.

(d) Manhole covers, grid inlets, etc

Manholes, grid inlets, etc, shall have covers and frames complying with SANS 558.

CB 04.03 CLEANING OF PREFABRICATED CULVERTS

The work involved under this section is the removal of silt and debris from prefabricated culverts including the cleaning of inlet and outlet structures.

CB 04.03.01 Construction

Prior to cleaning any prefabricated culverts, the Contractor shall arrange with the Engineer for an inspection of the stormwater network. The Contractor shall provide adequate equipment, such as torches, lights, mirrors, etc, to enable a basic visual inspection of all the culverts. Based on this inspection, the Engineer will instruct the Contractor as to which sections of the network require cleaning.

Material removed from the culverts shall be disposed of where instructed by the Engineer. Rubble and waste material shall be disposed of at the nearest appropriate solid waste disposal site, unless otherwise directed by the Engineer.

The Contractor must ensure that all material being removed is removed before or at

the nearest accessible downstream structure. No additional payment will be made for the removal of material which, as a result of cleaning operations, find its way into a previously clean section of the culvert network.

CB 04.03.02 Quality standard

Prefabricated culverts shall be cleaned of all silt and debris such that all surfaces are clearly visible and accessible for inspection.

All spoil material shall be spread neatly and shall not wash back into drainage trenches.

The size of the culverts for the different categories will be determined as follows:

(a) For pipe culverts - diameter

(b) For portal culverts - width.

CB 04.04 CONCRETE CHANNEL CONSTRUCTION AND REPAIR OF EXISTING CHANNELS

This section covers the construction of new concrete lined drains where required and the maintenance of existing concrete drains. It includes the construction of kerb and channel combinations and repairs where required.

CB 04.04.01 Construction

The Engineer will indicate the locations where new drains are to be constructed to improve drainage and shall instruct where repairs to existing drains are to be carried out.

Construction of the following type of concrete drains may be required:

(a) Concrete lining to open drains
(b) Concrete pipes
(c) Kerbing channeling combination.

Concrete drains shall be constructed in accordance with the details shown on the drawings or as directed by the Engineer.

(a) Excavation and preparation of bedding

The excavations shall be neatly trimmed to lines and levels so as to permit the accurate construction of the concrete linings. All loose material shall be well rammed at the optimum moisture content for the material used.

Where excavations are in hard material, overbreak shall be backfilled with concrete of the same class as specified for the lining.

In the case of kerbs and channels the trenches shall be excavated to the required depths and the bedding material shall be well rammed before placing the concrete.

Where wash-aways have occurred, any cavities or voids in the foundation material must be backfilled in layers not exceeding 150 mm in thickness and compacted to 90 % of modified AASHTO density.

(b) Concrete linings

Concrete lining of open drains shall be cast in situ only and the exposed surfaces shall be given a class U2 (wood-floated) surface finish.

Sealed joints in concrete shall be in accordance with the details indicated on the drawings and joints shall be painted with a coat of approved bituminous emulsion containing 60 % of pure bitumen by mass.

Expansion joints shall be made in accordance with the drawings.

(c) Half-round channels

Cast in situ half-round channels shall be constructed in accordance with the drawings, or to fit existing sections.

(d) Kerbing and channeling

Kerbing shall include barrier kerbs, mountable and semi-mountable types. All the elements shall be prefabricated units with cast in situ channeling unless otherwise specified by the Engineer.

Kerbing and channeling shall be laid on the approved bedding with close joints filled with 3:1 sand: cement mortar not exceeding 10 mm in thickness and neatly pointed with a pointing trowel. Kerbing shall be propped with class 15/19 in-situ concrete at each joint (size: 300 mm long x 200 mm wide x 80 % of kerb height).

(e) Concrete cast against existing surfaced edges

Where concrete lining or concrete channeling in kerb and channel combinations is to be cast against existing surfacing the edge shall first be cut, before excavation, with approved sawing equipment to provide a neat straight edge. Care shall be taken during the placing of the concrete not to spill concrete onto the adjacent surfacing. Any concrete stains shall be removed by the Contractor at his own expense.

(f) Reinstatement of damaged existing structures

Damaged existing structures shall be demolished to the extent directed by the Engineer on site and the resulting debris shall be spoiled.

The reinstatement of damaged sections shall be carried out to the same standards prescribed for new construction and shall be paid for under the relevant items scheduled for new structures.

Provision shall be made for the reinstatement of existing damaged prefabricated concrete half round channels.

(g) Inlet and outlet structures

The structures shall be constructed in accordance with the requirements specified in the relevant section in this specification.

CB 04.04.02 Quality standard

The drains shall be constructed neatly to the dimensions shown on the drawings and within the specified dimensional and alignment tolerances.

Repairs to drains shall be in uniformity with existing structures.

CB 04.04.03 Materials

(a) Concrete

Concrete for the various structural components shall comply with the class detailed on the drawings. Concrete in channel linings shall be class 20/19.

(b) Steel reinforcement

(i) Steel bars

Steel reinforcing bars shall comply with the requirements of SANS 920.

(ii) Welded steel mesh

Welded steel mesh shall comply with the requirements of SANS 1024.

CB 04.05 CLEARING OF CONCRETE DRAINS AND CHANNELS

This section covers the work in connection with the removal of silt, debris and vegetation causing obstruction to flow in drains and channels constructed from any type of material excluding earth drains and channels.

CB 04.05.01 Construction

Concrete channels shall be cleaned where instructed by the Engineer. Generally, channels shall be cleaned when depth of silt in invert exceeds 100 mm, or when other foreign matter is present.

Material removed from channels shall either be loaded and removed from the site or disposed of adjacent to channels where it cannot be washed back into the channel as directed by the Engineer.

Where material is spoiled adjacent to channels the Contractor shall ensure that the material is spread neatly and well clear of the top of the channels where it will not wash back. Material removed from kerb and channel combinations, side drains or from other channels where directed by the Engineer shall be transported to spoil.

Vegetation growing in channel joints and cracks shall be removed with roots to prevent regrowth.

Vegetation growing over channels from the edges shall be slashed at the concrete edges and disposed of. Undesirable vegetation shall be removed with roots and spoiled where directed by the Engineer.

CB 04.05.02 Quality standard

Concrete drainage channels shall be clear of any obstruction such that the concrete surfaces are clearly visible.

CB 04.06 CLEANING OF EARTH CHANNELS

This section covers the work involved in cleaning of all earth drains and channels, repairs to damaged earth drains and channels, as well as construction and repairs of banks and dykes.

CB 04.06.01 Execution of work

(a) Drains

Earth side drains and channels shall be cleaned of all debris, silt and vegetation

when instructed by the Engineer.

Silt and debris excavated from the drains shall be deposited and spread neatly in close proximity of the drains where it will not wash back.
Scoured and eroded sections of drains shall be backfilled with suitable material obtained from the side of the road or from suitable sources indicated by the Engineer. The backfill material shall be compacted at the optimum uniform moisture content in layers not exceeding 100 mm after compaction. The Contractor shall use suitable compaction equipment to produce repairs that will not erode or scour again.

If in the opinion of the Engineer drains require protective covering against scouring and erosion, such work shall be executed in accordance with the relevant section of this specification.

(b) Construction and repair of banks and dykes

Material for the construction and repair of banks and dykes shall be an approved soil or gravel obtained from sources approved by the Engineer. It shall be positioned in such a way that water will flow on the natural ground and against the bank.

Banks and dykes shall be properly compacted in layers not exceeding 150 mm in thickness. If approved by the Engineer, mitre banks may also be constructed of hand-packed stone, provided that the interstices are filled with an approved cohesive soil.

CB 04.06.02 Quality standard

Drainage channels shall be clear of any obstructions and no scouring, erosion or pooling shall be evident.

Existing fill and cut slopes and invert grades of drains shall be maintained.

CB 04.07 CONSTRUCTION AND REPAIR OF BRICKWORK INLET STRUCTURES

CB 04.07.01 Reinstatement of damaged existing structures

Damaged existing structures shall be demolished to the extent indicated by the Engineer on site and the resulting debris spoiled.

The reinstatement of damaged sections shall be carried out to the same standards prescribed for new construction and shall be paid for under the relevant items scheduled for new structures.

CB 04.07.02 Lowering of inlet structures

Existing structures which are not functional due to the inlet being above the surrounding pavement level or ground level shall be demolished to the extent indicated by the Engineer and reinstated at the correct level to the same standard prescribed for new construction.

CB 04.08 PROVISION OF LOCKABLE STORMWATER GRID INLETS

Stormwater inlet structures within the Port of Entry fence shall be provided with lockable grids. These shall be in the form of a steel bar secured to the base of the catch pit and long enough to just protrude through the inlet grid. There shall be a hole

in the end of the bar to allow a padlock to be positioned such that the grid will be immovable.

The steel bar shall be treated to avoid corrosion.

Padlocks shall be provided for all grid inlets. They shall be of a type suitable for outdoor use, or as specified in the Project Specifications.

CB 04.09 CLEANING OF PIPELINES

The work under this section involves the removal of silt and debris from pipelines, including the cleaning of inlet and outlet structures.

CB 04.09.01 Construction

Before cleaning any pipelines, the Contractor shall arrange with the Engineer for an inspection of the stormwater network. The Contractor shall provide adequate equipment such as torches, lights, mirrors and TV surveillance equipment, etc, to enable a basic visual inspection of all pipes. Based on this inspection, the Engineer will instruct the Contractor as to which sections of the network require cleaning and where detailed inspections are required.

Material removed from the pipes shall be disposed of where instructed by the Engineer. Rubble and waste material shall be disposed of at the nearest appropriate solid waste disposal site, unless directed otherwise by the Engineer.

The Contractor shall ensure that all material is removed at the nearest accessible structure. No additional payment will be made for the removal of material from previously cleaned sections of the network.

CB 04.09.02 Quality standard

Pipes shall be cleaned of all silt and debris.

All spoil material shall be spread neatly to ensure that it will not return to the drainage trenches.

The pipe sizes for the different categories will be determined by diameter.

CB 05 MAINTENANCE

This specification must be read in conjunction with Additional Specification: General Maintenance.

All components of the stormwater drainage infrastructure, including surface as well as underground components, shall be maintained during the maintenance phase of the Contract.

The scope of the maintenance work for the stormwater drainage infrastructure comprises the following:

(i) Maintenance of approximately 4500 m of concrete-lined channels of varying sizes.

(ii) Maintenance of approximately 900 m of concrete-lined channel 2m deep with a 2m base width and sloping sides outside the perimeter fence.

(iii) Maintenance of approximately 60 m of rectangular precast concrete culverts of varying sizes.

(iv) Maintenance of approximately 400 m of concrete storm water pipes of varying sizes.

The above description of the stormwater drainage infrastructure to be maintained is not necessarily complete and shall not limit the maintenance work to be carried out by the Contractor under this contract.

Maintenance shall include all repair work, replacing of components, fixing of defects, cleaning, or any other actions or rectifying measures necessary for complete and safe functioning of the stormwater drainage infrastructure.

Maintenance on the stormwater drainage infrastructure shall also include all other actions related to maintenance, such as temporary drainage features and temporary accommodation of traffic.

Remuneration for maintenance of the stormwater drainage infrastructure shall be deemed included in the tendered monthly payment for maintenance thereof and shall be paid as detailed in Additional Specification SA: General Maintenance.

CB 05.01 STORMWATER DRAINAGE SYSTEM

Routine maintenance on the storm water drainage system shall be done as described in table CB 05.01/1.

TABLE CB 05.01/1

NO	ROUTINE PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Visually inspect and report on complete installation.	Monthly
2	Check, inspect, repair or replace all manhole or inlet covers, grids and frames and builder's work to manholes.	Four-monthly
3	Check, inspect and repair manhole and inlet benching.	Four-monthly
4	Check, inspect, report and unblock any blockage that occurs.	Monthly

CB 06 MEASUREMENT AND PAYMENT

CB.01 PREFABRICATED CULVERT INSTALLATION AND REPAIR OF EXISTING CULVERTS AND STRUCTURES

CB.01.01 Excavation:

(a) Excavation of soft material within the following depth ranges below the surface level:

(i) 0 m up to and including 1,5 m .....Unit: cubic metre (m^3)

(ii) Exceeding 1,5 m up to and including 3,0 m .....Unit: cubic metre (m^3)

(iii) Exceeding 3,0 m up to and including 4,5 m .....Unit: cubic metre (m^3)

(iv) Etc in increments of 1,5 m

(b) Excavating hard material irrespective of depth .....Unit: cubic metre (m^3)

The unit of measurement shall be the cubic metre of material excavated within the specified dimensions, authorised by the Engineer in each case. Excavation in excess of widths specified or authorised shall not be measured for payment.

Irrespective of the total depth of the excavation, the quantity of material in each depth range shall be measured separately.

When measuring excavation for the removal of existing culverts, the volume occupied by the culvert shall not be subtracted from the calculated volume of excavation.

The tendered rates shall include full compensation for all excavation (including around structures), levelling, temporary timbering, shoring and strutting, for preparing the bottom of the excavation for the culvert beds, the disposal of unstable material unsuitable for backfilling, keeping the excavation safe, dealing with any surface or subsurface water and for any other operations necessary for completing the work as specified.

Payment shall distinguish between soft and hard material.

CB.01.02 Backfilling and reinstatement of pavement layers:

(a) *In situ* fill or cut material compacted to 90 % of modified AASHTO density.....Unit: cubic metre (m^3)

(b) Selected layers compacted to 93 % of modified AASHTO density.....Unit: cubic metre (m^3)

(c) Cement stabilized subbase layers compacted to 95 % of modified AASHTO density.....Unit: cubic metre (m^3)

(d) Cement stabilized base layers compacted to 97 % of modified AASHTO density Unit: cubic metre (m^3)

The unit of measurement for CB.01.02(a) and (b) shall be the cubic metre of gravel material placed and compacted according to authorised dimensions on drawings.

The unit of measurement for CB.01.02(c) and (d) shall be the cubic metre of stabilized material placed and compacted according to authorised dimensions.

The tendered rates shall include full compensation for procuring and furnishing, placing, compaction and finishing of materials, labour, tools and equipment for executing the work to the satisfaction of the Engineer.

CB.01.03 Prefabricated culverts:

(a) On class A bedding (type and diameter indicated)..... Unit: metre (m)

(b) On class B bedding (type and diameter indicated)..... Unit: metre (m)

(c) Portal culverts with prefabricated floor slabs (type and size indicated)..... Unit: metre (m)

The unit of measurement for prefabricated culverts shall be the metre of culvert laid. The length shall be measured along the soffit of the culvert.

The tendered rates shall include full compensation for providing, testing, loading, transporting and unloading the culverts, for providing and placing the bedding material

where required, and for the installation, laying and jointing of the culverts as specified including cutting them on the site and removing any waste.

CB.01.04 **Cast *in situ* concrete and formwork in stormwater structures:**

(a) Class 20 concrete .....Unit: cubic metre (m^3)

(b) Class 25 concrete Unit: cubic metre (m^3)

The unit of measurement shall be the cubic metre of concrete in place. Quantities shall be calculated from the dimensions shown on the drawings or as authorized.

The tendered rates shall include full compensation for procuring and furnishing all the materials, storing the materials, providing all plant, mixing, transporting, placing and compacting the concrete, forming the inserts, construction joints and contraction joints, curing and protecting the concrete, repairing defective surfaces and finishing the concrete surface as specified.

CB.01.05 **Replacement of manhole covers, grid inlets, etc**

(a) SANS 558 Type 4 - covers, grids, etc:

(i) Maximum dimension up to and including 300 mm .....Unit: number

(ii) Maximum dimension 301 mm to 600 mm .....Unit: number

(iii) Maximum dimension 601 mm to 900 mm .....Unit: number

(iv) Maximum dimension over 900 mm .....Unit: number

(b) SANS 558 Type 4 - frames only for covers, grids, etc:

(i) Maximum dimension up to and including 300 mm .....Unit: number

(ii) Maximum dimension 301 mm to 600 mm .....Unit: number

(iii) Maximum dimension 601 mm to 900 mm .....Unit: number

(iv) Maximum dimension over 900 mm .....Unit: number

(c) SANS 558 Type 2A - covers, grids, etc:

(i) Maximum dimension up to and including 300 mm .....Unit: number

(ii) Maximum dimension 301 mm to 600 mm .....Unit: number

(iii) Maximum dimension 601 mm to 900 mm .....Unit: number

(iv) Maximum dimension over 900 mm .....Unit: number

(d) SANS 558 Type 2A - frames only for covers, grids, etc:

(i) Maximum dimension up to and including 300 mm .....Unit: number

(ii) Maximum dimension 301 mm to 600 mm .....Unit: number

(iii) Maximum dimension 601 mm to 900 mm .....Unit: number

(iv) Maximum dimension over 900 mm .....Unit: number

The unit of measurement shall be the number of covers or frames installed. The classification of the size of each cover or frame will be based on the nominal dimensions of the unit and not on the actual dimensions.

The tendered rates shall include full compensation for procuring, furnishing and placing the new covers, grids and/or frames. The tendered rates shall also include full compensation for removing and disposing of the damaged covers, grids and/or frames.

CB.02 CLEANING OF PREFABRICATED CULVERTS

CB.02.01 Cleaning of prefabricated culverts and inlet structures (average depth of material removed not more than 100 mm):

(a) Prefabricated concrete pipes and portal culverts with maximum cross sectional dimension of:

(i) Up to and including 500 mm..... Unit: metre (m)

(ii) 501 mm to 750 mm..... Unit: metre (m)

(iii) 751 mm to 950 mm..... Unit: metre (m)

(iv) 951 mm to 1250 mm..... Unit: metre (m)

(v) 1251 mm to 1500 mm ..... Unit: metre (m)

(vi) 1501 mm to 2100 mm ..... Unit: metre (m)

(b) Prefabricated corrugated metal culverts with maximum cross sectional dimension of:

(i) Up to and including 500 mm..... Unit: metre (m)

(ii) 501 mm to 750 mm..... Unit: metre (m)

(iii) 751 mm to 950 mm..... Unit: metre (m)

(iv) 951 mm to 1250 mm..... Unit: metre (m)

(v) 1251 mm to 1500 mm ..... Unit: metre (m)

(vi) 1501 mm to 2100 mm ..... Unit: metre (m)

The unit of measurement shall be the metre of culvert cleaned (depth of material removed is on average not more than 100 mm), measured once along the soffit of the culvert. For multiple culverts each individual culvert shall be measured separately.

The tendered rates shall include full compensation for removing the material, for disposing of the material in an appropriate manner and ensuring that the material will not wash into drainage trenches.

CB.02.02 Cleaning of prefabricated culvert and inlet and outlet structures (average depth of material removed is more than 100 mm):

(a) Prefabricated concrete pipes and portal culverts with maximum cross sectional dimension of:

(i) Up to and including 500 mm..... Unit: metre (m^3)

(ii) 501 mm to 750 mm..... Unit: metre (m^3)

(iii) 751 mm to 950 mm..... Unit: metre (m^3)

(iv) 951 mm to 1250 mm..... Unit: metre (m^3)

(v) 1251 mm to 1500 mm ..... Unit: metre (m^3)

(vi) 1501 mm to 2100 mm ..... Unit: metre (m^3)

(b) Prefabricated corrugated metal culverts with maximum cross sectional dimension of:

(i) Up to and including 500 mm..... Unit: metre (m^3)

(ii) 501 mm to 750 mm..... Unit: metre (m^3)

(iii) 751 mm to 950 mm..... Unit: metre (m^3)

(iv) 951 mm to 1250 mm..... Unit: metre (m^3)

(v) 1251 mm to 1500 mm ..... Unit: metre (m^3)

(vi) 1501 mm to 2100 mm ..... Unit: metre (m^3)

The unit of measurement shall be the cubic metre of material removed (depth of material removed is on average more than 100 mm). The quantity of material to be removed shall be measured in place for each individual culvert.

The tendered rates shall include full compensation for removing the material from the culvert, for loading the material onto trucks, for transporting the material within a free-haul distance of 1,0 km and for spoiling the material as specified.

CB.02.03 **Provision of equipment for visual inspection of underground culvert network**..... Unit: lump sum

The tendered sum shall include full compensation for the provision of suitable equipment, such as torches, lights and mirrors, etc, to enable a basic visual inspection of the culvert network.

CB.02.04 **Visual inspection of underground culvert network**..... Unit: metre (m)

The tendered rate shall include full compensation for all processes necessary to complete a thorough check of the culvert network, including lifting and replacing manhole covers, using relevant equipment and any clearing necessary to allow the visual inspection to proceed.

CB.03 CONCRETE CONSTRUCTION AND REPAIR

CB.03.01 Excavation:

(a) Soft material.....Unit: cubic metre (m^3)

(b) Hard material .....Unit: cubic metre (m^3)

The unit of measurement shall be the cubic metre of material excavated in accordance with the authorised dimensions measured in place.

The tendered rates shall include full compensation for all plant, labour and tools necessary for excavating the material to the required dimensions, including trimming the excavation before placing concrete, disposing of the material from the site.

CB.03.02 **Cast *in situ* concrete:**

(a) Class 20 concrete .....Unit: cubic metre (m^3)

(b) Class 30 concrete .....Unit: cubic metre (m^3)

The unit of measurement shall be the cubic metre of concrete placed in situ. The quantity shall be calculated in accordance with the authorised dimensions.

The tendered rates shall include full compensation for procuring and furnishing all material and for all work necessary for mixing, placing and finishing the concrete to the authorised dimensions, including providing and erecting of formwork, for sawing of asphalt layers and for providing expansion and contraction joints as included on drawings or as instructed by the Engineer.

CB.03.03 **Backfill below channels** .....Unit: cubic metre (m^3)

The unit of measurement shall be the cubic metre of backfill as may be instructed by the Engineer to be placed below channels.

The tendered rate shall include full compensation for furnishing, procuring, placing and compacting concrete.

CB.03.04 **Precast concrete kerbing:**

(a) Supply and install (type indicated) ..... Unit: metre (m)

(b) Install only (type indicated) ..... Unit: metre (m)

The unit of measurement shall be the metre of precast kerbing complete as constructed, measured along the face of the kerb.

The tendered rate for CB.03.04(a) shall include full compensation for preparing of bedding, furnishing and installing all materials and supporting the kerb with in situ concrete, for backfilling behind kerbs, all complete as specified.

The tendered rate for CB.03.04(b) shall include full compensation for preparing of bedding, furnishing and installing all materials and reinstalling existing kerbing, all complete as specified.

CB.03.05 **Steel reinforcement:**

(a) Mild steel bars.....Unit: ton (t)

(b) High-tensile steel bars .....Unit: ton (t)

(c) Welded steel mesh ..... Unit: kilogram (kg)

The unit of measurement for steel bars shall be the ton of reinforcing, and kilogram of welded steel in place in accordance with the drawings or as authorised. Ties, stools and other steel used for positioning the reinforcing steel shall be measured as steel reinforcement.

The tendered rate shall include full compensation for supplying, delivering, cutting,

bending, welding, trial weld joints, placing and fixing the steel reinforcement including all tying wire, spacers and waste.

CB.03.06 **Sealed joints in concrete lining open drains (type indicated)** ..... Unit: metre (m)

The unit of measurement shall be the metre of completed joint of each size and type.

The tendered rate shall include full compensation for supplying all material and for all labour, tools, formwork and incidentals necessary for sealing the joint as shown on the drawings or specified in the Project Specifications.

CB.03.07 **Demolition and removal of damaged existing structures:**

(a) Plain concrete .....Unit: cubic metre (m^3)

(b) Reinforced concrete.....Unit: cubic metre (m^3)
The unit of measurement for CB.03.07(a) and (b) shall be the cubic metre of existing material demolished, determined from 70 % of the rated cubic metre capacity of the truck used to remove the material.

The tendered rates shall include full compensation for all labour, equipment and tools for removal of the damaged sections, trimming the bedding and for loading, transporting and disposing of the material from the site.

The reinstatement of damaged sections shall be paid for under the relevant items for constructing new structures.

CB.03.08 **Concrete side beams**.....Unit: cubic metre (m^3)

The unit of measurement shall be the cubic metre of concrete in side beams constructed as instructed.

The tendered rate shall include full compensation for furnishing all material and labour including formwork as necessary, placing concrete and shaping all surfaces and all excavations required.

CB.03.09 **Overhaul on material for haul in excess of 1,0 km:**

(a) Excavated material to spoil.....Unit: cubic metre kilometer (m^3-km)

(b) Existing structures demolished.....Unit: cubic metre kilometer (m^3-km)

The unit of measurement shall be the cubic metre of loose material hauled in excess of 1,0 km, measured according to the rated capacity of the truck used, multiplied by the average overhaul distance.

The tendered rate shall include full compensation for hauling the material in excess of the free-haul distance.

CB.04 **CLEANING OF CONCRETE DRAINS AND CHANNELS**

CB.04.01 **Removal and dispose of material from:**

(a) Drains and channels within the following invert width ranges:

(i) Less than 1,0 m ..... Unit: metre (m)

(ii) 1,0 m up to and including 2,0 m ..... Unit: metre (m)

(iii) Exceeding 2,0 m up to and including 3,0 m ..... Unit: metre (m)
(iv) Exceeding 3,0 m ..... Unit: metre (m)

The unit of measurement shall be the metre of channel cleaned, measured once along the invert of the channel.

The tendered rates shall include full compensation for all labour and equipment required for removing the material from channels irrespective of the depth of silt and debris and for loading, off-loading and spreading when material removed is intended for spoiling at designated spoil sites. The tendered rates shall also include full compensation for the removal of vegetation in channels and growing over the edges of channels.

The tendered rates shall also include for transporting the excavated material to spoil sites.

Where material is disposed of adjacent to the channels, the tendered rate shall include full compensation for removing the material from the channels, irrespective of the depth of silt and debris, spoiling and spreading the material adjacent to the channel where it cannot be washed back in to the channel.

CB.04.02 **Overhaul of material hauled in excess of the free-haul distance of 1,0 km** ..... Unit: cubic metre kilometer (m^3-km)

The unit of measurement shall be the cubic metre of material hauled to spoil, the volume to be determined from the rated capacity of the truck multiplied by the average overhaul distance. All trucks shall be fully loaded to their rated capacity.

The tendered rate shall include full compensation for hauling the material the average overhaul distance to the designated spoil site.

CB.05 CLEANING AND MAINTENANCE OF EXISTING EARTH CHANNELS

CB.05.01 **Cleaning earth drains and channels** ..... Unit: cubic metre (m^3)

The unit of measurement shall be the cubic metre of material cleaned out of the drain.

The tendered rate shall include full compensation for all labour and equipment required for removing the obstruction from drains, irrespective of depth of silt and debris and disposal of the excavated material as described.

CB.05.02 **Repairing of earth drains and channels** ..... Unit: cubic metre (m^3)

The unit of measurement shall be the cubic metre of compacted material calculated from the dimensions measured in place.

The tendered rate shall include full compensation for trimming the eroded area to firm surrounding material, for procuring, transporting placing and compacting the backfill material.

CB.05.03 **Banks and dykes** ..... Unit: cubic metre (m^3)

The unit of measurement shall be the cubic metre of in place in banks or dykes, calculated in accordance with authorised dimensions.

The tendered rate shall include full compensation for procuring, transporting furnishing, placing, watering, compacting, shaping and trimming of material in the

banks and dykes.

CB.05.04 **Cleaning of vegetation at inlet and outlet structures (5 m x 5 m)** .....Unit: square metre (m^2)

The unit of measurement shall be the area measured in square metres, cleared of all vegetation blocking the inlet and outlet structures.

The tendered rate shall include for labour, clearing of vegetation, removing to spoil of vegetation and tools to complete the work to the approval of the Engineer.

CB.05.05 **Overhaul of material in excess of the free-haul distance of 1,0 km** .....Unit: cubic metre kilometre (m^3-km)

The unit of measurement shall be the cubic metre of imported material, nett volume of material compacted in place, multiplied by the average overhaul distance in excess of 1,0 km.

The tendered rate shall include full compensation for hauling the material the distance from the designated source in excess of 1,0 km.

CB 06 REPAIR AND CONSTRUCTION TO EXISTING BRICKWORK INLETS

CB.06.01 **Demolition and removal of existing structures** .....Unit: cubic metre (m^3)

The unit of measurement shall be the cubic metre of existing material demolished. The tendered rates shall include full compensation for all labour, equipment and slabs for the removal of the section, trimming the bedding and for loading, transporting and disposing of the material from the site.

CB 06.02 **Repair of brickwork inlet structures** .....Unit: number

The unit of measurement shall be the number of inlet structures repaired.

The tendered rate shall include full compensation for furnishing all material and labour necessary for restoring the inlet structure to an as new state.

CB.06.03 **Reconstruction of brickwork inlet structures** .....Unit: number

The unit of measurement shall be the number of inlet structures completely rebuilt.

The tendered rate shall include full compensation for furnishing all material and labour necessary for rebuilding the inlet structure to a complete state.

CB.07 LOCKABLE GRID INLETS

CB.07.01 **Provision of lockable grid inlets** .....Unit: number

The unit of measurement shall be the number of grid inlets fitted with a steel bar suitable for locking the inlet cover down.

The tendered rate shall include full compensation for all labour, equipment and tools, rust protection and any other function necessary for the secure installation of the bar.

CB.07.02 **Provision of padlocks** .....Unit: number

The unit of measurement shall be the number of padlocks provided for lockable grid inlets.

The tendered rate shall include purchasing and installation of all padlocks, as well as providing a full set of labeled keys to the User Client.

CB 08 **CLEANING OF PIPELINES**

The cleaning of pipelines will be measured and paid for under the payment items listed under CB.02 cleaning of prefabricated culverts. Pipelines and related structures will be regarded as pre-fabricated culverts and related structures for this purpose.

TECHNICAL SPECIFICATION

CE WATER DISTRIBUTION NETWORKS

CONTENTS

CE 01 SCOPE

This specification covers the materials, equipment, methods, testing and work required for the repair and maintenance of existing water distribution networks. Such distribution networks may comprise:

(a) Primary and secondary distribution pipelines
(b) Irrigation pipe networks and sprinklers
(c) Valves
(d) Bulk water meters
(e) Domestic water meters
(f) Chambers
(g) Pumping stations
(h) Borehole installations
(i) Reservoirs.

This specification shall form an integral part of the maintenance and servicing contract document and shall be read in conjunction with portion 3: Additional Specifications included in this document.

This specification shall act as a guideline to the Particular Specification and, in the event of any discrepancies between the Technical Specification and the Particular Specification, the latter shall take precedence.

The Contractor shall at all times adhere to this specification, unless otherwise specified in the Particular Specification.

CE 02 STANDARD SPECIFICATIONS

CE 02.01 GENERAL STANDARD SPECIFICATIONS, REGULATIONS AND CODES

The latest edition, including all amendments up to date of tender, of the following specifications, publications and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof:

SANS 1200 D - Earthworks
SANS 1200 DB - Earthworks (pipe trenches)
SANS 1200 G - Concrete (structural)
SANS 1200 L - Medium-pressure pipelines
SANS 1200 LB - Bedding (pipes)

CE 02.02 OCCUPATIONAL HEALTH AND SAFETY ACT OF 1993

All regulations and statutory requirements as laid down in the latest edition of the Occupational Health and Safety Act of 1993: Construction Regulations, 2003 as promulgated in Government Gazette No 25207 and Regulation Gazette No 7721 of 18 July 2003 shall be adhered to.

CE 02.03 MANUFACTURERS' SPECIFICATIONS, CODES OF PRACTICE AND INSTALLATION INSTRUCTIONS

All equipment and materials shall be installed, serviced and repaired strictly in accordance with the manufacturers' specifications, instructions and codes of practice.

CE 02.04 MUNICIPAL REGULATIONS, LAWS AND BY-LAWS

All municipal regulations, laws, by-laws and special requirements of the Local Authority shall be adhered to unless otherwise specified.

CE 03 OPERATING AND MAINTENANCE MANUALS

No operating and maintenance manuals will be developed for this section.

The contractor shall use the Maintenance Control Plan (see SA Maintenance) to schedule routine preventative maintenance activities.

CE 04 EXECUTION OF REPAIR WORK

CE 04.01 GENERAL

The Contractor shall investigate and inspect all areas of the installation to confirm the extent of the repair work required and shall report to the Engineer. The Engineer will thereafter demarcate any areas to be repaired and shall instruct the Contractor with regard to the repair work to be done.

At the start of the repair and maintenance Contract all the systems, installations and equipment shall be repaired as specified in the Particular Specification. This repair work shall include but not be limited to the specified Particular Specification details.

All repair work shall be executed using approved materials and equipment suitable to the systems and/or installations they serve.

All materials and equipment shall comply fully with the requirements as specified for each installation.
The said repair work shall be executed in accordance with the relevant codes of practice, standards, regulations, municipal laws and by-laws, manufacturer's specifications and codes of practice and all additional and particular specifications included in this document.

All new equipment, materials and systems shall be furnished with a written guarantee with a defects liability period of 12 months from date of completion of repair work. These guarantees shall be furnished in favour of the Department of Public Works. On completion of the required and specified repair work the systems, installations and equipment shall be commissioned and handed over if the satisfaction of the Engineer has been obtained.

Repair work items for the water distribution systems shall be categorised under the following headings:

(a) Repair of existing pipelines
(b) Cleaning of existing pipelines
(c) Repair of fittings
(d) Repair of existing structures.

CE 04.02 REPAIR OF EXISTING PIPELINES

This section covers the requirements for the repair of the water distribution pipelines for defects such as pipe breaks and leakage for distribution pipelines.

CE 04.02.01 General

Repair work to the water distribution system is detailed in the Particular Specification and may include but not be limited to the following:

(a) Replacement of damaged, broken, leaking, corroded surface and underground pipework and fittings;

(b) Replacement of damaged, broken and missing manhole covers and frames;

(c) Repair work to damaged manholes;

(d) Initial unblocking and clearing of all water distribution pipes and manholes;

(e) Repair and upgrading of the water distribution system where necessary;

(f) Introduction of additional connections to the water distribution system;

(g) Removal of unauthorised connections;

(h) Reinstatement and making good of walls, concrete, road surfaces, etc, to an approved acceptable level where any repair, upgrade and/or service work has been executed;

(i) Video surveying of all underground drainage pipework to establish root ingress, damaged pipework, fat build-up, blockages, incorrect falls, sagging and as-built information. This survey shall be utilised to establish the extent of repair and upgrade work to be executed;

(j) Test pipe system for leakage;

(k) Repair, replace and service valves, which shall include new gaskets, gland packings, seals, bolt and nuts, etc;

(l) Where valves do not close properly, all these valves shall be refurbished, descaled and if necessary replaced;

(m) Repair, clean and service all strainers, including the replacement of strainer elements where corroded and installation of new gaskets;

(n) Repair, service, test and readjust pressure-reducing valves. Pressure gauges are to be recalibrated and checked. Up and downstream pressures are to be logged. Downstream pressure has to be adjusted to an acceptable level, taking into account the allowable working pressure of the system and its components;

(o) Repair, service and check the proper functioning of all non-return valves;

(p) Repair, service, readjust and calibrate all safety and expansion relief valves;

(q) Repair, service and clean out all air release valves and vacuum breakers;

(r) Repair, service and log readings of water meters including cleaning of integral strainers;

(s) Water storage tanks are to be emptied, cleaned out, repaired, sealed and put back into operation. Ball float and/or filling valves to these tanks are to be serviced and repaired where required;

(t) Water pipes are to be sampled for corrosion and scaling. The Engineer will evaluate the actions to be followed if the outcome of this sampling requires attention;

(u) Water supply has to be sampled and chemically analysed for the suitability to the systems and materials it serves;

(v) Pressure test and sterilise repaired new installation and equipment;

(w) Reinstatement and making good of walls, tiling, floors, concrete, finishes, holes, chases, surfaces, etc, to an acceptable level where repair, upgrade and/or service work have been executed.

CE 04.02.02 Construction

The Engineer will indicate the pipeline sections in need of repair and shall instruct the Contractor with regard to the repair work to be done.

(a) Excavation

The width of the excavation shall be sufficient to allow the proper laying, bedding and backfilling of the pipelines. The width of the excavation for each type and size of pipeline shall be as set out in SANS 1200 DB.

The depth of the excavation for each type and size of pipeline shall depend on site conditions and the amount by which the excavation is to exceed the proposed level of the invert of the pipeline and shall be sufficient to allow the type and thickness of bedding material instructed by the Engineer.

Where excavation is to be carried out through asphalt premix or concrete, the asphalt/concrete shall be cut neatly and vertically with approved sawing equipment before the asphalt/concrete is removed.

Cutting, breaking out and replacing of concrete pavements will be paid under Subclause CA.02.

Excavations shall extend such that, where possible cut in may be reduced by lifting adjacent pipes.

(b) Classification of excavation

All excavations shall be classified as follows for payment purposes:

(i) Hard material

Material which cannot be excavated except by drilling and blasting or with the use of pneumatic tools or mechanical breakers and boulders exceeding 0,10 m^3 shall be classified as hard material.

Where more than 40 % of any material (by volume) consists of boulders each exceeding 0,10 m^3 in size, the material shall be classified as hard material.

(ii) Soft material

All material not classified as hard material shall be classified as soft material.

Notwithstanding the above classification, all material excavated from previously constructed fills, subgrades and subbases shall be classified as soft material.

(c) Disposal of excavated material

Where excavated material does not comply with the requirements for backfilling material as specified or is surplus to backfilling requirements, such excavated material shall be removed from the site.

Material suitable for use in the works, however, shall be used as prescribed.

(d) Removal of damaged pipelines

Where indicated by the Engineer damaged sections of pipelines shall be completely removed and replaced.

(e) Pipe couplings

Repair sections will be joined, utilising existing pipe sockets and collars where possible.

Repair couplings shall be used with the approval of the Engineer.

(f) Laying of uPVC pipelines

New sections of uPVC pipelines shall be laid on a granular bed suitable for flexible pipelines as directed by the Engineer. The inside of the pipes shall be smooth and without any displacement and all pipes shall be laid true to line and level with a minimum slope of 2 % or as directed by the Engineer.

Refer to SANS 1200 LB: Bedding (pipes), for the specification on bedding.

(g) Laying of asbestos cement, concrete or galvanised mild steel pipelines

New sections of the pipelines shall be laid on class A or B bedding as directed by the Engineer. The inside of the pipes shall be smooth and without any displacement and all pipes shall be laid true to line and level with a minimum slope of 2 % or as directed by the Engineer.

Refer to SANS 1200 LB: Bedding (pipes), for the specification on bedding.

(h) Rock foundation

Where rock, shale or hard material is encountered on the bottom of excavations a bed of fine material as required for class B bedding shall be placed before laying the pipe.

(i) Concrete encasement

Where instructed by the Engineer pipes shall be encased in concrete. All such encasing shall be done in accordance with the Engineer's instructions and sufficient allowance shall be made for movement joints.

(j) Extension of existing pipelines

Where existing pipelines require extension or where damaged sections are replaced the new sections shall be placed at the same grade and, where they join the existing service, at the same level as the existing pipeline.

Existing chambers or other structures which may obstruct any new work shall be demolished and removed. The demolition and reconstruction of new structures shall be paid for under the relevant sections in the specification.

(k) Construction in existing roads

Road crossings shall either be constructed utilising sufficient provision of bypass roads or utilising the half width of the road. At all times a through route shall be maintained for all traffic.

(l) Repairing of leaks

Where leaks occur at pipe sockets or collars the affected section shall be cut from the pipeline and repaired using repair couplings.

Where obvious leaks occur due to displaced sealing rubbers, the rubbers shall be replaced if the replacement can be done economically by lifting adjacent pipes.

(m) Replacement of pipes damaged by exposure to extensive ultraviolet light

Pipes damaged as a result of excessive exposure to sunlight shall be replaced where indicated by the Engineer.

CE 04.02.03 Quality standard

Pipelines shall be laid at even gradients within the points of correction, to the satisfaction of the Engineer and the applicable specifications.

CE 04.02.04 Materials

Materials and equipment to be used for repair items shall be suitable and/or adaptable to the existing installation and shall comply with the following:

(a) Supercast cast-iron pipes and fittings

Supercast cast iron pipes can be used for underground and above ground installations. Plain ended cast iron pipes and fittings shall be used, manufactured from 150, Grade A, grey iron in accordance with SANS 1034. Fittings and pipes shall be free of pinholes, blowholes, blemishes, flash and foundry sand and have a smooth bore. All pipes and fittings shall be sand blasted and coated on the inside and outside by submersion in a corrosion inhibiting oxide primer or bitumen paint.

The pipes and fittings shall be joined by means of stainless steel neoprene couplings as supplied by the manufacturer's of the pipe system. The coupling shall be installed according to the manufacturer's specification and is to be tightened with a torque wrench to a torque of 6,8 Nm.

(b) uPVC pipe and fittings under ground

uPVC pipes and fittings can be used for above ground installations.

For pipe sizes larger than 160 mm diameter, uPVC class 6 pressure pipe to SANS 966 shall be used with prefabricated uPVC bends and junctions. Prefabrication shall be done by means of hot-air welding of fittings to be covered with three layers of fibreglass reinforced lining over welded sections. The resin to be used shall be as specified by the manufacturer for usage with PVC. Bends shall be manufactured out of 3 to 4 sections per bend. Pipe joints shall be done by means of couplings fixed with solvent cement for PVC piping. This joint shall be reinforced with a fibreglass lining of three layers.

Piping is to be supported and bracketed with properly sized and designed brackets consisting of two half sections clamped over the pipe and hung with two hanger rods.

Pipes are to be pressure tested in sections as specified in this specification.

(c) Prefabricated galvanised steel piping and fittings above ground

The pipe to be used shall be plain-ended medium gauge uncoated pipe to SANS 62, galvanised to SANS 763 and shall be approved by the Galvanising Association of South Africa. All fittings are to be manufactured out of the same material, welded with flanged ends or rolled ends to fit clambon fittings. Fittings are only to be galvanised after manufacturing. All joints are to be either flanged or equipped with clambon couplings. All fittings and junction to be 45° sections.

The pipe system must be properly secured and bracketed at regular intervals with correctly sized and designed galvanised brackets.

Pipes are to be pressure tested in sections as specified in this specification.

(d) HDPE pipe and fittings

HDPE pipes and fittings can be used for underground and above ground installations where specified in accordance with SANS 8770:2008 only pipes manufactured using an extrusion process and tempered in a hot bath shall be used. Pipes shall be plain ended and only moulded HDPE bends and fittings shall be used. Jointing of pipes and fittings shall be done by butt welding, electro-sleeve couplings and/or flanged joints. Pipes and fittings shall only be installed by industry approved installers and the Contractor shall furnish a certificate to this effect. Pipes and fittings shall be installed strictly according to the manufacturer's application technique.

Pipes are to be pressure tested in sections as specified in this specification

(e) Galvanised steel pipe installations

(i) All galvanised steel pipes shall be medium gauge mild steel screwed and socketed pipes to SANS 62 and shall be normalised and marked as such by the manufacturer. Pipes shall be hot-dipped galvanised to SANS 763 and shall be approved by the Galvanising Association of South Africa.

(ii) All fittings shall be malleable cast-iron fittings to SANS 509 and galvanised to SANS 763 and shall be approved by the Galvanising Association of South Africa.

(iii) All 80 diameter and larger pipes shall be joined with Class 16 flanged couplings to SANS 1123/1600. The bolts, nuts and spring washers to be used on these joints shall be cadmium plated.

(iv) In pipe ducts and elsewhere pipes shall be fixed onto walls, soffits, etc, with approved type of supports, holderbats, clamps, etc. Brackets shall be designed to structurally support and fix the pipe system and shall have enough clearance from walls, soffits, etc, to insulate hot-water pipes and maintain equipment.

(v) Pipes shall be supported according to the manufacturer's specifications with approved brackets at the following maximum intervals:

NORMAL SIZE (mm)	HORIZONTAL (mm)	VERTICAL (mm)
15 dia to 20 dia	1 200	1 830
32 dia to 40 dia	1 830	2 450
50 dia to 150 dia	2 450	3 050

(vi) Pipes shall be installed in such a manner as to prevent airlocks. A minimum rise of 1:250 shall be maintained to high points, which shall be fitted with suitable air release valves.

(vii) All pipes shall be marked according to SANS 10140 or as specified by the Engineer. All surface pipes shall be painted.

(viii) Pipes shall be installed flush unless otherwise instructed by the Engineer.

(ix) Provision shall be made for thermal contraction and expansion.

(x) The type of pipe joint compound shall be approved by the Engineer and used sparingly with good quality hemp. For pipes larger than 80 mm diameter a jointing compound such as Epidermix 32 shall be used.

(xi) Any pipes buried shall have at least 900 mm cover and be coated and wrapped to SANS 11 17 and tested in the presence of the Engineer.

(xii) All exposed hot-water pipes shall be lagged as specified.

(xiii) All pipework and fittings shall be pressure tested and sterilised as specified.

(xiv) Valves shall be installed on all branch pipes and ball-o-stop valves on all connectors to basin pillar cocks, sink mixers, cistern type WCs and other fittings.

(xv) Approved type expansion bellows shall be installed where required for expansion and contraction to prevent excessive stain on fittings and pipe joints.

(f) <u>uPVC underground pipe installations</u>

(i) uPVC piping shall conform to SANS 966 with rubber ring type joints.

(ii) All bends shall be uPVC type fittings with rubber ring joints.

(iii) All other fittings such as T-pieces, reducers, flanges, etc, shall be bitumen-dipped cast iron rubber ring jointed fittings to SANS 546.

(iv) No solvent weld type fittings will be allowed.

(v) All cast iron fittings shall be coated and wrapped to SANS 1117.

(vi) All pipes shall be laid on a 100 mm sand-bedding cradle and covered with 300 mm sand before backfilling.

(vii) All backfilling shall be to the Engineer's specification and approval.

(viii) Pipe trenching and bedding shall be as follows:

AREA	MINIMUM COVER	BEDDING TYPE	MAIN FILL
Vehicle traffic	1 100	Flexible pipe bedding as per SANS 1200 LB	Soilcrete
Under surface bed	600		Soilcrete
Other areas	900		90% of modified AASHTO density

(ix) All thrust blocks shall be cast between the pipe and the undisturbed trench material.

(x) No concrete shall come into direct contact with the uPVC pipe. At the thrust blocks the bend shall be wrapped with Densopol 80 HT Tape or approved equivalent.

(xi) DPE pipe connections to UPVC pipes up to 50 mm diameter can be done by means of SG iron manufactured saddles with the appropriate gaskets and cadmium-plated bolts and nuts.

(xii) All pipe crossings under traffic areas shall be backfilled with soilcrete and compacted as specified.

(xiii) All pipework shall be pressure tested with all joints uncovered, to the satisfaction of the Engineer.

(xiv) Suitably sized air release valves built into valve chambers shall be installed at all high points of the pipeline.

(g) <u>HDPe underground pipe installations</u>

(i) HDPe piping shall be Type 4 HDPe pipe to SANS 533.

(ii) All fittings shall be of Plasson compression type, conforming to ISO/DIS 3458.

(iii) All pipes shall be laid on a 100 mm sand bedding cradle and covered with 300 mm of sand of selected material.

(iv) All backfilling shall be to the Engineer’s specification and approval.

(v) Pipe trenching and bedding shall be as follows:

AREA	MINIMUM COVER	BEDDING TYPE	MAIN FILL
Vehicle traffic	1 100	Flexible pipe bedding as per SANS 1200 LB	Soilcrete
Under surface bed	600		Soilcrete
Other areas	900		90% of modified AASHTO density

(vi) No concrete shall come into direct contact with the HDPe pipe. At these points the fittings shall be wrapped with a Densopol 80 HT tape or approved equivalent.

(vii) All pipe crossings under traffic areas shall be backfilled with soilcrete and compacted as specified.

(viii) All pipework shall be pressure tested with all joints uncovered to the satisfaction of the Engineer.

(ix) Suitably sized air release valves built into valve chambers shall be installed at all high points of the pipeline.

(h) Valves

(i) Gate valves underground in valve chambers to connect to uPVC piping (65 mm NB and larger)

Gate valves are to be equipped with non-rising spindle, spherical graphite iron body to SANS 936 Grade 42, cast-iron nitrile butadine rubber-covered gate, stainless steel spindle, nitrile butadine rubber O-rings and seals, cast iron bonnet and gunmetal thrust collar to BS 1400 LG2.

The valve shall conform to SANS 664 and/or 665, and shall be capable of withstanding a working pressure of 1 600 kPa.

The valve shall be fitted with a square key spindle top to close the valve in a clockwise direction and socket ends to SANS 665 to fit into uPVC Class 12 pipe and installed to detail.

(ii) Gate valves underground in valve chamber to connect to HDPe piping

The gate valves shall be of the dezincified brass type with brass gate, brass body, non-rising spindle and BSP threaded socket ends. The valve shall conform to SANS 776 Class 125. The valve shall be able to withstand a working pressure of 1 600 kPa. The valve shall be fitted with a hand wheel on an extended spindle shaft of 700 mm to close in a clockwise direction and installed to detail.

(iii) Gate valves above ground for temperatures up to 40 °C to connect to steel piping (65 mm NB and larger)

Gate valves to be equipped with non-rising spindle, spherical graphite iron body to SANS 936 Grade 42, cast-iron nitrile butadine rubber-covered gate, stainless steel spindle, nitrile butadine rubber O-rings and seals, cast iron bonnet and gunmetal thrust collar to BS 1400 LG2.

The valve shall conform to SANS 664 and/or 665, and shall be capable of withstanding a working pressure of 1 600 kPa.
The valves shall be fitted with flanged ends to SANS 1123/1600, hand wheel to close the valve in a clockwise direction and installed in an upright position or side ways to a maximum 90° from upright.

(iv) Gate valves above ground for temperatures above 40 °C to connect to steel piping (65 mm NB and larger)

Gate valve shall be equipped with non-rising spindle, spherical graphite iron body to SANS 963 Grade 42, cast-iron gate, gunmetal seat and gate rings, high-tensile bronze spindle, cast-iron bonnet and gunmetal thrust collar to BS 1400 LG2.

The valve shall conform to SANS 665 and shall be capable of withstanding a working pressure of 1 600 kPa and a temperature of 90 °C.

The valve shall be fitted with flanged ends to SANS 1123/1600, hand wheel to close the valve in a clockwise direction and installed in an upright position or sideways to a maximum 90° from upright.

(v) Gate valves above-ground to fit to copper pipes (65 mm NB and larger)

Gate valves shall be equipped with non-rising spindle, gunmetal bronze or dezincified brass body, gunmetal or dezincified brass gate, graphite asbestos packing in the gland.

The valve shall be fitted with a hand wheel to close in a clockwise direction and installed in an upright position or sideways to maximum 90° from upright.

The valve shall be equipped with flanges to SANS 1123/1600, hand wheel to close the valve in a clockwise direction and installed in an upright position or sideways to a maximum 90° from upright.

(vi) Gate valves above-ground for temperatures up to 100 °C (up to 50 mm NB)

The gate valves shall be of the dezincified brass type with brass gate, brass body, non-rising spindle and BSP threaded socket ends. The valve shall conform to SANS 776-1965 Class 125.

The valve shall be able to withstand a working pressure of 1 600 kPa.

The valve shall be equipped with a hand wheel to close in a clockwise direction.

The valve shall be installed in an upright position or sideways to a maximum 90° from upright and shall be so placed with other fittings to be removable without cutting the pipework.

(vii) Ball-O-Stop valves (15 mm diameter - 25 mm diameter)

This valve shall be a full-way ballcock type with BSP threaded ends. This valve shall conform to SANS 1056 Part 3, 1985, shall be rated for a test pressure of 2 000 kPa, and shall be chrome-finished where exposed.

(viii) Angle regulating valves

This valve shall be a 15 mm diameter chromium-plated angel regulating valve with a 350 mm chromium-plated copper tube and cap nuts where required.

(i) <u>Strainers</u>

(i) Strainers for connection to steel or uPVC pipes (65 mm NB and larger)

These strainers shall be of the Y-type with cast iron body, stainless steel or bronze strainer element and shall be equipped with flanged ends to SANS 1123/1600. The whole size of the strainer element shall be maximum 1 mm diameter and be removable without dismantling of pipework. The strainer shall be suitable for a temperature of up to 90 °C at a 1 000 kPa pressure rating and installed with the element facing downwards or a maximum of 45° sideways.

(ii) Strainers for connection to steel and copper pipes (up to 50 mm NB)

The strainers shall be of the Y-type with bronze or dezincified brass body, stainless steel strainer element and must be equipped with BSP threaded socket ends. The whole size of the strainer element shall be maximum 0,8 mm diameter. The strainer shall be suitable for a temperature of up to 90 °C at a pressure rating of 1 000 kPa and installed with the element facing downwards or a maximum of 45° sideways.

(j) Non-return valves

(i) Non-return valves for cold water (65 mm NB and larger)

The non-return valve shall be of the spring-loaded dual flap plate type fitted between two flanges (wafer).

The non-return valve shall be equipped with a cast-iron body, aluminium bronze plates, stainless steel springs and neoprene seals on the plates. The valves shall be suitable for a working pressure of 1 000 kPa.

(ii) Non-return valves for hot water (up to 100 mm diameter) and cold water (up to 50 mm NB)

The non-return valve shall be of the spring-loaded piston type, with bronze or dezincified brass body, stainless steel spring and bronze disc with neoprene seal fitted with BSP threaded socket ends. The valve shall be suitable for a working pressure of 1 000 kPa and a temperature of up to 90 °C. All valves shall be installed as to be removable without extensive pipework removal.

(k) Air release valves and vacuum breakers

(i) Double orifice double-acting air release valves with sizes from 50 mm NB to 200 mm NB

The air release valve shall be fitted with small and large orifice. The air release valve shall be fitted with a cast-iron or stainless steel body, stainless steel or fibreglass balls, integral shut-off valve and flanged ends to SANS 1123/1600. The valve shall be equipped with an anti-shock facility.

The valve shall be suitable for maximum pressure of 1 600 kPa.

(ii) Single orifice air release valves for main water lines with sizes from 25 mm NB to 50 mm NB

The air release valve shall be fitted with a small orifice, cast-ron or stainless steel body, fibre glass or stainless steel ball float and BSP threaded inlet.

When the valve is installed a shut-off valve shall be installed on the inlet side. The valve shall be equipped with an anti-shock facility.

The valve shall be suitable for maximum pressure of 1 600 kPa.

(iii) Single orifice double purpose air release valves for domestic water lines up to 15 mm NB

The air release valves shall be fitted with a stainless steel float, brass or cast steel body with an integral shut-off valve fitted.

The valve shall be capable to withstand a working pressure of 1 000 kPa at 110 °C.

(iv) Vacuum breaker up to 40 mm diameter

The vacuum breakers shall be fitted with neoprene seal, spring-loaded disc in a dezincified brass or bronze body. The valve shall seal watertight and shall be designed to withstand a working pressure of 1 000 kPa and a temperature of 90 °C.

(l) Pressure-reducing valves

(i) Combination pressure reducing stations

Where a high peak flow can occur as well as a small flow and the small flow is out of the range of the large pressure-reducing valve, a small pressure-reducing valve shall be installed in parallel with the large pressure-reducing valve. The two pressure-reducing valves in parallel shall be set according to the manufacturer's specification.

(ii) Large pressure-reducing valves (65 mm NB and larger)

The pressure reducing valve shall be equipped with a cast iron body, neoprene-nylon reinforced diaphragm, bronze seal disc washer, stainless steel shaft and flanged ends. The valve shall be pilot operated and shall be designed to handle high flows at a minimum head loss.

The valve must be adjustable to handle a wide range of incoming pressure at a constant downstream pressure.

The valve shall be equipped with flanged ends to SANS 1123/1600.

(iii) Small pressure-reducing valves (15 mm NB - 50 mm NB)

The pressure-reducing valve shall be equipped with brass body, balanced single seat and integral strainer. The valve shall be able to handle a wide range of incoming pressure while the downstream pressure stays constant with maximum inlet pressure of 1 000 kPa and a maximum water temperature of 40 °C.

The valve shall be equipped with BSP male threaded brass union couplings.

(m) Water meters

(i) Combination water meters

Where high peak flow as well as a low flow can occur, and the low flow is out of the registration range of large water meter, a small diameter water meter shall be installed in parallel with the large water meter to cater for the low flows with integral automatic change-over valves. These valves shall be designed to have a minimum pressure drop at the operating point.

(ii) Water meters (50 mm NB and larger)

These water meters shall be of the dry type with all gears and transmission and roller counters in a dry head, and shall be equipped with flanged ends to SANS 1123, cast-iron body with high quality corrosion proof coating. The meter must be protected from magnetic fields and sealed to prevent tampering with adjustments. The meter must be able to work up to a pressure of 1600 kPa under a maximum water temperature of 40 °C. The scale of meter must be in cubic metre (m^3) and equipped with needle indicators reading in litres. The accuracy of the meter shall be not less than 98 %.

The meters shall be installed with leading and trailing lengths of pipes to the manufacturer's specification.

(iii) Water meters (up to 50 mm NB)

The meter shall be of the volumetric rotary piston type with brass body equipped with union couplers. The meter reading must be in kilolitres. The meter shall have an accuracy of not less than 98 %. The meter must be able to operate up to a water pressure of 1000 kPa at a water temperature of 40 °C.

The meters shall be installed with leading and trailing lengths of pipes to the manufacturers specification.

CE 04.03 FIRE WATER PIPED RETICULATION NETWORKS

CE 04.03.01 General

Repair work to the fire water piped reticulation networks is detailed in the Particular Specification and shall include but no be limited to the work described below. This specification only covers the water piped reticulation for the fire water protection system, whereas the equipment to this installation, such as fire hydrants, hose reels and extinguishers, are covered and detailed in Technical Specification JC: Conventional Fire Fighting Equipment. This specification must be read in conjunction with the afore-mentioned specification.

Repair work to the fire water piped reticulation networks may include the following:

(a) Replacement of damaged, broken, leaking, corroded above-ground and underground pipe work, fittings and equipment;

(b) Repair, replace and service valves which shall include new gaskets, gland packings, seals, bolt and nuts, etc;

(c) Where valves do not close properly, all these valves are to be refurbished, descaled and if necessary replaced;

(d) Repair, service and check the proper functioning of all non-return valves and backflow preventers;

(e) Repair, service, readjust and calibrate all pressure gauges;

(f) Repair work to bracketing systems including fixing and repair of existing brackets and the introduction of additional brackets where required;

(g) Report all related problems to fire fighting equipment to the Engineer;

(h) Water storage tanks are to be emptied, cleaned out, repaired, sealed and put back into operation. Ball float or/and filling valves to these tanks are to be serviced and repaired where required;

(i) Pressure test and sterilise repaired new installation and equipment;

(j) Reinstatement and making good of walls, tiling, floors, concrete, finishes, holes, chases, surfaces, etc, to an acceptable level where any repair, upgrade and/or service work have been executed;

(k) Record pressure readings on supply to installation.

CE 04.03.02 Material and equipment specification for fire water piped reticulation networks

Materials and equipment to be used for repair items shall be suitable and/or adaptable to the existing installation and shall comply with the relevant specification.

CE 04.04 CLEANING OF PIPELINES

The work under this section involves the removal of silt, debris and lime deposits from within the pipelines and the general cleaning in areas resulting from leakage.

CE 04.04.01 Construction

Prior to the cleaning of any pipeline sections, the Contractor shall arrange with the Engineer for an inspection of the pipe route. Based on the inspection, the Engineer will instruct the Contractor as to which sections of the network require cleaning.

Visual inspections utilising check circuit TV cameras will not be required unless deemed essential on large diameter pipelines.

Sections of the pipeline may be removed for a more detailed inspection. Such sections will be repaired as specified in Subclause CE 04.02. Sections will only be cut from the pipeline where specifically instructed by the Engineer.

The method to be applied for the cleaning of the pipelines will be chemical or mechanical and shall be followed by disinfection of the related section. The method to be applied for each section of the pipeline will be instructed by the Engineer.

Material removed from the pipelines shall be disposed of as instructed by the Engineer.
The Contractor shall discuss the method proposed for the scouring of the pipelines where insufficient scour valves are present with the Engineer prior to implementation.

CE 04.04.02 Quality standard

Pipelines shall be cleaned such that head losses along the pipe route are negligible under simulated fire flow, when measured at convenient points along the route.

CE 04.05 REPAIR OF FITTINGS

CE 04.05.01 Construction

The Engineer will indicate the fittings that are to be repaired.

The repair of the following fittings may be required:

(a) Gate valves
(b) Fire hydrants
(c) Viking Johnson couplings
(d) Pressure-reducing valves
(e) Ferrules
(f) Domestic water meters
(g) Bulk water meters
(h) Stop-cocks
(i) Tees
(j) Bends
(k) End caps
(l) Saddles
(m) Sprinklers.

CE 04.06 REPAIR OF STRUCTURES

The Engineer will indicate the structures that are to be repaired or cleaned from debris.

Damaged existing structures shall be demolished to the extent directed by the Engineer on site and the resulting debris and other debris spoiled at designated sites.

The reinstatement of damaged structures shall be carried out to the same standards prescribed for new construction.

CE 05 TESTS AND INSPECTIONS ON COMPLETION OF REPAIR WORK

Except where otherwise provided in the Contract, the Contractor shall provide all labour, materials, power, fuel, accessories and properly calibrated and certified instruments necessary for carrying out such tests. The Contractor shall make arrangements for such tests and he shall give at least 72 hours notice to the Engineer, in writing, prior to commencement of the test.

In the event of the plant or installation not passing the test, the Employer shall be at liberty to deduct from the Contract price all reasonable expenses incurred by the Employer or the Engineer attending the repeated test.

Whenever any installation or equipment is operated for testing or adjusting as provided for above, the Contractor shall operate the entire system for as long a period as may be required to prove satisfactory performance at all times in the occupied space served by that system for up to twenty-four hours a day continuously until the system is handed over.

The Contractor shall provide all labour and supervision required for such operation and the Employer may assign operating personnel as observers, but such observation time shall not be counted as instruction time.

After complete installation of the system all equipment shall be tested, adjusted and readjusted until it operates to the satisfaction and approval of the Engineer.

The Contractor shall submit certificates of tests carried out to prove the quality and proper functioning of all equipment and also certificates to be obtained from all relevant authorities and statutory bodies, etc.

CE 06 QUALITY ASSURANCE SYSTEM

The Contractor shall institute an approved quality assurance (QA) system which shall be submitted to the Employer or Engineer for approval. The records of this QA system shall be kept throughout the duration of the Contract and be submitted to the Engineer at regular intervals as required.

CE 07 MAINTENANCE TO INSTALLATION SYSTEMS AND EQUIPMENT

CE 07.01 GENERAL

This part of the Contract shall include routine preventative maintenance, corrective maintenance and breakdown maintenance as described in Additional Specification SA: General Maintenance.

The maintenance work to be performed and executed shall be done strictly in accordance with Additional Specification SA: General Maintenance, and as specified in the Particular Specification and this specification.

The said maintenance work shall be executed in accordance with the relevant codes of practice, standards, regulations, municipal laws and by-laws and the manufacturer's specifications and codes of practice.

The maintenance schedules and frequency shall be developed under the maintenance control plan to be implemented by the Contractor.

All new equipment, components and materials supplied and installed under the maintenance Contract shall be furnished with the prescribed manufacturer's guarantees.

The maintenance work and items are categorised for each maintenance activity under the following headings:

(a) Repair of water distribution pipelines (see table CE 07.02/1)
(b) Cleaning of existing pipelines (see table CE 07.02/2)
(c) Repair of fittings (see table CE 07.02/3)
(d) Repair of existing structures (see table CE 07.02/4)
(e) Fire water piped reticulation structures (see table CE 07.02/5).

The scope of the external water network and bulk water network is indicated in the drawings in the Contract.

CE 07.02 ROUTINE PREVENTATIVE MAINTENANCE

This routine maintenance of the installations, systems and equipment shall be done in accordance with Additional Specification SA: General Maintenance and the Particular Specification related to this work.

The routine maintenance work to be performed and executed shall include, but not be limited to the following items listed in the tables below under each heading.

These actions and findings shall be logged and reported on the relevant approved schedules and reports.

TABLE CE 07.02/1 REPAIR OF WATER DISTRIBUTION PIPELINES

NO	ROUTINE PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Visually inspect and report on complete system	Monthly
2	Log all water meter readings	Monthly
3	Log all pressure gauge readings	Monthly
4	Check, inspect, report and repair leaks/replace rotten pipes where required	Monthly
5	Sample water supply and chemical analyses to be provided by approved company	Monthly
6	Bulk Water storage tanks to be emptied, cleaned out, inspected, repaired and resealed where necessary	Annually
8	Clean out all strainers	Monthly
9	Check, inspect, repair or replace all bracketing systems	Four-monthly
10	Paint repairs to piping, fittings and equipment	Annually

TABLE CE 07.02/2 CLEANING OF EXISTING PIPELINES

NO	ROUTINE PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Visually inspect and report on complete system	Monthly
2	Remove silt, debris and loose lime deposits from within pipelines where required by scouring	Annually
3	Do general cleaning in areas where leakage has occurred	Six-monthly

TABLE CE 07.02/3 REPAIR OF FITTINGS

NO	ROUTINE PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Replace all valve gaskets, gland packings and seals	Annually
2	Check, inspect, service, repair and readjust all pressure reducing valves	Annually
3	Check, inspect and test operation of all valves on site	Four-monthly
4	Check, inspect, service, test and repair/replace all safety and expansion release valves	Six-monthly
5	Check, inspect, service, test and repair/replace all air release valves and vacuum breakers	Four-monthly
6	Check, service, repair or replace all ball float valves	Six-monthly
7	Check, inspect, test, service and repair/replace all non-return valves	Four-monthly

TABLE CE 07.02/4 REPAIR OF EXISTING STRUCTURES

NO	ROUTINE PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Visually inspect and report on all water distribution related structures	Monthly
2	Clean out structures of debris	Six-monthly

TABLE CE 07.02/5 FIRE WATER PIPED RETICULATION STRUCTURES

NO	ROUTINE PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Visually inspect and report on complete system	Monthly
2	Report any failures/breakage of fire fighting equipment to the Engineer	Monthly
3	Log all pressure gauge readings	Monthly
4	Replace all valve gaskets, gland packings and seals	Annually
5	Clean out water storage tanks and reseal/repair if necessary	Annually
6	Check, inspect, service, repair/replace all non-return valves and backflow presenters	Four-monthly
7	Check, inspect, report and repair all leaks/replace rotten pipes where required	Monthly
8	Inspect, service, readjust and calibrate all pressure gauges	Four-monthly
9	Paint repairs to piping, fittings and equipment	Annually
10	Check, inspect, repair or replace all bracketing systems	Four-monthly

CE 07.03 CORRECTIVE MAINTENANCE

This corrective maintenance of the installations, systems and equipment to be done in accordance with Additional Specification SA: General Maintenance and the Particular Specification related to this work.

The Contractor shall inspect and check all equipment, materials, systems and installation for any pending breakdowns, maladjustments or anomalies of equipment.

The Contractor shall report and take actions to correct such deficiencies.

CE 07.04 BREAKDOWN MAINTENANCE

Breakdown maintenance of the installations, systems and equipment shall be done in accordance with Additional Specification SA: General Maintenance.

All breakdown problems experienced shall be acted upon within the time limitations allowed in the General Maintenance specification.
All breakdown maintenance shall be done in accordance with the related specifications, standards, regulations and codes.

The Contractor shall have access to the necessary spares, equipment and tools for the expected breakdowns.

CE 08 MEASUREMENT AND PAYMENT

CE.01 WATER DISTRIBUTION PIPELINES

CE.01.01 Repair of existing pipelines ..... Unit: metre (m)

The unit of measurement shall be per metre length of pipe replaced. In each case the Contractor shall agree on the length of pipe to be replaced and the method of coupling the pipes.

The tendered rate shall include full compensation for cleaning and grubbing, excavation, removal of existing pipeline, dealing with water logged conditions, provision of bedding and additional backfill, logging and backfilling of replacement pipeline, finishing, repair of kerbs, road surfaces, accommodation of traffic, excavation in all materials, removal of unsuitable material from the trench, disposal of surplus materials.

Separate items will be scheduled for house connections and distribution pipes.

The provision of the materials will be measured separately under CE 01.02.

CE.01.02 Provision of materials

(a) Pipelines ..... Unit: metre (m)

The unit of measurement shall be the metre of pipe replaced.

(b) Fittings .....Unit: number
The unit of measurement shall be the number of fittings installed.

The tendered rates shall include full compensation for all transport to the place of installation, storage, labour costs.

Separate pay items shall be listed for the pipe materials and fittings per diameter and class.

CE.01.03 Replacement of manhole covers, grid inlets and the like

(a) SANS 558 Type 4 - covers, grids, etc, only:

(i) Maximum dimension up to 300 mm .....Unit: number
(ii) Maximum dimension 301 mm - 600 mm .....Unit: number
(iii) Maximum dimension 601 mm - 900 mm .....Unit: number
(iv) Maximum dimension over 900 mm .....Unit: number

(b) SANS 558 Type 4 - frames only for covers, grids, etc:

(i) Maximum dimension up to 300 mm .....Unit: number
(ii) Maximum dimension 301 mm - 600 mm .....Unit: number
(iii) Maximum dimension 601 mm - 900 mm .....Unit: number
(iv) Maximum dimension over 900 mm .....Unit: number

(c) SANS 558 Type 2A - covers, grids, etc, only:

(i) Maximum dimension up to 300 mm .....Unit: number
(ii) Maximum dimension 301 mm - 600 mm .....Unit: number

(iii) Maximum dimension 601 mm - 900 mm .....Unit: number

(iv) Maximum dimension over 900 mm .....Unit: number

(d) SANS 558 Type 2A - frames only for covers, grids, etc:

(i) Maximum dimension up to 300 mm .....Unit: number

(ii) Maximum dimension 301 mm - 600 mm .....Unit: number

(iii) Maximum dimension 601 mm - 900 mm .....Unit: number

(iv) Maximum dimension over 900 mm .....Unit: number

The unit of measurement shall be the number of covers or frames installed. The classification of the size of each cover or frame will be based on the nominal dimensions of the unit and not on the actual dimensions.

The tendered rates shall include full compensation for procuring, furnishing and placing the new covers, grids and/or frames. The tendered rates shall also include full compensation for removing and disposing of the damaged covers, grids and/or frames from the site.

CE.01.04 Repair of corrosion protection

Corrosion protection of pipes with diameters of:

(a) Up to 100 mm dia ..... Unit: metre (m)

(b) 101 to 200 mm dia ..... Unit: metre (m)

(c) 201 to 300 mm dia ..... Unit: metre (m)

(d) 301 to 400 mm dia ..... Unit: metre (m)

The unit of measurement shall be meter length of pipe painted with corrosion protection in accordance with Specification LB: Corrosion protection.

The tendered rate shall include full compensation for preparation of pipe fittings, application of corrosion protection and curing of corrosion protection.

Separate items shall be scheduled for different types of pipework.

CE.01.05 New Pipelines: Preparation and Finishing ..... Unit: metre (m)

The unit of measurement shall be per metre length of pipe being replaced. In each case the Contractor shall agree on the length of pipe to be replaced.

The tendered rate shall include full compensation for cleaning and grubbing, all excavations to the specified depth, removal of existing pipeline, dealing with water logged conditions, provision of bedding and additional backfill, logging and backfilling of replacement pipeline, finishing, repair of kerbs, road surfaces, accommodation of traffic, excavation in all materials, removal of unsuitable material from the trench, disposal of surplus materials and pressure testing of the completed pipeline.

The provision of the pipeline materials will be measured separately under CE 01.02.

CE.02 REPAIR OF FIRE WATER PIPE RETICULATION NETWORK

Measurement and payment items from CE.01, CE.03, CE.04 and CE.05 will be utilised for work done on the external fire water pipe reticulation. Additional payment items for specialist fittings shall be paid under Specification JC.

CE.03 CLEANING OF PIPELINE

CE.03.01 Cleaning of deposits in pipeline by mechanical means for pipes of diameters of:

(a) Up to 100 mm dia ..... Unit: metre (m)

(b) 101 to 200 mm dia ..... Unit: metre (m)

(c) 201 to 300 mm dia ..... Unit: metre (m)

(d) 301 to 400 mm dia ..... Unit: metre (m)

CE.03.02 Scouring of pipeline to remove trapped debris for pipes of diameters of:

(a) Up to 100 mm dia ..... Unit: metre (m)

(b) 101 to 200 mm dia ..... Unit: metre (m)

(c) 201 to 300 mm dia ..... Unit: metre (m)

(d) 301 to 400 mm dia ..... Unit: metre (m)

The unit of measurement shall be metre length of pipe cleaned or scoured.

The unit rate of measurement for item CA.03.01 shall include full compensation for the emptying of the pipeline, cleaning, refilling and reporting on the condition of the pipe after cleaning. The rate shall also include the disposal of waste material in and appropriate manner.

The unit of measurement for item CA.03.02 shall include full compensation for the scouring of the pipeline and refurbishing of the pipeline. The unit of measurement shall be the total length of filled pipeline from which the water is scoured. The length shall be agreed with the Engineer prior to scouring.

The provision of additional scour points shall also be included in the rate.

CE.04 REPAIR OF FITTINGS

CE.04.01 Servicing of valves ..... Unit: number

The unit of measurement shall be the number of valves serviced.

The tendered rate shall include full compensation for cleaning, removing rust, scale or other solids from surfaces or moving parts, proper greasing of all moving parts, preparation for corrosion protection coating and painting of valves.

Separate items will be listed in the Schedule of Quantities for different types and sizes of equipment.

CE.04.02 Recondition valves ..... Unit: number

The unit of measurement shall be the number of valves reconditioned.

The tendered rate shall include full compensation for dismantling, cleaning, removing rust, removing scale or other solids from surfaces and moving parts, replacing components such as hinges, spindles, hard wheels or gates, swing axles, swing gates, replacing or repair of seals, skimming of seal surfaces, proper greasing of all moving parts, preparation for corrosion protection, painting or any other action or cost necessitated to recondition a value to a perfect functional drop tight condition.
Separate items will be listed in the Schedule of Quantities for different types and sizes of equipment.

CE.04.03 **Decommission and remove valves** .....Unit: number

The unit of measurement shall be the number of valves decommissioned and removed.

The tendered rate shall include full compensation for all labour and equipment required to decommission and remove valves, such as installation of temporary isolating valves or blank flanges, removal of unserviceable valves, loosening and removal of bolts and nuts, or any other related action required. Excavation to exposed partially buried valves shall also be included in the rate.

Separate items will be scheduled in the Schedule of Quantities for different types and sizes of valves.

CE.04.04 **Repair of house connections** .....Unit: number

The unit of measurement shall be the number of house connections repaired.

The tendered rate shall exclude the provision of new fittings measured under CE. 01.02 but shall otherwise include full compensation for appurtenant fittings, excavation, backfilling and other necessary work to repair existing house connections.

All connections to the distribution pipelines, up to a diameter of 32 mm shall be measured as "house connections".

CE.05 **REPAIR OF STRUCTURES**

CE.05.01 **Demolition and removal of damaged existing structures**

(a) Plain concrete .....Unit: cubic metre (m^3)

(b) Reinforced concrete .....Unit: cubic metre (m^3)

(c) Brickwork .....Unit: square metre (m^2)

(d) Precast concrete manhole sections .....Unit: number

The unit of measurement for CE.05.01(a) and (b) shall be the cubic metre of existing material demolished, determined from 70 % of the rated cubic metre capacity of the truck used to remove the material.

The unit of measurement for CE.05.01(c) and (d) shall be the square metre length of brickwork and the number of precast concrete manhole sections.

The tendered rates shall include full compensation for all labour, equipment and tools for removal of the damaged sections, trimming the bedding and for loading, transporting and disposing of the material. Excavation and backfill shall also be included for constructing the precast concrete manholes inclusive of all work required to complete the work as shown on the drawings.

The reinstatement of damaged sections shall be paid for under the relevant items for constructing new structures.

CE.05.02 **Cleaning of existing manholes, chambers and other structures**.....Unit: cubic metre (m^3)

The unit of measurement shall be the cubic metre of debris and other material to be disposed, removed from manholes, chambers and other structures.

The tendered rates shall include full compensation for all labour, equipment and tools for removal of the material, trimming the bedding and for loading, transporting and disposing of the material.

CE.05.03 **Overhaul on material for haul in excess of 1,0 km**

(a) Excavated material to spoil.....Unit: cubic metre kilometre (m^3-km)

(b) Existing structures demolished.....Unit: cubic metre kilometre (m^3-km)

The unit of measurement shall be the cubic metre of loose material hauled in excess of 1,0 km, measured according to the rated capacity of the truck used, multiplied by the average overhaul distance. All trucks shall be fully loaded to their rated capacity.

The tendered rate shall include full compensation for hauling the material in excess of the free-haul distance.

CE.05.04 **Repair of structures**

(a) Brickwork .....Unit: square metre (m^2)

(b) Concrete .....Unit: cubic metre (m^3)

(c) Precast concrete manhole sections .....Unit: number

The unit of measurement shall be the cubic metre of brickwork or concrete constructed.

The tendered rate shall include full compensation for the provision of materials, transport, preparation and placing of foundations, labour and all other associated work to complete the work required.
Separate items will be scheduled for specific installations.

CE.05.05 **Marker posts**.....Unit: number

The unit of measurement shall be the number of marker posts installed.

The tendered rate shall include full compensation for the manufacture and installation complete as shown on the drawings.

CE.05.06 **Sample testing**

(a) Extract sample to determine lime deposition, corrosion and general condition for pipes of:

(i) Up to 100 mm dia .....Unit: number

(ii) 101 to 200 mm dia.....Unit: number

(iii) 201 to 300 mm dia.....Unit: number

(iv) 301 to 400 mm dia.....Unit: number

The unit rate of measurement shall be the number of sample tests carried out.

The tendered rate shall include full compensation for cutting into pipe and extraction of sample, visual inspection and reporting on condition of pipe. The tendered rate shall also include full compensation for the appropriate disposal of the sample and for the repair of the section pipeline.

Compensation for provision of new pipes and fittings, shall be measured under CE 01.

CE.05.07 New structures

Precast concrete manhole sections.....Unit: number

The unit of measurement shall be the number of new pre-cast manholes constructed complete with precast top, manhole frame, cover and finishing.

The tendered rate shall include full compensation for the provision of materials, transport, preparation and placing of foundations, labour and all other associated work to complete the work required.

CE.06 TESTS AND INSPECTIONS OF REPAIR WORK

CE.06.01 Pressure testing

(a) Pressure test pipeline in sections of pipes with diameter of:

(i) Up to 100 mm dia ..... Unit: metre (m)

(ii) 101 to 200 mm dia..... Unit: metre (m)

(iii) 201 to 300 mm dia..... Unit: metre (m)

(iv) 301 to 400 mm dia..... Unit: metre (m)

The unit of measurement shall be the metre length of pipe tested.

The tendered rate shall include full compensation for isolation of test section, filling of section with water, testing for required duration and reporting on performance of pipes, the provision of any additional water shall also be included in the rate. The rate shall also include the provision of all equipment, labour and supervision necessary for the completion of the pressure test.

CE.06.02 Provision of equipment for visual inspection of underground pipeline network..... Unit: lump sum

The tendered sum shall include full compensation for the provision of suitable equipment, such as torches, lights and mirrors, etc, to enable a basic visual inspection of the pipeline network.

CE.06.03 CCTV inspection of underground pipework

(a) Pipes of diameter:

(i) Up to 300 mm dia ..... Unit: metre (m)

(ii) 301 to 600 mm dia..... Unit: metre (m)

The unit of measurement shall be the metre length of pipe inspected.

The tendered rate shall include full compensation for all inter-pipe relocations required to conduct a thorough check of the pipework where indicated by the Engineer.

CE.07 LOCATE AND CONNECT INTO THE EXISTING WATER NETWORK

(a) Locate and connect into the existing water network pipeline.....Unit: number

The tendered rate shall include the provision of all equipment, labour, fittings and material required to locate the existing water network pipeline, excavate and expose the existing pipe, blank off any unnecessary connections, and connect to the new pipeline.

TECHNICAL SPECIFICATION

FC HOT-WATER GENERATING INSTALLATIONS

CONTENTS

FC 01 SCOPE

This specification covers the general repair and maintenance of hot-water generating installations, which include the following:

(a) Steam generated hot-water heating equipment
(b) Electrical generated hot-water heating equipment
(c) Primary and secondary pumps
(d) Hot-water storage vessels
(e) Lagging and cladding of vessels and piping systems
(f) Hot-water reheating vessels
(g) Corrosion protection linings to storage vessels and re-heaters
(h) Hot, cold and drainage pipework to the plant room installation
(i) Electrical control systems, wiring and control panels
(j) Thermostats and safety equipment.

This specification also addresses the training of
- User Client and associates, and
- maintenance staff.

This specification shall form an integral part of the repair and maintenance contract document, and shall be read in conjunction with the additional and particular specifications compiled as part of this document.

This specification shall act as a guideline to the particular specification and, in the event of any discrepancies between the Technical Specification and the Particular Specification, the latter shall take precedence.

FC 02 STANDARD SPECIFICATIONS

FC 02.01 GENERAL STANDARD SPECIFICATIONS, REGULATIONS AND CODES

The latest edition, including all amendments up to date of tender of the following specifications, publications and codes of practice shall be read in conjunction with this specification and shall deemed to form part thereof:

FC 02.01.01 SABS and other specifications and codes

SABS 0400 - The applications of the building regulations
SABS 0142 - Code of practice for the wiring of premises
SABS 0140 - Identification colour marking
SABS 044 - Parts I to IV: Welding
SABS 460 - Copper tubes for domestic plumbing
SABS 0252 - Parts I and II
SABS 0103 - The measurement and rating of environmental noise with respect to annoyance and speech communications
SABS Specifications listed on page 3 of the DPW specification OW 371
Atmospheric Pollution Prevention Act, No 45 of 1965
BS 2790
BS 1740
BS 21
BS 1640
BS 5500

FC 02.01.02 Department of Public Works specifications

OW 371 - Specification of materials and methods to be used (Fourth revision, October 1993)
STD.PWD.VII - Standard Specification for steam boiler installations
Standard Specification for electrical installations and equipment pertaining to mechanical installations

FC 02.01.03 Occupational Health and Safety Act of 1993

All regulations and statutory requirements as laid down in the latest edition of the Occupational Health and Safety Act, 1993 (Act No 85 of 1993) shall be adhered to.

FC 02.01.04 Manufacturers' specifications, codes of and practice and installation instructions

All equipment and materials shall be installed, serviced and repaired strictly in accordance with the manufacturers' specifications, instructions and codes of practice.

FC 02.01.05 Municipal regulations, laws and by-laws

All municipal regulations, laws, by-laws and special requirements of the Local Authority shall be adhered to unless otherwise specified.

FC 03 VARIATIONS AND ADDITIONS TO STANDARD SPECIFICATIONS

The following additional general specifications and requirements shall be read in conjunction with this specification and shall be adhered to unless otherwise specified in the Particular Specification.

FC 03.01 GENERAL REPAIR AND INSTALLATIONS REQUIREMENTS

(a) All materials and equipment supplied and installed shall be new and of high quality and manufactured to the relevant specifications, suitable for providing efficient, reliable and trouble-free service.

(b) All work shall be executed in a first-class workman-like manner by qualified tradesmen.

(c) All equipment, component parts, fittings and materials supplied and/or installed, shall conform in respect of quality, manufacture, test and performance to the requirements of the applicable current SABS specifications and codes, except where otherwise specified or approved by the Engineer in writing.

(d) All materials and workmanship which, in the opinion of the Engineer, is inferior to that specified for the work, will be condemned. All condemned material and workmanship shall be replaced or rectified as directed and approved by the Engineer.

(e) The Contractor shall submit a detailed list of the equipment and material to be used to the Engineer for approval before placing orders or commencing installation.

(f) All new equipment, materials and systems shall be installed and positioned such as to not impede on access routes, entrances and other services. The Contractor shall coordinate these items taking other services and equipment into account.

(g) All control equipment and serviceable items shall be installed and positioned such that they will be accessible and maintainable.

(h) The Contractor shall make sure that all safety regulations and measures are applied and enforced during the repair and construction periods to ensure the safety of the public and User Client.

(i) Repair work shall be programmed in accordance with Additional Specification SC: General Decommissioning, Testing and Commissioning Procedures, to ensure the shortest possible down-time of any service and the least inconvenience to the User Client and public. The Contractor shall make sure that the necessary notifications and notices are timeously put into place for these activities.

FC 04 OPERATING AND MAINTENANCE MANUALS

The Contractor shall be responsible for the compilation of an inventory list and operating and maintenance manuals.

This shall be done in accordance with Additional Specification SB: Operating and Maintenance Manuals.

All information shall be recorded and reproduced in electronic format, as well as three sets of hard copies to be supplied to the Department.

Over and above what is specified in Additional Specification SB: Operating and Maintenance Manuals**,** the operating and maintenance manual to be compiled shall be structured to include at least the following:

(a) System description

Complete system description and the working of the plant.

(b) Commissioning data

Complete commissioning, test and inspection data of systems and equipment.

(c) Operating data

(i) Systems and equipment running check list and frequency of servicing required;
(ii) Safety precautions to be implemented;
(iii) Operator's duties (logging requirements);
(iv) Lubricating oils and service instructions.

(d) Mechanical equipment

(i) Description of all major items with the make, model number, names, addresses and telephone numbers of the suppliers, manufacturers or their agents;
(ii) Design capacities of all equipment, including selection parameters, selection curves, capacity tables, etc;
(iii) Manufacturer's brochures and pamphlets;
(iv) Schedule of spares with part numbers recommended to be held as stock;
(v) Vessels pressure test and certification certificates.

(e) Maintenance instructions

(i) Schedule of maintenance particulars, frequency of services and replacements;
(ii) Trouble-shooting guide;
(iii) Part number of all replacement items and spares;
(iv) Capacity curves of all pumps;
(v) Serial numbers of all items of equipment.

(f) Electrical equipment

(i) Schedule of equipment, indicating manufacturer, type, model number, capacity and addresses and telephone numbers of suppliers;
(ii) Maintenance instructions;
(iii) Manufacturer's brochures and pamphlets;
(iv) Complete as-built circuit diagrams and diagrammatic representation of interconnections of all electrical equipment.

(g) Instrumentation and control

(i) Description of each control system;
(ii) Schedule of control equipment, indicating manufacturer, type, model number, capacity and addresses and telephone numbers of suppliers;
(iii) Maintenance instructions;
(iv) Manufacturer's brochures and pamphlets.

(h) Drawings

(i) Paper prints of all as-built mechanical and electrical drawings;
(ii) Wiring diagrams framed behind glass shall be mounted adjacent to each relevant control panel.

FC 05 TRAINING OF OPERATORS FOR THE OPERATION OF THE INSTALLATION AND EQUIPMENT

In addition to the requirements of Additional Specification SD: General Training, the Contractor shall allow and provide for additional training of the User Client's representative(s) as specified and set out in this specification. The objective of this training will be to ensure that the following be achieved:

(a) The identification of pending faults and repairs at an early stage;
(b) Reducing the maintenance cost of the equipment to an acceptable level, and maintaining the cost at this level;
(c) Preventing malicious operation of the systems and equipment.

The training course for the User Client's representative(s) shall include at least the following:

(a) Equipment and component recognition.

(b) How to operate the equipment including the following:

(i) Starting the equipment;
(ii) Manual and automatic controlling;
(iii) Shut-down and isolating of equipment and systems;
(iv) Cleaning of equipment.

(c) Emergency procedures to be followed in the case of breakages, system faults, steam cuts, etc.

(d) Safety precautions to be followed and implemented.

(e) The identification, reporting and recording of faults and operation of equipment.

(f) The logging of equipment operation, readings and settings.

FC 06 LOGGING AND RECORDING PROCEDURES

The Contractor shall under this repair and maintenance contract institute a logging and recording system as part of his maintenance control plan as defined in Additional specification SA: General and Maintenance. This shall consist of a log and record book, which shall be utilised to log and record all operations, faults, system checks, breakdowns, maintenance visits, inspections, etc.

The logbook shall be kept in a safe place as agreed with the User Client and the Engineer and shall only be utilised by the maintenance personnel, the Contractor and the Engineer. Copies of the monthly entries and recordings into the logbook shall be submitted by the Contractor together with his monthly report to the Engineer.

The logbook shall be structured to include at least the following:

(a) Weekly inspection and maintenance actions;
(b) Monthly inspection and maintenance actions;
(c) Four-monthly inspection and maintenance actions;
(d) Annual inspection and maintenance actions;
(e) Breakdown reports;
(f) Daily system and equipment operating conditions, observations, recordings and measurements;
(g) Inspection and test comments and reports.

The Contractor shall also institute an attendance register, which shall be kept in a safe place as agreed with the User Client and the Engineer. This register shall be completed by all persons visiting the installation, including:

(a) Maintenance personnel
(b) Contractor
(c) Inspectors
(d) User client personnel
(e) Engineer.

The register shall state the date, time-in, time-out, name, company and reason for visit.

A copy of the register shall be submitted by the Contractor together with his monthly report.

FC 07 TESTS AND INSPECTIONS ON COMPLETION OF REPAIR WORK

Except where otherwise provided in the Contract, the Contractor shall provide all labour, materials, power, fuel, accessories and properly calibrated and certified instruments necessary for carrying out such tests. The Contractor shall make arrangements for such tests and he shall give at least 72 hours written notice to the Engineer before commencing the test.

In the event of the plant or installation not passing the test, the Employer shall be at liberty to deduct from the Contract amount all reasonable expenses incurred by the Employer or the Engineer attending the repeated test.

Whenever any installation or equipment is operated for testing or adjusting as provided for above, the Contractor shall operate the entire system for as long a period as may be required to prove satisfactory performance at all times in the occupied space served by that system for up to twenty-four hours a day continuously until the system is handed over.

The Contractor shall provide all labour and supervision required for such operation and the Department may assign operating personnel as observers, but such observation time shall not be counted as instruction time.

After completing the installation or system, all equipment shall be tested, adjusted a readjusted until it operates to the satisfaction and approval of the Engineer.

The Contractor shall submit certificates of tests carried out to prove the efficiency of all equipment, as well as certificates to be obtained from all relevant authorities and statutory bodies, etc.

FC 08 QUALITY ASSURANCE SYSTEM

The Contractor shall institute an approved quality assurance (QA) system that shall be submitted to the Engineer for approval. The records of this QA system shall be kept throughout the duration of the Contract and submitted to the Engineer at regular intervals as required.

FC 09 COMMISSIONING AND RECOMMISIONING OF PLANT AND INSTALLATION

FC 09.01 GENERAL

On completion of the repair work and/or the installation of new systems the plant and equipment shall be put into operation after all tests and adjustments have been carried out to the satisfaction of the Engineer. Where new plant is installed the Contractor shall run and operate the system for a period of time as specified by the Engineer and train the staff of the User Client to operate and maintain the system.

Logging of the operation of the installations shall commence immediately upon start-up.

The Contractor shall submit a full commissioning report.

FC 09.02 RECOMMISSIONING OF HOT-WATER GENERATING INSTALLATION AND ANCILLARY EQUIPMENT

On completion of any repairs the Contractor shall re-commission the systems, installation and/or equipment influenced by such repairs.

This operation shall be done strictly in accordance with the manufacturer's specification and relevant standards, norms and specifications from the applicable body, authority and/or department. The operation shall include but not be limited to the following:

(a) All required pre-commissioning mechanical checks

(i) Check all steam, water and drain connections (when applicable).

(ii) Check all moving parts.

(iii) Check seals, gaskets and joints.

(iv) Reinstall all plugs and covers and check that they are properly secured.

(v) Check and record that all lubrication to equipment and components has been done in accordance with manufacturer's specification.

(vi) Check and ensure that all valves and safety valves are correctly installed and in the correct operating position. Safety valves are to be set in accordance with the required blow-off pressure for the installation.

(vii) Check and ensure that all control equipment such as pressure-reducing valves, heat control equipment, etc, are set and adjusted to the correct controlling value in accordance with the system parameters and manufacturer's specification.

(viii) All steam and condensate pre-commissioning checks shall be done in accordance with Technical Specification FB (where applicable).

(ix) Check and confirm that all required tests and inspections to storage vessels, primary heater vessels and re-heater vessels have been done and that all required certificates are in place.

(x) Check and ensure that the domestic hot-water and cold-water piping system is operational and that no leaks are present.

(xi) Check, test and inspect the correct installation and operation of all primary and secondary pumping systems (where applicable).

(xii) Check that all the required pressure testing to the repaired installations and/or new equipment has been done, witnessed and recorded in accordance with the relevant specifications.

(xiii) Check, test and inspect all bracketing and supports for the relevant installations and equipment to ensure that they are properly secured and installed in accordance with the manufacturer's specifications and installation specification.

(xiv) Check, inspect and ensure that all lagging and cladding to the vessels and piping installation are installed and repaired in accordance with the applicable specifications from the relevant controlling authority.

(xv) Check, inspect and ensure that no leaks to equipment, systems and installations occur.

(b) <u>All required pre-commissioning electrical checks</u>

(i) Check all wiring connections for tightness and repair any hot connections.

(ii) Check that all electrical equipment has been properly reconnected in accordance with the manufacturer's specification.

(iii) Perform and record all required electrical insulation tests on equipment.

(iv) Check and test all controls without livening up electrical equipment.

(v) Check all motor-driven equipment for correct rotational directions.

(vi) Check and test the operation of all indication and warning lights.

(vii) Check, set, record and readjust all equipment control and set points in accordance with manufacturer's specifications.

(viii) Run all motor-driven equipment for a period to ensure free movement and correct operation.

(c) Commissioning of equipment

On completion of the pre-commissioning checks the Contractor shall proceed with the commissioning of the equipment. This shall be done strictly in accordance with the manufacturer's specification and system parameters and shall include but not be limited to the following:

(i) During the commissioning process all safety and warning system checks are to be performed on the thermostatic control system where applicable.

(ii) During load conditions the equipment shall be readjusted and finally switched to automatic operation on completion of all automatic control functions for correct operation where applicable.

(iii) Check that steam pressure valves are readjusted where necessary to the correct set point under load conditions where applicable.
This shall be done in accordance with Technical Specification FB: Steam Generating Installations.

(iv) Check the operation of all steam trap arrangements where applicable.
This shall be done in accordance with Technical Specification FB: Steam Generating Installations.

(v) Check that water pressure-reducing valves are adjusted and set to the correct operating value for the specific system.

(vi) Check the correct operation of all systems. Readjust primary and secondary pumping control equipment where applicable.

(vii) Test and check for any leaks to the system, equipment and installation.

(viii) Check for any unnecessary strain to system, equipment and installation due to expansion and contraction.

(ix) Check the correct functioning of all heating temperature control equipment to ensure the correct switching levels and that all safeties are operational.

(x) Record temperatures and flow conditions.

The Contractor shall visit, inspect, test and readjust the systems, equipment and installation during the week following the recommissioning to ensure the correct functioning of the equipment and its associated components.

FC 10 GUARANTEE OF INSTALLATION AND EQUIPMENT

The Contractor shall provide guarantees obtained from the manufacturer(s) and/or supplier(s) to the effect that each piece of new equipment, supplied and installed under the repair contract, complies with the required performance and will function as part of the complete system.

All new equipment, including, the complete new installations and the systems as a whole shall be guaranteed for a period of 12 (twelve) months commencing upon the day of issue of a certificate of completion for the repair work of the installation.

FC 11 MAINTENANCE TOOLS AND SPARES

Each installation shall be equipped with the necessary maintenance tools and spares required by the specific type of equipment and installation for the daily operation and maintenance of the system. At the start of the repair and maintenance contract the Contractor shall in the presence of the User Client make an inventory of the existing tools and spares, and any shortfall or damaged tools and spares shall be replaced with new. All replacement tools and spares shall be as specified by the equipment manufacturers. These tools and spares shall be kept in a lockable room or cabinet of which the maintenance supervisor and the Contractor shall carry keys. The Contractor shall on a monthly basis take stock of these items in the presence of the User Client's maintenance supervisor and record and report to the Engineer. Any shortfall shall be replaced by the Contractor as part of his responsibility under this Contract.

The tools and spares to be carried shall include but not be limited to at least the following:

(a) Tools

(i) Grease and oil lubrication equipment;
(ii) Equipment operating keys and tools.

(b) Spares

(i) Spare sight glasses for sight glass indicators, seals and gaskets (where applicable);
(ii) Spare seats, gaskets and gland packings for valves, etc;
(iii) Spare steam traps, at least one of each type present on the installation (where applicable);
(iv) Spare pressure gauges, at least one of each range and type;
(v) Spare electrical elements (where applicable);
(vi) Spare thermostats, at least one of each type present on the installation (where applicable);
(vii) Spare pilot lights, contactors, circuit brackets, relays, thermal overloads, etc, for electrical control panels;
(viii) Spare temperature gauges, at least one of each range and type.

FC 12 REPAIR WORK TO INSTALLATIONS, SYSTEMS AND EQUIPMENT

FC 12.01 GENERAL

During the repair and maintenance contract all the systems, installations and equipment shall be repaired as specified in the Particular Specification. This repair work shall include but no be limited to the specified Particular Specification details.

All repair work shall be executed using approved materials and equipment suitable to the systems and/or installations they serve. The said repair work shall be executed in accordance with the relevant codes of practice, standards, regulations, municipal laws and by-laws, manufacturer's specifications and codes of practice and all additional and particular specifications included in this document.

The repair work items are listed in the Particular Specification and Schedule of Quantities with all relevant details, such as capacity, size, manufacturer, model number, etc.

All repair work shall be executed within the specified durations listed in the Appendix to Tender. All new equipment, materials and systems shall be furnished with a written guarantee of a defects liability period of 12 months commencing on the date of issue of a certificate for completion of the repair work. These guarantees shall be furnished in favour of the Department of Public Works.

Repair work items for the steam generating installations shall be categorised under the following headings:

(a) General requirements for hot-water generating installations

(b) Steam and condensate pipework (where applicable)

Refer to Technical Specification FB: Steam Distribution Installations.

(c) Hot-water storage vessels

(i) Existing hot-water storage vessels
(ii) Electrically driven storage vessels, new hot-water storage vessels
(iii) Heating services for hot-water storage vessels.

(d) Lagging and cladding of vessels and piping

(i) Vessel lagging and cladding
(ii) Hot-water and hot-water return pipe lagging and cladding

(e) Pressure testing

(f) Corrosion protection linings

(g) Sterilisation of installation

(h) Heating control equipment

(i) Steam heating equipment
(ii) Electrical heating equipment

(i) Instruments and controls

(i) Type of instrumentation and controls
(ii) Instrumentation and controls, installation requests

(j) Primary and secondary pumping installations

(i) Primary pumping equipment
(ii) Secondary pumping equipment

(k) Domestic hot-water and cold-water pipe installations

(i) Strainers
(ii) Valves
(iii) Air vents
(iv) Thermostatic water flow control valve
(v) Expansion equipment
(vi) Flow meters
(vii) Check valves
(viii) Vacuum breakers
(ix) Expansion release valve
(x) Safety valves

(xi) Pressure gauges

(l) Electrical installations

(i) Electrical control panels
(ii) Wiring and cabling.

Any repair work, which may be required on the systems, equipment and installation, shall be executed using approved materials, equipment, methods and tooling suitable for the specific application. The said repair work shall be executed in accordance with the relevant codes of practice, standards, regulations, statutory regulations, manufacturer's specifications and codes of practice and as specified in all additional and particular specifications included in this document.

At the start of the repair and maintenance contract, the repair work specified in the Particular Specification shall be done in accordance with the items listed. Any repair work during the maintenance period shall also adhere to this specification.

FC 12.02 GENERAL REQUIREMENTS FOR HOT-WATER GENERATING INSTALLATIONS

All repair work and new installation of hot-water generating installations shall adhere to the standard specifications of the Department of Public Works and all relevant specifications, norms, standards and regulations applicable to this type of installation, including the following general requirements:

(a) The hot-water generating installation shall be repaired, installed and maintained as a complete functional unit, with all the responsibilities, functions and operating parameters taken into account to ensure the continuous supply of hot water to the consumer points.

(b) The hot-water generating installation shall be capable of providing ample supply of hot water to the consumer points by means of ensuring the correct sizing of the hot-water storage and production.

FC 12.03 STEAM AND CONDENSATE PIPEWORK

All steam and condensate installations shall be done in accordance with Technical Specification FB: Steam Distribution Installations.

FC 12.04 HOT-WATER STORAGE VESSELS

FC 12.04.01 Existing hot-water storage vessels

At the start of the maintenance and repair contract the Contractor shall inspect, repair, service, clean out and test all hot-water storage vessels.

The inspection shall include the following:

(a) Isolate drain, open manholes and clean out hot-water vessels.
(b) Inspect vessel welds.
(c) Inspect internal corrosion lining and check for any pit holes and damages to the vessel material and connections.
(d) Inspect lagging and cladding.

(e) Inspect condition of all elements, steam heating coils, controls, safety valves, etc.

During this inspection the Contractor shall notify the Engineer in advance to allow the Engineer to witness the Contractor's findings. The Contractor shall submit a written report on the findings.

All manhole and pipe gaskets shall be replaced.
No repair work shall be proceeded with prior to approval from the Engineer.

Should any welding repair work be required it shall be performed by a coded welder in accordance with acceptable practices, codes and norms.

Should the corrosion lining be damaged or corroded, thus necessitating the relining of the vessel, this shall be done with an approved lining suitable for the water quality and operating temperature under which this system is functioning.

For further details on repair to resisting linings and installation of new linings refer to FC12.06.

All safety valves shall be serviced, overhauled and readjusted to the correct safety pressure blow-off part.

All lagging and cladding shall be inspected, repaired and where necessary replaced.

On completion of all repair and service work the Contractor shall reinstate all equipment, fill the hot-water vessel with water and pressure test it to 1,5 times the permissible operating pressure or allowable test pressure.

On passing of the pressure test the Contractor shall re-commission the hot-water vessels and put it back on line.

FC 12.04.02 **<u>New hot-water storage vessels</u>**

Where new hot-water storage vessels are to be installed it shall be done in accordance with the following specification and on approval of the necessary workshop drawings to be provided by the Contractor.

The storage vessels shall be of the vertical cylindrical type with dished ends on both sides, and shall be manufactured to BS 5500 Category II in mild steel for a working pressure as indicated for the three systems. A pressure test certificate for each vessel shall be supplied by the manufacturer.

The vessel shall be equipped with at least the following :

(a) Properly sized flanged manhole for easy access
(b) Flanged inlets and outlets to SABS 1123 Table 10
(c) Sparge pipe on the cold-water inlet
(d) Correctly sized thermometer
(e) Correctly sized temperature and pressure relief valve
(f) Air release valve
(g) Correctly sized pressure gauge
(h) BSP threaded sockets for thermostats
(i) 40 mm diameter BSP threaded socket at the lowest point of the storage tank for draining purposes
(j) 50 mm diameter boss element segments for auxiliary elements.

An expansion relief valve shall be installed on the inlet to the storage vessels for thermal expansion.

Where pipe connections to the storage vessel are done with dissimilar materials (such as copper), isolating flanges shall be used (dielectric coupling).

Before ordering and manufacturing of storage vessels a workshop drawing shall be submitted to the Engineer for approval.

The Contractor shall satisfy himself that access and plantroom sizes are to the dimensions on the drawings and that the equipment will fit into the space allowed.

FC 12.04.03 Heating sources for hot-water storage vessels

(a) Electrical elements

Where electrical immersion elements are used to heat the water inside the hot-water storage vessel, these elements shall be replaced at the start of the repair and maintenance contract.

All the thermostat controls and safety cut outs shall be cleared, inspected, tested, adjusted to the set point and where necessary replaced.

(b) Steam heating

Where steam heat exchangers are used to heat the water inside the storage vessel, these coils shall be removed together with the steam chest and associated equipment. The coils shall be descaled, cleaned, inspected and tested.

Where necessary the heat exchanger and/or coils shall be replaced.

FC 12.05 LAGGING AND CLADDING

All lagging and cladding to hot-water vessels, primary heaters, secondary heaters and hot and circulation water piping shall be inspected for defects, damages and shortages at the start of the repair and maintenance contract. The Contractor shall report his findings to the Engineer in writing.

All repairs to be done shall match the existing installation and the Contractor shall ensure that no sharp edges from the metal cladding pose a danger to anybody.

The following specification shall be adhered to:

(a) Vessel lagging and cladding

The storage vessels shall be insulated with a 80 mm thick layer of mineral glass wool with a density of 88 kg/m³ and finally covered with 0,6 mm thick galvanized sheet metal. The sheet-metal work has to be done by a specialist. (All edges are to be rolled and no sharp edges will be allowed.)

(b) Hot-water and return water pipe lagging and cladding

All hot water and hot-water return pipes shall be insulated with preformed fibreglass sections covered with galvanized sheet-metal muffs in a water tight manner. Sheet-metal muffs shall be installed with the joints overlapping at least 50 mm and the longitudinal overlap pointing downwards to prevent ingress of water. The sheet-metal muff shall be strapped with 10 mm galvanized straps by means of a strapping tool with a

minimum of 2 straps/section. All pipe bends, T-pieces, etc, shall be insulated with 25 mm diameter fibreglass rope covered with a 12 mm thick layer of self-setting fibre cement. A reinforcing gauze shall be wrapped over the fibre cement while wet and then painted with mastic paint when dry.

Table FC 12.05/1 below provides a guideline for the preformed fibreglass section thickness to be used.

The fibreglass sections shall have a density of at least 88 kg/m^3.

TABLE FC 12.05/1: FIBREGLASS SECTION THICKNESS

PIPE SIZE (STEEL)	PIPE SIZE (COPPER)	THERMAFLEX THICKNESS
100 mm dia	108 mm dia	50 mm
80 mm dia	76 mm dia	40 mm
65 mm dia	67 mm dia	40 mm
50 mm dia	54 mm dia	25 mm
40 mm dia	42 mm dia	25 mm
32 mm dia	35 mm dia	25 mm
25 mm dia	28 mm dia	20 mm
20 mm dia	22 mm dia	20 mm
15 mm dia	15 mm dia	15 mm

FC 12.06 **PRESSURE TESTING**

The Contractor shall at the completion of the repair contract arrange for a complete pressure test to be executed on the hot-water generating installation. This shall be done in collaboration with the User Client and Engineer to ensure the minimum down-time of the installation, as well as to establish a suitable period for this pressure test. All leaks shall be repaired and the system shall be tested at the cost of the Contractor. This test shall be witnessed by the Engineer.

The tests shall be performed on all hot-water storage vessels, primary heating vessels, secondary heater vessels and domestic water pipe systems.

All safety and expansion release valves shall be removed and plugged, and on completion these shall be reinstalled.

The systems shall be filled with water after all branches have been plugged, sealed or closed.

The systems shall be hydraulically pressure tested by means of a suitable manually operated or mechanically driven pressure pump.

A pressure of at least 1,5 times the working pressure of the class rating of pipes or fittings shall be applied for a period of time specified in the specifications or as recommended by the manufacturers. (Refer to SABS 1200 for minimum and maximum test pressures.)

Tests should not be performed against closed valves.

Leakage which occurs shall be measured, calculated and checked against the allowable losses, as specified in SABS 1200.

If the completed sections comply with all specifications and pass the tests and inspection, it can be approved and the Contractor may be instructed to re-commission the plant.

FC 12.07 CORROSION PROTECTION LININGS

All vessel corrosion protection linings shall be inspected and repaired and/or replaced where necessary.

Repairs shall only be done to linings where the supplier and installer of these linings approve of such repairs. These repairs shall then be done strictly in accordance with the manufacturer's specification and shall be certified by an approved inspection authority.

Where new linings are to be installed, the required preparation work including sand blasting and removal of old lining shall be done in accordance with the recommendation of the supplier of the new lining.

Where new linings are to be introduced they shall be similar or equal to the following:

(a) Internally coated with a durable, high operating temperature glass flake lining with DTF of one millimetre, similar or equal to a Polygrass VE lining as supplied by Corrocoate, suitable for an operating temperature of 95 °C at the indicated working pressures.

The applications of these linings shall be witnessed and certified as being to the manufacturer's application standards by an approved inspection authority.

(b) Externally the vessels shall be coated with two coats of red oxide paint.

FC 12.08 STERILISATION OF WATER SIDE OF INSTALLATION

The Contractor shall at the completion of the repair contract sterilise the complete water side of the hot-water system including vessels and pipes.

This shall be done as described in the following guidelines.

(a) The complete system shall be filled with potable water chlorinated to a concentration of 15 mg of chlorine per litre of water which shall remain in contact with the inner surface of the pipeline for a period of not less than 24 hours. The pipeline shall be filled for sterilising in such a manner that no chlorine shock is created or air is trapped in the pipeline.

(b) The Contractor shall submit full details of the proposed method for sterilising the pipeline to the Engineer for approval at least 14 days before commencing sterilising.

(c) The cost of water for filling the pipeline for sterilising shall be borne by the Contractor.

(d) The Contractor shall provide all materials, tools, equipment and labour necessary to sterilise the pipeline. After sterilising the pipeline the Contractor shall, at no extra cost, empty the pipeline and dispose of the water in a manner approved by the Engineer.

(e) The Contractor may use the following products as a source of chlorine:

(i) Chloride of lime to SABS 295 yielding 33 % free chlorine by mass;

(ii) Calcium hypochlorite to SABS 295 yielding 70 % free chlorine by mass;

(iii) Chlorine gas applied by chlorinator.

(f) After sterilisation, an approved water quality test to a minimum number of 10 % of the total water points, randomly selected, evenly spread and marked on drawings, shall be carried out. This test shall include a full bacteriological test as per SABS 241 and the results shall be submitted to the Engineer for inclusion in the Contract documents. Each abortive test shall be for the Contractor's cost.

When tested the water shall comply with the limits given in column 2 or 3, as relevant, of table FC 12.08/1.

TABLE FC 12.08/1: BACTERIOLOGICAL REQUIREMENTS

1 PROPERTY	2 RECOMMENDED MAXIMUM LIMIT	3 MAXIMUM ALLOWABLE LIMIT
Total coliform bacteria count per 100 millilitre	Nil*	5
Faecal coliform bacteria count per 100 millilitre	Nil	Nil
Standard plate count per millilitre	100	Not specified

Note:

* If any coliform bacteria are found in a sample, take a second sample immediately after the tests on the first sample have been completed; this sample shall be free from coliform bacteria.

Not more than 5 % of the total number of water samples (from any one reticulation system) tested per year may contain coliform bacteria.

FC 12.09 HEATING CONTROL EQUIPMENT

The Contractor shall at the start of the repair and maintenance contract inspect, test, repair, readjust, and if necessary replace heating controls for the hot-water system.

This shall include the following:

(a) Check for correct switching and/or control temperature operating points.

(b) Check, test and ensure that the safety cut-out mechanisms are in place and switch and/or control at the correct level.

(c) Ensure that equipment has been installed in accordance with the manufacturer's specification.

(d) Ensure that all pockets are descaled and free of any defects.

The following control equipment shall be serviced, repaired and where required replaced if damaged beyond repair.

FC 12.09.01 Steam heating control equipment

Where immersed type thermostatic steam control valves are utilised they shall be serviced and repaired as follows:

(a) Dismantle and strip down thermostatic control valve including removal of pocket.
(b) Descale and clean all equipment.
(c) Replace element subassembly if necessary.
(d) Replace cover joint, gland packing, heater joint, coupling joint and all gaskets where applicable.
(e) Check valve seat and if necessary reseat.
(f) Reassemble control valve and reinstall, test and adjust to correct level.

All other type of thermostatic heating control valves shall be serviced, repaired and overhauled in accordance with the manufacturer's specification.

FC 12.09.02 Electrical heating control equipment

All electrical thermostat control equipment shall be serviced and repaired in accordance with the manufacturer's specification.

This shall include the following:

(a) Dismantle, clean and descale thermostat pockets.
(b) Test switching actions for correct operation.
(c) Test safety cut-out switching points for correct operation.

Replace thermostat if the switching does not take place in accordance with the manufacturer's specification.

FC 12.10 PRIMARY AND SECONDARY PUMP INSTALLATIONS

The Contractor shall at the start of the repair and maintenance contract inspect, test, service and if required replace primary and secondary circulating pumps.

The pumps are to be inspected, tested, serviced and repaired together with their associated equipment and pipework. All repair and service work shall be done strictly in accordance with the manufacturer's specification.

The repair work to the pumps and equipment shall include at least the following:

(a) Inspect and test the pumps for correct operation.

(b) Replace gland packings, seals and gaskets.

(c) Inspect and test for any bearing noise and replace if necessary.

(d) Clean out pump strainers, check non-return valves, valves, etc.

(e) Test pump motor windings for balance phases, insulation test and check wiring.

(f) Inspect pump mountings and repair if necessary.

Where in-line glandless canned pumps are used, these shall be inspected, tested, serviced where possible, impeller inspected and cleaned and if found beyond repair, replace with a suitable replacement in accordance with the operating parameters.

FC 12.11 DOMESTIC HOT AND COLD WATER INSTALLATIONS

The Contractor shall at the start of the repair and maintenance contract inspect, tests, service, repair and if required, replace damaged items on the complete hot and cold-water piping installation inside the hot-water generating plant rooms.

The repair work specification shall be read in conjunction with Technical Specification AA: Plumbing and Drainage Installations.

Repair work to the domestic hot and cold-water installation networks shall be as detailed in the Particular Specification and shall include, but not be limited to the following:

(a) Replace damaged, broken, leaking and corroded above and underground pipework, fittings and equipment.

(b) Repair, replace and service valves, including new gaskets, gland packings, seals, bolt and nuts, etc.

(c) Test the proper closing of all valves and where valves do not close properly, the valves shall be refurbished, descaled and if necessary replaced.

(d) Repair, clean and service all strainers including replacement of strainer elements where corroded and installation of new gaskets.

(e) Repair, service, test and readjust pressure-reducing valves. Pressure gauges shall be recalibrated and checked. Up and downstream pressures are to be logged. Downstream pressure to be adjusted to an acceptable level taking the allowable working pressure of the system and its components into account.

(f) Repair, service and check the proper functioning of all non-return valves.

(g) Repair, service, readjust and calibrate all safety and expansion relief valves.

(h) Repair, service and clean out all air release valves and vacuum breakers.

(i) Do repair work to bracketing systems including fixing and repair of existing brackets and the introduction of additional brackets where required.

(j) Hot-water pipe lagging and cladding shall be inspected, repaired, sealed and replaced where required.

(k) Repair, service and log readings of watermeters including cleaning of integral strainers.

(l) Water pipes are to be sampled for corrosion and scaling. The Engineer shall evaluate the actions to be carried out if the outcome of this sampling requires attention.

(m) Water supply shall be sampled and chemically analysed for the suitability to the systems and materials it serves.

(n) Pressure test and sterilise repaired new installation and equipment.

(o) Reinstate and make good walls, tiling, floors, concrete, finishes, holes, chases, surfaces, etc, to an acceptable level where any repair, upgrade and/or service work has been executed.

FC 12.12 ELECTRICAL INSTALLATION, WIRING AND CONTROL PANELS

FC 12.12.01 Instrumentation and controls

All instrumentation and control equipment shall be inspected, tested, repaired, adjusted and where necessary replaced. All repair and service work shall be done strictly in accordance with the manufacturer's specification.

The repair work to the instrumentation and control equipment shall include at least the following:

(a) Test all equipment for correct operation.

(b) Inspect, test, service, adjust setting and if necessary repair, and/or replace steam detector.

(c) Inspect, recalibrate and, if beyond repair, replace steam pressure gauge.

FC 12.12.02 Electrical control panels

All electrical control panels shall be inspected, tested, and repaired, including all equipment inside the control panel. All repair and service work shall be done strictly in accordance with the manufacturer's specification.

The repair work to the electrical control panels shall include at least the following:

(a) Test all control equipment for correct operation.

(b) Check and test all MCBs, isolators, contactors, overloads, other type of motor drives, pilot lights, control switches, etc, and readjust all set points; where equipment is found to be faulty these shall be replaced with new approved equipment.

(c) Check all wiring and connections for proper conducting and replace where hot connections are found.

(d) Clean out panel interior and exterior, inspect panel body, fascias, doors, paintwork, etc, and repair where necessary.

FC 13 MAINTENANCE TO INSTALLATIONS AND EQUIPMENT

[Note: There will be no maintenance work required for this installation and equipment in this contract.]

FC 13.01 GENERAL

Monthly maintenance responsibilities for each installation including all units and components as specified, shall commence with access to the site. A difference shall be made in payment for the maintenance prior to and after practical completion of repair work.

Maintenance responsibilities of the completed installation shall commence upon the issue of a certificate of practical completion for repair work, and shall continue for the remainder of the 36-month contract period.
This part of the Contract shall include:

(a) Routine preventative maintenance;
(b) Corrective maintenance, and
(c) Breakdown maintenance,

as defined in Additional Specification SA: General Maintenance, for the specified installations described under FC 01 of this specification.

The maintenance work to be performed and executed shall be done strictly in accordance with Additional Specification SA: General Maintenance, and as specified in Particular Specification PFC and this specification.

The said maintenance work shall be executed in accordance with the relevant codes of practice, statutory regulations, standards, regulations, municipal laws and by-laws and the manufacturers' specifications and codes of practice.

The maintenance schedules and frequency shall be developed under the maintenance control plan to be instituted by the Contractor, as specified in Additional Specification SA: General Maintenance.

All new equipment, components and materials supplied and installed under the maintenance contract shall be furnished with a prescribed manufacturer's guarantee.

The maintenance work and items are to be categorised by the Contractor for each maintenance activity under the following headings:

(a) Steam and condensate pipework (where applicable)
(b) Hot-water storage vessels
(c) Heating equipment
(d) Lagging and cladding of vessels and piping
(e) Corrosion protection linings
(f) Circulating pumps
(g) Domestic hot and cold-water piping systems
(h) Electrical controls, panels and wiring.

The Contractor shall be remunerated monthly, based on his performance, for maintaining the complete installation in a perfect functional condition.

FC 13.02 **ROUTINE PREVENTATIVE MAINTENANCE**

The routine maintenance of the installations, systems and equipment shall be done in accordance with Additional Specification SA: General Maintenance and the Particular Specification related to this work.

The routine maintenance work to be performed and executed shall include but not be limited to the items listed in tables FC 13.02/1, FC 13.02/2, FC 13.02/3 and FC 13.02/4 below under the respective headings.
These actions and findings shall be logged and reported on the relevant approved schedules and reports.

TABLE FC 13.02/1: WEEKLY ACTIONS AND MAINTENANCE

ITEM	MAINTENANCE DESCRIPTION	ACTION RESPONSIBILITY	ACTION
1	Inspect equipment, components and installations for any visible defects, leaks, damages and/or pending faults.	Contractor	Check/Record
2	Check and record all pressure gauge temperature and flow meter readings, and readjust equipment if necessary.	Contractor	Adjust/Check/Record
3	Check operation of pumps, heating equipment and controls for correct functioning.	Contractor	Check/Record
4	Check electrical control panels for any faults.	Contractor	Check/Record
5	Report any faults, defects, leaks, damages, etc, to Engineer.	User Client	Check/Record/Report

TABLE FC 13.02/2: MONTHLY ACTIONS AND MAINTENANCE

ITEM	MAINTENANCE DESCRIPTION	ACTION RESPONSIBILITY	ACTION
1	All as listed under table FC 13.02/1	Contractor/ User Client	Check/Record Adjust/Repair/Report
2	Blow down all dirt pockets and record.	Contractor	Service/Record
3	Clean out all stainers and record.	Contractor	Service/Record
4	Check all valve gland seals and packings for leaks and replace and repair if necessary.	Contractor	Check/Service/Repair /Record
5	Check, inspect and repair if necessary all expansion joints for leaks and damages.	Contractor	Check/Repair/Record
6	Check all safety devices for correct operation and repair and replace where necessary.	Contractor	Check/Service/Repair /Record

ITEM	MAINTENANCE DESCRIPTION	ACTION RESPONSIBILITY	ACTION
7	Check and test all electrical control functions and operations. Repair and report any faults and defects.	Contractor	Check/Service/Repair /Record
8	Complete logbook and report.	Contractor	Report

TABLE FC 13.02/3: FOUR-MONTHLY ACTIONS AND MAINTENANCE

ITEM	MAINTENANCE DESCRIPTION	ACTION RESPONSIBILITY	ACTION
1	All as listed under tables FC 13.02/1 and FC 13.02/2.	User Client/ Contractor	Check/Record/Adjust/ Repair
2	Service, repair, clean, replace seals gaskets, reset and/or replace worn parts as directed by the manufacturer of all steam traps (where applicable).	Contractor	Check/Service/Repair /Report
3	Service, repair, replace glasses and gaskets where necessary and clean all sight glasses.	Contractor	Check/Service, Repair, Report
4	Repair lagging and cladding where necessary.	Contractor	Check/Repair/Report
5	Repair all steam leaks.	Contractor	Check/Repair/Report
6	Repair all water leaks.	Contractor	Check/Repair/Report
7	Inspect and test all heating equipment Repair where necessary.	Contractor	Check/Repair/Report
8	Inspect all hot -water storage vessels for any leaks and packing faults. Repair if necessary.	Contractor	Check/Repair/Report
9	Test, inspect and repair all pumps.	Contractor	Check/Service/ Repair/Report
10	Lubricate all lubrication points in accordance with the manufacturer’s specification.	Contractor	Check/Service/ Report
11	Complete logbook and report.	Contractor	Report

TABLE FC 13.02/4: ANNUAL ACTIONS AND MAINTENANCE

ITEM	MAINTENANCE DESCRIPTION	ACTION RESPONSIBILITY	ACTION
1	All as listed under tables FC 13.02/1, FC 13.02/2 and FC 13.02/3.	User Client / Contractor	Check/Record/ Adjust/Repair
2	Drain, clean out, inspect and repair all defects and linings on hot-water storage vessels.	Contractor	Inspect / Test / Service / Repair
3	Inspect and repaint all equipment where required.	Contractor	Inspect / Test / Service / Repair
4	Remove, strip, service, repair, adjust and replace where necessary all pressure control and safety valve equipment.	Contractor	Service / Repair / Adjust / Report
5	Complete logbook and report.	Contractor	Report

FC 13.03 CORRECTIVE MAINTENANCE

This corrective maintenance of the installations, systems and equipment shall be done in accordance with Additional Specification SA: General Maintenance and the Particular Specification related to this work.

The Contractor shall inspect and check all equipment, materials, systems and installation for any pending breakdowns, maladjustments or anomalies of equipment.

The Contractor shall report and take actions to correct such defects.

FC 13.04 BREAKDOWN MAINTENANCE

Breakdown maintenance of the installations, systems and equipment shall be done in accordance with Additional Specifications SA: General Maintenance.

All breakdown problems experienced shall be acted upon within the time limitations allowed in the General Maintenance specifications.

All breakdown maintenance shall be done in accordance with the relevant specifications, standards, regulations and codes.

The Contractor shall have access to the necessary spares, equipment and tools for any possible breakdowns.

TECHNICAL SPECIFICATION

FO LOCAL CRIMINAL RECORD CENTRES

CONTENTS

FO 01 SPECIFICATION FOR LOCAL CRIMINAL RECORD CENTRE LABORATORY INSTALLATIONS

There shall be made reference to three (3) types/sizes for Local Criminal Record Centre Laboratory installations:

a) Small: (personnel – 5 to 20)

This LCRC Laboratory Complex will cover the following floor space (m²)

- Forensic Laboratory - 40 m²
- Digital Capturing Room - 20 m²
- Evidence Room - 20 m²
- Sorting Room for Photos / DCS 3 - 20 m²
- Vehicle Investigation Booth - 50 m²

b) Medium: (personnel – 20 to 40)

This LCRC Laboratory Complex will cover the following floor space (m²)

- Forensic Laboratory - 50 m²
- Digital Photographic Room - 25 m²
- Evidence Room - 30 m²
- Sorting Room for Photos / DCS 3 - 30 m²
- Vehicle Investigation Booth - 50 m²

c) Large: (personnel – 40 plus)

This LCRC Laboratory Complex will cover the following floor space (m²)

- Forensic Laboratory - 60 m²
- Digital Capturing Room - 40 m²
- Mini Colour Lab - 40 m²
- Evidence Room x 2 (2 x 30 m²) - 60 m²
- Sorting Room for Photos / DCS 3 - 20 m²
- Store Room for Photographic Material - 20 m²
- Vehicle Investigation Booth - 50 m²

FO 02 SPECIFICATION – GENERAL:

This "General" specification includes the general items that shall be present in every Local Criminal Record Centre Laboratory Installations regardless of the Laboratory Layout/Arrangement.

1.2 BUILDING:

1.2.1 Walls:

a) Material of Construction:

i) Brick & Mortar:

All walls shall be that of brick and mortar Plaster shall be smooth.

ii) Dry Walling:

1. In certain instances, dry walling can only be used.
2. When dry walling is used for:
   - Forensic Laboratory
   - Exhibit Room

   The dry walling shall encase, at least 1.2 mm galvanised sheet metal panels, to guarantee the security of specific Laboratories.
3. Approval from SAPS shall be acquired to use dry walling.
4. In these instances the joints shall be seam free and sanded smooth.

iii) Ceilings shall be:

1. Suspended ceiling tile type
2. 1200 x 600 ceiling panels
3. Washable
4. Dust shield above ceiling panels to be that of 0.8mg plastic sheeting placed above Suspended Ceiling
5. Ceiling joining strips shall be that of mild steel Epoxy Painted white or aluminium anodised / epoxy painted.

iii) Doors:

All Doors for access to the various laboratories shall be as specified in the specific laboratory specification here below.

b) Paint:

i) Walls:

All internal wall surfaces shall be painted with:

Make: Plascon
Type: Acrylic – fully washable
Colour: Broken White
Code: EPL 314

ii) Ceiling:

All ceilings shall washable and if NOT drop in as per 1.2.1 (iii) above – ceilings shall be painted with:

Make: Plascon
Type: Acrylic – fully washable
Colour: White
Code: EPL 030

iii) Doors:

All doors shall be SOLID wood type
Solid Doors shall be:
Sanded smooth

Make: Plascon
Type: Enamel – fully washable
Colour: Painted to compliment the existing colours in the building.

iv) Door Frames:

The door frames shall be that of steel, Aluminium or Solid Wood sanded smooth and painted where applicable

Make: Plascon
Type: Enamel – fully washable
Colour: White
Code: D232

v) Window Frames:

The window frames shall be that of steel, Aluminium or Solid Wood sanded smooth and painted where applicable.

Make: Plascon
Type: Enamel – fully washable
Colour: White
Code: D232

vi) Burglar Proofing:

The Burglar Proofing shall be that of steel, sanded smooth and painted

Make: Plascon
Type: Hammer tone – fully washable
Colour: Black
Code: hammerite

vii) PVC Extraction Ducting – Inside Laboratory:

All PVC Extraction Ducting shall be painted the same colour as the internal walls of the Laboratory:

Make: Plascon
Type: Acrylic – fully washable
Colour: Broken White
Code: EPL 314

viii) PVC Extraction Ducting – Outside Laboratory:

All PVC Extraction Ducting outside of the laboratory and exposed to the elements shall be painted:

Make: Plascon
Type: Aluminium Bitumen
Colour: Silver
Code: RMBI

ix) PVC Extraction Fans – Outside Laboratory:

All the PVC Extraction Fans, when situated outside of the building and exposed to the elements shall be painted:

Make: Plascon
Type: Aluminium Bitumen
Colour: Silver
Code: RMBI

c) Tiling:

i) Walls:

The Tiles shall be:

1. 1.5m height tiled from finished floor level
2. Only Grade 1 quality tiles used
3. Chemical resistant
4. 100 % square
5. Tiled with maximum 5mm grouting space between tiles
6. Colour - to be approved by SAPS
7. Grout Colour - to be approved by SAPS
8. Tiles shall be sealed with “DEEP SEAL” CODE TWCH005

9. Quarter round plastic/PVC edging shall finish all tile raw edges (juncture between walls and tiles, tiles ending at doors)
10. Aluminium L-Sections - corner protections shall be installed at:
    - Protruding tiled corners – 1.5m high above finished floor level
    - Tiled stairs – the full width of the stairs, every stair and shall be non-slip
11. Tile size shall not exceed:
    - Nominal 400mm x 400mm
12. Same type and colour tiles shall be used for walls and Floor – NO WHITE TILES shall be used

ii) Floor:

The Tiles shall be:

1. Cover the complete floor area of the laboratory
2. Only Grade 1 quality tiles used
3. Chemical resistant
4. 100 % square
5. Tiled with maximum 5mm grouting space between tiles
6. Colour - to be approved by SAPS
7. Grout Colour - to be approved by SAPS
8. Tiles shall be sealed with "DEEP SEAL" CODE TWCH005
9. Quarter round plastic/PVC edging shall finish all tile raw edges (juncture between walls and tiles, tiles ending at doors)
10. Aluminium L-Sections - corner protections shall be installed at:
    - Protruding tiled corners – 1.5m high above finished floor level
    - Tiled stairs – the full width of the stairs, every stair and shall be non-slip
11. Tile size shall not exceed:
    - Nominal 400mm x 400mm
12. Same type and colour tiles shall be used for Walls and Floor – NO WHITE TILES shall be used.

1.2.2 Electrical:

Lightning and Surge protection shall be installed to protect ALL electronic and electrical equipment - Refer to ANNEXURE A regarding the specification.

a) Main Distribution Board:

The main electrical distribution board shall be a new installation and only feed the Laboratory, Dark Room, Mini Colour Lab, Digital Laboratory and Vehicle inspection booth.

i. This DB shall NOT be installed inside of any of the rooms as mentioned above.
ii. Supply cable to Main DB shall be that of
iii. 16mm Four(4) Core armoured cable
iv. 16mm separate earth
v. Main Feed circuit Breaker shall be that of 5KA 60 Amp Triple Pole
vi. For RENTED properties, a 3 Phase energy meter shall be installed
vii. DB shall be marked with the appropriate signage
viii. Installation shall be according to SABS 0142

ix. Installation shall carry a COC certificate verifying 1.2.2 (a) (v) here above.
x. All materials used shall be NEW and carry the SABS compliance quality mark.
xi. All wiring / circuits shall be chased into walls and NO surface mounting shall be accepted.
xii. All Circuit Breakers shall be labelled
xiii. Installation shall carry a 1 year guarantee on equipment as well as workmanship
xiv. Dedicated circuit breakers shall be installed for the following:
- Lights - 15 Amp
- Geyser - 20 Amp
- Plug Sockets - 20 Amp – maximum four (4) plugs sockets per Breaker
- Cyanoacrylate Fuming Chamber unit complete with it's extraction system – 20Amp NO mix loading
- Chemical Fuming Chamber unit complete with it's extraction system – 20 Amps NO mix loading
- Etching station unit complete with it's extraction system – 20 Amps NO mix loading
- Powder Down-flow unit complete with it's extraction system – 20 Amps NO mix loading
- Bio Forensic Exhibit dryer unit – 20 Amps NO mix loading
- Laboratory central extraction system – 20 Amps NO mix loading
- Laboratory Fresh Air Supply system – 20 Amps NO mix loading
- Air conditioners – size of Curve breaker will be determined by size and demand of air-conditioning units. Each Air conditioner must run on its own Circuit. A Weather Proof Isolator with appropriate Amperage size shall be installed within 1000mm from condensing unit.
- Mini Colour Lab Unit – size of Curve breaker will be determined by size and demand of unit. The Mini Colour Lab Unit must run on its own 380 V 3 Phase Circuit. An Isolator with appropriate Amperage size shall be installed within 1000mm from Mini Colour Lab Unit.

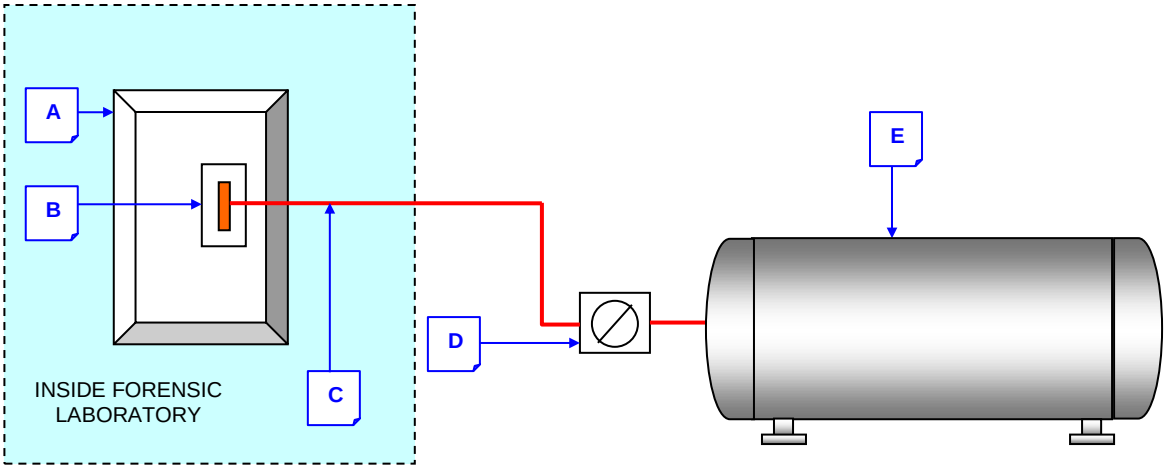
a) Lights:

i. Vapour Proof – IP65 - ceiling mounted
ii. Removable Diffuser
iii. Size : 1200 mm double tube – 2 x 36 Watt
iv. One light per 5 square meters area – Minimum of 300 Lux shall be achieved
v. Switch per room shall be independent.
vi. Installation according to SABS 1042 standards

b) Geyser:

i. Shall be 150 L Kwikot equal or approved
ii. Shall have 3 kW element
iii. Shall be that of 12.65 Amps
iv. Circuit shall be that of 2.5mm
v. Separate earth conductor of 2.5mm thick, shall be installed and fasted to the geyser supply circuit at 300mm intervals.
vi. Shall have 20 Amp Isolator installed within 1000mm of Geyser

vii. Geyser Shall be bonded to earth over Hot and Cold water inlets, Latco and Pressure Valves.
viii. Bonding to be connected to Main Earth, to Earth Stud on body of Geyser and to Earth Point on geyser Element
ix. Installation according to SABS 1042 standards



ITEM	DESRIPTION	SPECIFICATION
A	Laboratory Distribution Board	The Laboratory complex, including the *Forensic Lab, Digital Lab, Dark Room, Colour Lab, Vehicle Inspection Boot, shall* have its own DB – supplied from the MAIN building's PRIMARY DB
B	Circuit Breaker	The circuit breaker supplying power to the GEYSER shall be that of **SINGLE 20 Amp**
C	Supply cable GEYSER	This cable should be that of: - **2.5mm** - Single circuit feeding single 20 Amp Isolator - Two (2) core (L, N) - One (1) Separate 2.5 mm Earth - Earth is attached to the circuit every 300mm - Protected e.g. Norse/Armoured/Conduit Should be chased into the walls and NOT surface mounted
D	Geyser Isolator	This switch should be that of: - 2 pole - On & Off clearly marked - 220/230 V - Weather Proof Should be mounted within 1000mm from Geyser
E	Geyser	Kwikot equal or approved - Volume – 150 Litre - 230 Volt - 3 kW

c) Plug Points:

i. Wall Mounted
- Clipsal Double Socket
- Code: 2025
- Colour: Desert Sand
- Size 120 x 120 mm

ii. Wall Mounted (DEDICATED)
- Clipsal Double Socket -
- Code: ST2025TWE
- Colour: White
- Size 120 x 120 mm

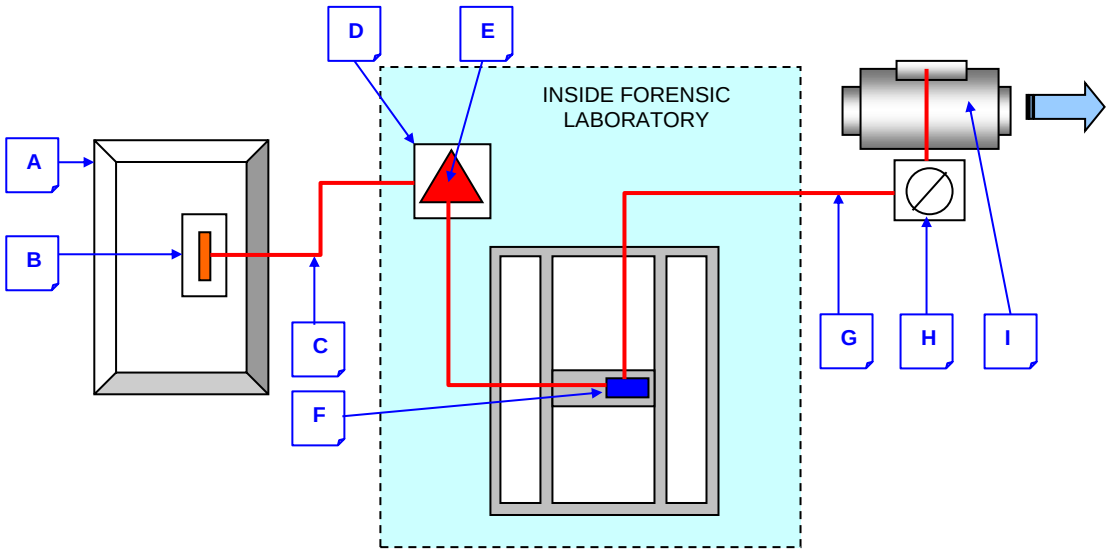
iii. Fan Isolators:
- 230 V
- 2 Pole
- Weather Proof

iv. Fresh Air Supply Isolator
- 230 V
- 2 Pole
- Weather Proof

v. Extraction Systems:

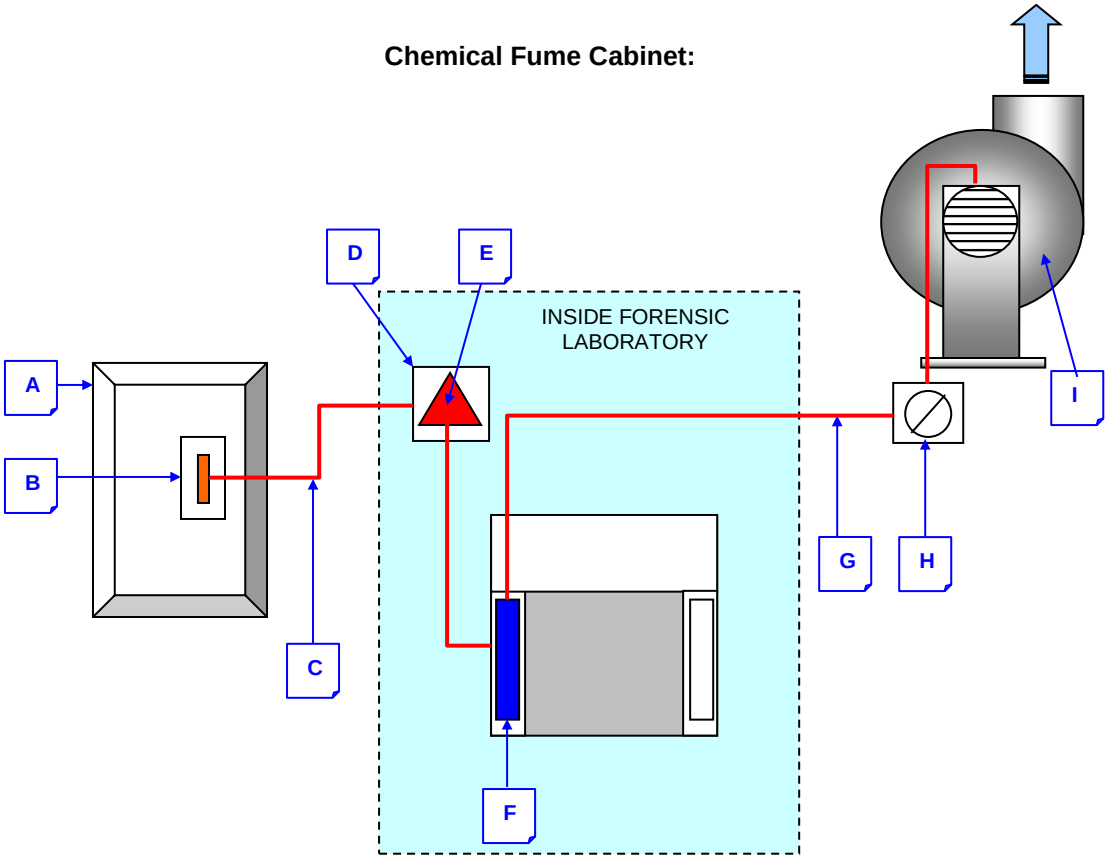
The Extraction Systems are designed to achieve the following:
- Extraction from Specialized LCRC Equipment in Laboratories.
- Creation of Negative Pressure in Laboratories
- Installation according to SABS 0142 Standards

Cyanoacrylate Fuming Chamber:



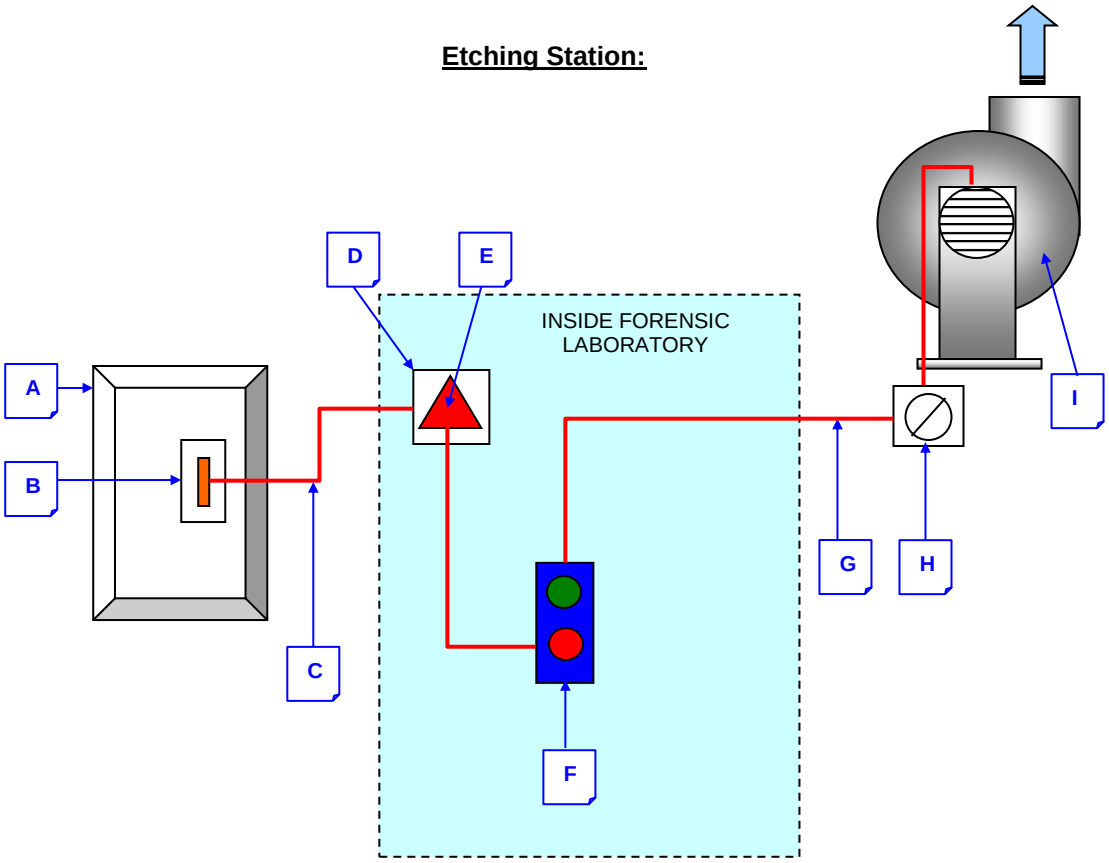
ITEM	DESRIPTION	SPECIFICATION
A	Laboratory Distribution Board	The Laboratory complex, including the *Forensic Lab, Digital Lab, Dark Room, Colour Lab, Vehicle Inspection Boot, shall* have its own DB – supplied from the MAIN building's PRIMARY DB
B	Circuit Breaker	The circuit breaker supplying power to the Cyanoacrylate Fuming Chamber and it's extraction fan shall be that of **SINGLE 20 Amp**
C	Supply cable to Single 16 Amp Socket Outlet for the Cyanoacrylate Fuming Chamber	This cable should be that of: - **2.5mm** - Single circuit feeding single 16 Amp socket outlet only - Three core (L, N and Earth) - Protected e.g. Norse/Armoured/Conduit Should be chased into the walls and NOT surface mounted
D	Double 16 Amp Socket Outlet	Dedicated Outlet for the Cyanoacrylate Fuming Chamber - Double socket - 16 Amp - NO Mix Loading
E	Single 16 Amp Plug Top	This cable should be that of: - 2.5mm - Three core (L, N and Earth) - Supplied by Equipment supplier
F	On/Off Switch located inside the electronics Cyanoacrylate Fuming Chamber	The Cyanoacrylate Fuming Chamber shall decide when extraction for this units is required
G	Power supply cable to the Extraction Fan form the Cyanoacrylate Fuming Chamber	This cable should be that of: - **2.5mm** - Three core (L, N and Earth) - Protected e.g. Norse/Armoured/Conduit Should be chased into the walls and NOT surface mounted
H	Cyanoacrylate Fuming Chamber Extraction Fan Isolator	This switch should be that of: - 2 pole - On & Off clearly marked - 220/230 V - Weather Proof Should be mounted within 1000mm from Cyanoacrylate Fuming Chamber Extraction Fan Extraction Fan.
I	Cyanoacrylate Fuming Chamber Extraction Fan	CDC 200/0,8 Inline Centrifugal fan with internal direct drive motor. - Volume – 900m³/h @ 100Pa - 2490 Rpm - 230 Volt – 50 Hz - 0.11 Kw - 0.52 Amps

Chemical Fume Cabinet:



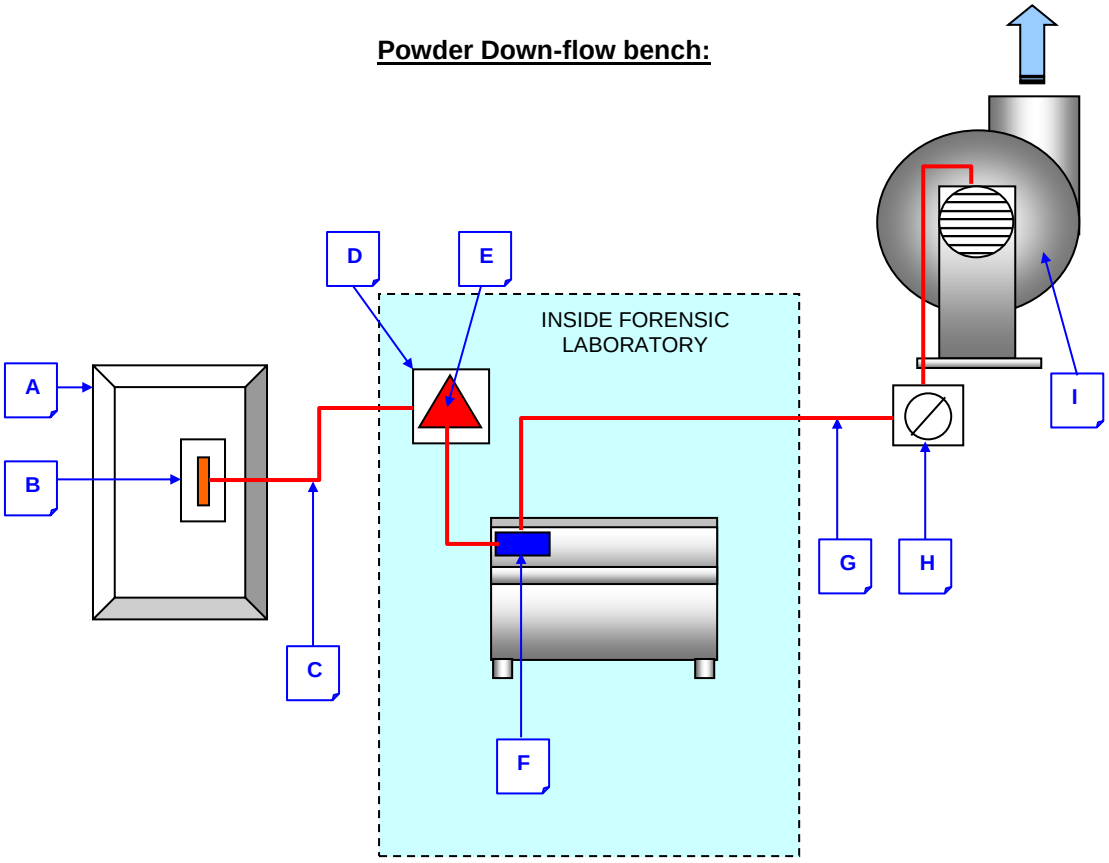
ITEM	DESRIPTION	SPECIFICATION
A	Laboratory Distribution Board	The Laboratory complex, including the *Forensic Lab, Digital Lab, Dark Room, Colour Lab, Vehicle Inspection Boot, shall* have its own DB – supplied from the MAIN building's PRIMARY DB
B	Circuit Breaker	The circuit breaker supplying power to the Chemical Fume Cabinet and it's extraction fan shall be that of **SINGLE 20 Amp**
C	Supply cable to Single 16 Amp Socket Outlet for the Chemical Fume Cabinet	This cable should be that of: - **2.5mm** - Single circuit feeding single 16 Amp socket outlet only - Three core (L, N and Earth) - Protected e.g. Norse/Armoured/Conduit Should be chased into the walls and NOT surface mounted
D	Double 16 Amp Socket Outlet	Dedicated Outlet for the Chemical Fume Cabinet - Double socket - 16 Amp - NO Mix Loading
E	Single 16 Amp Plug Top	This cable should be that of: - 2.5mm - Three core (L, N and Earth) - Supplied by Equipment supplier
F	On/Off Switch located inside the Electrical Control Panel on the left hand side of the Chemical Fume Cabinet	The On/Off switch for the Chemical Fume Cabinet shall be clearly marked and designed for manual switching.
G	Power supply cable to the Extraction Fan form the Chemical Fume Cabinet	This cable should be that of: - **2.5mm** - Three core (L, N and Earth) - Protected e.g. Norse/Armoured/Conduit Should be chased into the walls and NOT surface mounted
H	Chemical Fume Cabinet Extraction Fan Isolator	This switch should be that of: - 2 pole - On & Off clearly marked - 220/230 V - Weather Proof Should be mounted within 1000mm from Chemical Fume Cabinet's Extraction Fan.
I	Chemical Fume Cabinet Extraction Fan	HR88S-250/1,5M Polypropylene / PVC Centrifugal fan with external direct drive motor. - Volume – 810m³/h @ 200Pa - 1400 Rpm - 230 Volt – 50 Hz - 0.12 Kw

Etching Station:



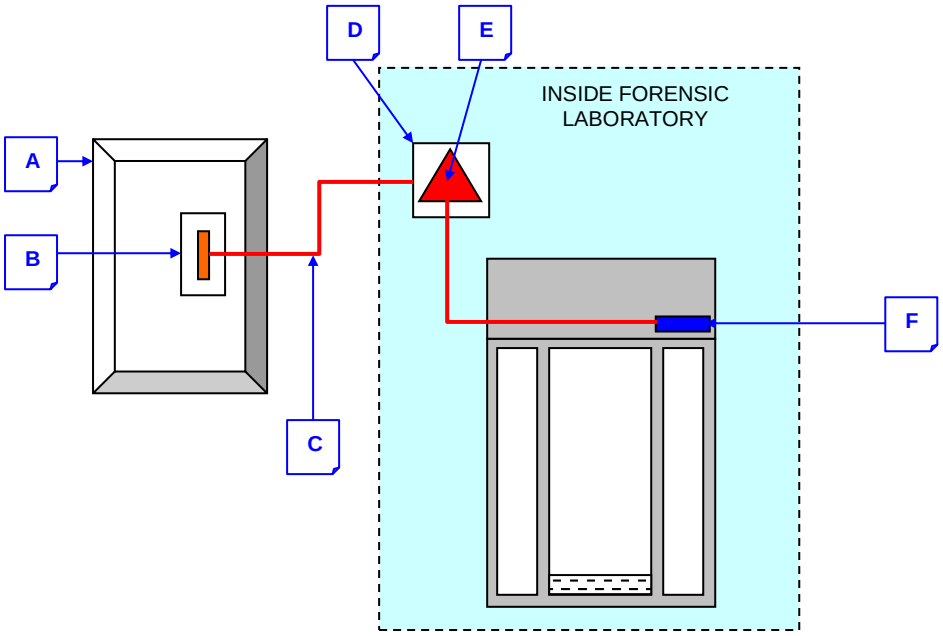
ITEM	DESRIPTION	SPECIFICATION
A	Laboratory Distribution Board	The Laboratory complex, including the *Forensic Lab, Digital Lab, Dark Room, Colour Lab, Vehicle Inspection Boot, shall* have its own DB – supplied from the MAIN building's PRIMARY DB
B	Circuit Breaker	The circuit breaker supplying power to the Etching Station Extraction System fan shall be that of **SINGLE 20 Amp**
C	Supply cable to Single 16 Amp Socket Outlet for the Etching Station Extraction System	This cable should be that of: - **2.5mm** - Single circuit feeding single 16 Amp socket outlet only - Three core (L, N and Earth) - Protected e.g. Norse/Armoured/Conduit Should be chased into the walls and NOT surface mounted
D	Double 16 Amp Socket Outlet	Dedicated Outlet for the Etching Station Extraction System - Double socket - 16 Amp - NO Mix Loading
E	Single 16 Amp Plug Top	This cable should be that of: - 2.5mm - Three core (L, N and Earth) - Supplied by Equipment supplier
F	On/Off Switch positioned against the wall at the Etching Station.	The On/Off switch for the Etching Station Extraction System shall be clearly marked and designed for manual switching. – push button
G	Power supply cable to the Extraction Fan form the Etching Station Extraction System	This cable should be that of: - **2.5mm** - Three core (L, N and Earth) - Protected e.g. Norse/Armoured/Conduit Should be chased into the walls and NOT surface mounted
H	Etching Station Extraction System - Extraction Fan Isolator	This switch should be that of: - 2 pole - On & Off clearly marked - 220/230 V - Weather Proof Should be mounted within 1000mm from Etching Station Extraction System Fan
I	Etching Station Extraction System Fan	HR63S-250/1,5M Polypropylene / PVC Centrifugal fan with external direct drive motor. - Volume – 810m³/h @ 400Pa - 1400 Rpm - 230 Volt – 50 Hz - 0.12 Kw

Powder Down-flow bench:

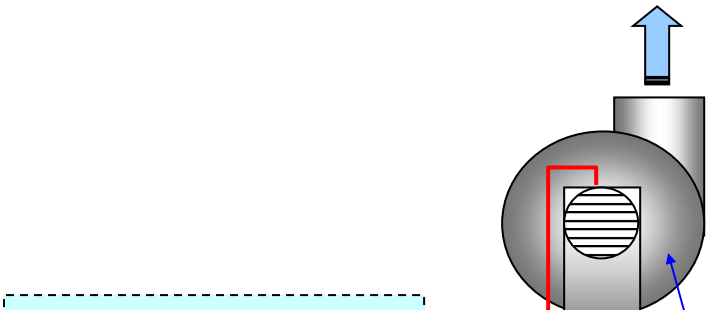


ITEM	DESRIPTION	SPECIFICATION
A	Laboratory Distribution Board	The Laboratory complex, including the *Forensic Lab, Digital Lab, Dark Room, Colour Lab, Vehicle Inspection Boot, shall* have its own DB – supplied from the MAIN building's PRIMARY DB
B	Circuit Breaker	The circuit breaker supplying power to the Powder Down Flow Bench Extraction System fan shall be that of **SINGLE 20 Amp**
C	Supply cable to Single 16 Amp Socket Outlet for the Powder Down Flow Bench Extraction System	This cable should be that of: - **2.5mm** - Single circuit feeding single 16 Amp socket outlet only - Three core (L, N and Earth) - Protected e.g. Norse/Armoured/Conduit Should be chased into the walls and NOT surface mounted
D	Double 16 Amp Socket Outlet	Dedicated Outlet for the Powder Down Flow Bench Extraction System - Double socket - 16 Amp - NO Mix Loading
E	Single 16 Amp Plug Top	This cable should be that of: - 2.5mm - Three core (L, N and Earth) - Supplied by Equipment supplier
F	On/Off Switch located inside the Electrical Control Panel on the left hand side of the Powder Down Flow Bench	The On/Off switch for the Powder Down Flow Bench System shall be clearly marked and designed for manual switching.
G	Power supply cable to the Extraction Fan form the Powder Down Flow Bench Extraction System	This cable should be that of: - **2.5mm** - Three core (L, N and Earth) - Protected e.g. Norse/Armoured/Conduit Should be chased into the walls and NOT surface mounted
H	Powder Down Flow Bench Extraction System - Extraction Fan Isolator	This switch should be that of: - 2 pole - On & Off clearly marked - 220/230 V - Weather Proof Should be mounted within 1000mm from Powder Down Flow Bench Extraction System Fan
I	Powder Down Flow Bench Extraction System Fan	HR88S-250/1,5M Polypropylene / PVC Centrifugal fan with external direct drive motor. - Volume – 900m³/h @ 200Pa - 1400 Rpm - 230 Volt – 50 Hz - 0.12 Kw

Bio-Forensic Exhibit Dryer:



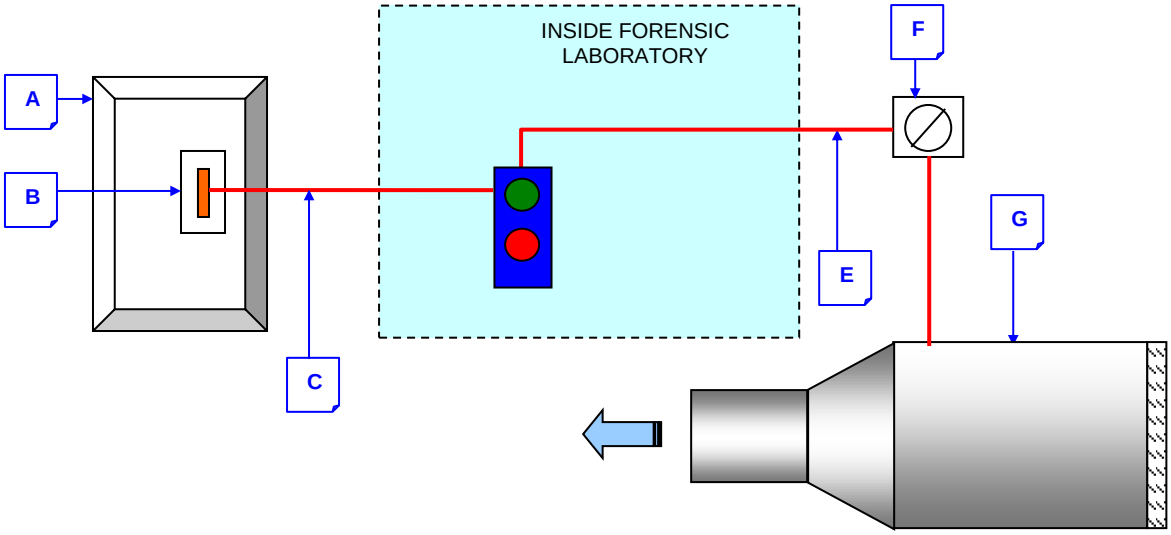
ITEM	DESRIPTION	SPECIFICATION
A	Laboratory Distribution Board	The Laboratory complex, including the *Forensic Lab, Digital Lab, Dark Room, Colour Lab, Vehicle Inspection Boot, shall* have its own DB – supplied from the MAIN building's PRIMARY DB
B	Circuit Breaker	The circuit breaker supplying power to the Bio-Forensic Evidence Dryer shall be that of **SINGLE 20 Amp**
C	Supply cable to Single 16 Amp Socket Outlet for the Bio-Forensic Evidence Dryer	This cable should be that of: - **2.5mm** - Single circuit feeding single 16 Amp socket outlet only - Three core (L, N and Earth) - Protected e.g. Norse/Armoured/Conduit Should be chased into the walls and NOT surface mounted
D	Double 16 Amp Socket Outlet	Dedicated Outlet for the Bio-Forensic Evidence Dryer - Double socket - 16 Amp - NO Mix Loading
E	Single 16 Amp Plug Top	This cable should be that of: - 2.5mm - Three core (L, N and Earth) - Supplied by Equipment supplier
F	On/Off Switch located inside the Electrical Control Panel on the right hand side of the Bio-Forensic Evidence Dryer	The On/Off switch for the Bio-Forensic Evidence Dryer System shall be clearly marked and designed for manual switching.



Laboratory Central Extraction System:

ITEM	DESRIPTION	SPECIFICATION
A	Laboratory Distribution Board	The Laboratory complex, including the *Forensic Lab, Digital Lab, Dark Room, Colour Lab, Vehicle Inspection Boot, shall* have its own DB – supplied from the MAIN building's PRIMARY DB
B	Circuit Breaker	The circuit breaker supplying power to the Central Laboratory Extraction System fan shall be that of **SINGLE 20 Amp**
C	Supply cable to On/Off Switch positioned against the wall in the Forensic Laboratory.	This cable should be that of: - **2.5mm** - Three core (L, N and Earth) - Protected e.g. Norse/Armoured/Conduit Should be chased into the walls and NOT surface mounted
D	On/Off Switch positioned against the wall in the Forensic Laboratory.	The On/Off switch for the Central Laboratory Extraction System shall be clearly marked and designed for manual switching. – push button - **20 Amp**
E	Power supply cable to the Extraction Fan form the Central Laboratory Extraction System	This cable should be that of: - **2.5mm** - Three core (L, N and Earth) - Protected e.g. Norse/Armoured/Conduit Should be chased into the walls and NOT surface mounted
F	Central Laboratory Extraction System - Extraction Fan Isolator	This switch should be that of: - 2 pole - On & Off clearly marked - 220/230 V - Weather Proof Should be mounted within 1000mm from Central Laboratory Extraction System Fan
G	Central Laboratory Extraction System Fan	HR63S-250/1,5M Polypropylene / PVC Centrifugal fan with external direct drive motor. - Volume – 900m³/h @ 380Pa - 1400 Rpm - 230 Volt – 50 Hz - 0.12 Kw

Fresh Air Supply System:



ITEM	DESRIPTION	SPECIFICATION
A	Laboratory Distribution Board	The Laboratory complex, including the *Forensic Lab, Digital Lab, Dark Room, Colour Lab, Vehicle Inspection Boot, shall* have its own DB – supplied from the MAIN building's PRIMARY DB
B	Circuit Breaker	The circuit breaker supplying power to the Central Laboratory Fresh Air supply System fan shall be that of **SINGLE 20 Amp**
C	Supply cable to On/Off Switch positioned against the wall in the Forensic Laboratory.	This cable should be that of: - **2.5mm** - Three core (L, N and Earth) - Protected e.g. Norse/Armoured/Conduit Should be chased into the walls and NOT surface mounted
D	On/Off Switch positioned against the wall in the Forensic Laboratory.	The On/Off switch for the Central Laboratory Fresh Air supply System shall be clearly marked and designed for manual switching. – push button - **20 Amp**
E	Power supply cable to the Supply Fan for the Central Laboratory Fresh Air supply System	This cable should be that of: - **2.5mm** - Three core (L, N and Earth) - Protected e.g. Norse/Armoured/Conduit Should be chased into the walls and NOT surface mounted
F	Central Laboratory Fresh Air Supply System - Fan Isolator	This switch should be that of: - 2 pole - On & Off clearly marked - 220/230 V - Weather Proof Should be mounted within 1000mm from Fan Filter unit Fan
G	Central Laboratory Fresh Air Supply System Fan Filter Unit	DDM 9/9 Centrifugal fan with internal direct drive motor. - Volume – 2200m³/h @ 380Pa - 1400 Rpm - 230 Volt – 50 Hz - 0.55 Kw

1.2.2 Plumbing:

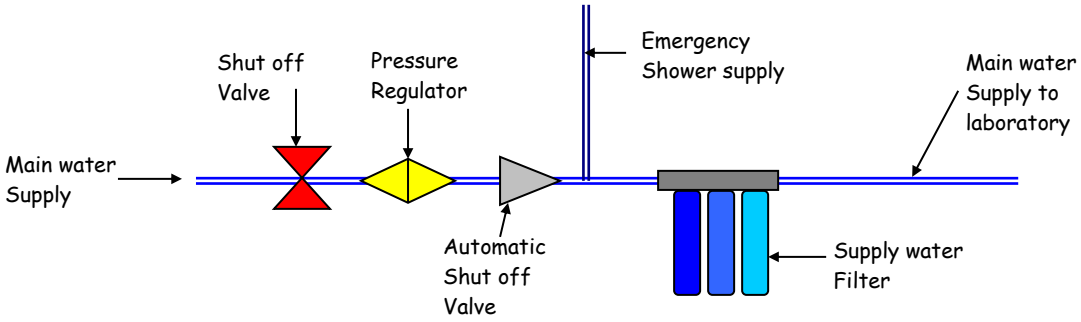
a) Supply:

i) Main Supply to LCRC Laboratory Complex

1. Supply:

The following shall be installed into the main water supply to the LCRC Laboratory Complex

a) Shut off valve
b) Pressure regulator protecting plumbing installation against HIGH pressure - 3 Bar maximum required
c) Automatic shut off valve to protect installation against pipe bursts
d) Half inch copper pipe and fittings – SABS approved and marked
e) Installed according to the relevant SABS standard
f) Water filter in main line after Emergency shower connection – Water Filter shall have:
   i. ½ inch inlet and outlet
   ii. Minimum 3 Bar pressure retention



2. Termination:

All copper supply pipes shall terminate inside the laboratories with ½ inch Bollow-Stop ball valves

b) Waste:

1. Waste:

i) uPVC drain pipes (blue) shall be used.
ii) uPVC bends and joints shall be used.
iii) U-traps and waste fittings shall be supplied as part of the equipment
iv) uPVC Drain Pipes shall have a minimum fall of 5 °
v) Acid and Solvent waste shall NOT be disposed off into the municipal waste
vi) All waste pipes to be painted the same colour as walls –
   1. Make: Plascon
   2. Type: Acrylic – fully washable
   3. Colour: Broken White
   4. Code: EPL 314

1.2.4 Security:

a) Doors:

i) Trellidor security gates shall be installed at the Entrance to the Forensic Laboratory.

ii) Magnetic Lock Access Control complete with battery backup, shall be installed as access to the Forensic Laboratory Main Door/Entrance

iii) One (1) Release button shall be installed next to the Forensic Laboratory Main Door/Entrance on the inside of the Laboratory.

iv) One (1) Master key, complete with Programming Instructions shall be supplied to the client at handover

v) Five (5) Access keys shall be supplied to the client at handover

vi) Forensic Laboratory Main /Entrance Door shall have the “Cylinder” type key lock complete with five (5) keys to be supplied to the client at handover

vii) External Doors – Should there be additional doors in the Forensic Laboratory;

1. These doors shall be secured with the Trellidor security gate complete with five (5) keys to be supplied to the client at handover.
2. The solid wood door shall be fitted with “Cylinder” type lock complete with five (5) keys to be supplied to the client at handover.

b) Windows:

i) All Windows shall be fitted with Burglar Proofing. This Burglar Proofing shall be:

a. High security burglar bars – minimum 12mm x 12 mm square solid steel rod
b. Welded at 100 mm spacing vertically
c. Secured/welded horizontally every 200mm.

ii) This burglar proofing shall be secured on the outside of the windows by means of a minimum of 8 x M8 Rawl bolts

iii) Post installation of the Burglar guards, the M8 Rawl bolts’ heads shall be welded so removals of these Rawl Bolts are impossible.

1.2.5 Alarm Systems:

a) Access Control:

i) Forensic Laboratory:

1. The Access control for the Forensic Laboratory shall be as described in 1.2.4 (a) here above

b) Smoke detector:

i) Forensic Laboratory:

1. Two (2) Smoke detectors shall be installed in the Forensic Laboratory.
2. Smoke detectors shall be installed in the immediate proximity of the Solvent Storage Cabinets
3. Smoke detector Alarm shall sound outside of the Forensic Laboratory e.g. passage

1.2.6 Finishes:

a) Windows:

Where windows are present in the Forensic Laboratory:

i) Windows shall be fitted with Block-out blinds.
ii) Block-out blinds shall be that of “Grade 6” material
iii) Colour and design shall be approved by SAPS.

b) Fittings:

i) Towel Rails:

1. Towel Rails shall be installed against the wall at all sinks e.g. Double sink in Forensic Laboratory, Triple Bowl sink in Dark Room.
2. Design and Colour of these towel rails shall be approved by SAPS

ii) Soap Dispensers:

1. Soap Dispensers shall be installed against the wall at all sinks e.g. Double sink in Forensic Laboratory, Triple Bowl sink in Dark Room.
2. Soap Dispensers shall be that of Serra ® Lee Type
3. One (1) Litre Liquid Soap shall be supplied for the installation.
4. Dispensing of the One (1) Litre Liquid Soap into the Soap Dispensers shall be the responsibility of the SAPS

iii) First aid Kit:

1. First Aid Kit shall be installed against a wall, where clearly visible, in the Forensic Laboratory.
2. First Aid Kit shall carry the appropriate marking

3. First Aid Kit shall contain the following medical items:

4. First Aid Kit shall contain an Inventory Control Sheet when supplied.

NO:	ITEM	SIZE	QTY
1	BURNSHEILD MULTIPACK DRESSINGS	600mm x 400mm	2
2	BURNSHEILD MULTIPACK DRESSINGS	200mm x 200mm	2
3	BURNSHEILD MULTIPACK DRESSINGS	100mm x 100mm	2
4	NECK BRACE		
5	BANDAGES – FIRST AID DRESS NO: 2	50mm x 75mm	2
6	BANDAGES – FIRST AID DRESS NO: 3	75mm x 100mm	6
7	BANDAGES – FIRST AID DRESS NO: 5	150mm x 200mm	5
8	BANDAGES - PROFORM STRETCH CONFORM	75mm	6
9	BANDAGES - PROFORM STRETCH CONFORM	100mm	6
10	PRESSURE DRESSING		1
11	SPLINTS – MASONITE	280mm	2
12	ARM SLING		4
13	PROGAUZE STERILE COTTON SWABS - 5PCS	75mm x 75mm	2
14	PROGAUZE NON STERILE COTTON SWABS - 5PCS	75mm x 75mm	1
15	SINGLE-EYE WASH CONTAINER		1
16	SINGLE-EYE BANDAGE		2
17	SINGLE-EYE PATCH		1
18	COTTON WOOL ROLL	100g	1
19	FRIARS BALSAM BP - BOTTLE	20ml	1
20	GENTIAN VIOLET 1% - BOTTLE	20ml	1
21	CENTRIKLOR ANTI SEPTIC CREAM - TUBE	30g	1
22	SAFUR BLEU EYE DROPS - BOTTLE	5ml	1
23	ENO ANTACID – PACKET	5g	5
24	H-PLASTERS		5
25	STRIP PLASTER – FOLDED		1
26	"BAND-AID" TYPE PLASTER		20
27	BANDAGE PLASTER PER ROLL		1
28	PAINAMOL PAIN TABLETS - BOX OF 20	500mg	1
29	CETRIMIDE 1% WOUND CLEANER - BOTTLE	100ml	1
30	MEDAC INSTANT COLD PACK		1
31	LATEX GLOVES PER PAIR		4
32	PLASTER ROLL		1
33	RESPAID MOUTH PIECE		2
34	SAFETY PINS	SMALL	4
35	SAFETY PINS	MEDIUM	4
36	SAFETY PINS	LARGE	4
37	BANDAGE SCISSORS		1
38	TWEEZERS		1

Safety Signs as per schedule

4. Safety Signs shall be supplied according to the following Schedule:

NO.	ITEM		QUANTITIES					
			F/Lab	D/Room	C/Lab	D/Lab	V/Insp	REQ.
1	**Safety Sign - Biological Hazard @**							**0**
	a. Evidence Dryer		1					**1**
	b. Fridge		1					**1**
	c. Entrance		1					**1**
2	**No Entry**							**0**
	a. Entrance		1	1	1	1	1	**5**
3	**No Smoking**							**0**
	a. Entrance		1	1	1	1	1	**5**
4	**Safety Coat / jacket**							**0**
	a. Entrance		1	1	1		1	**4**
	b. Etching Station		1					**1**
	c. Down flow Bench		1					**1**
	d. Chemical Fume Extraction Cabinet		1					**1**
	e. Cyanoacrylate Fuming Chamber		1					**1**
5	**Keep Clean**							**0**
	a. Entrance		1	1	1	1	1	**5**
	b. Dustbin		1	1	1	1	1	**5**
6	**Acid warning**							**0**

NO.	ITEM		QUANTITIES					
			F/Lab	D/Room	C/Lab	D/Lab	V/Insp	REQ.
	a. 500 mm wide Acid storage Cabinet		1					**1**
	b. 1000 mm wide Acid Storage Cabinet		1					**1**
	c. Etching Station		1					**1**
7	**Flammable**							**0**
	a. 500 mm wide Solvent storage Cabinet		1					**1**
	b. 1000 mm wide Solvent Storage Cabinet		1					**1**
8	**Wear Goggles**							**0**
	a. Chemical Fume Extraction Cabinet		1					**1**
	b. Etching Station		1					**1**
9	**Wear Gloves**							**0**
	a. Chemical Fume Extraction Cabinet		1					**1**
	b. Powder Down flow Bench		1					**1**
	c. Etching station		1					**1**
	e. Photo Development Sink			1				**1**
	f. Bio-forensic Evidence Dryer		1					**1**
	g. Cyanoacrylate Fuming Chamber		1					**1**
	h. Entrance			1	1		1	**3**
10	**Wear Safety shoes**							**0**
	a. Entrance		1					**1**
11	**Wear Dust Mask**							**0**
	a. Powder Down flow Bench		1					**1**
	b. Entrance						1	**1**
12	**Extraction**							**0**
	a. Chemical Fume Extraction Cabinet		1					**1**
	b. Powder Down flow Bench		1					**1**
	c. Bio-forensic Evidence Dryer		1					**1**
	d. Etching Station		1					**1**
	e. Entrance			1	1		1	**3**
	f. Cyanoacrylate Fuming Chamber		1					**1**
13	**First Aid**							**0**
	a. At First aid Box		1					**1**
14	**Exit**							**0**
	a. Exits		1	1	1	1	1	**5**
15	**General warning**							**0**
	a. Chemical waste storage cupboard		1	1	1		1	**4**
	b. 500 mm wide Acid storage Cabinet		1	1	1			**3**
	c. 1000 mm wide Acid Storage Cabinet		1	1	1			**3**
	d. 500 mm wide Solvent storage Cabinet		1	1				**2**
	e. 1000 mm wide Solvent Storage Cabinet		1	1				**2**
	f. Entrance						1	**1**
16	**Filtered Treated Water**							**0**
	a. Water Supply		1					**1**
17	**Fire Extinguisher arrow**							**0**
	a. Fire Extinguishers - 4.5 Kg		1	1	1	1	1	**5**
	b. Fire Extinguishers - 9 Kg		1					**1**
18	**Fire Extinguisher**							**0**
	a. Fire Extinguishers - 4.5 Kg		1	1	1	1	1	**5**
	b. Fire Extinguishers - 9 Kg		1					**1**
19	**No Cell Phones**							**0**

NO.	ITEM		QUANTITIES					
			F/Lab	D/Room	C/Lab	D/Lab	V/Insp	REQ.
	a. Entrance		1					**1**
20	**Laser Warning (zw12)**							**0**
	a. DCS - 3 (Forensic Light Source)		1					**1**

5. Safety Signs shall be supplied with double sides (mirror type) glue tape.
6. Safety Signs shall be installed as per the schedule 1.2.6(b)(iv) 1. here above.

iv) Dust bin:

1. One (1) 50 Litre “Addis” Type, Swing Lid Plastic Dustbin shall be supplied per laboratory.
2. Should the allowance in the Laboratory Furniture be made for a Cupboard fitted Dustbin, 1.2.6 (b) (v) 1. here above can be ignored.

v) Fire Extinguishers:

1. One (1) 4.5 Kg Dry Powder Fire Extinguisher shall be supplied and installed in every Laboratory e.g.
   One (1) in Forensic Laboratory,
   One (1) in Digital Laboratory,
   One (1) in Mini Colour Laboratory etc.

2. One (1) 9 Kg Dry Powder Fire Extinguisher shall be supplied and installed in the passage/area, wall mounted, outside of the Forensic Laboratory

vi) Chairs:

Laboratory chairs shall be supplied as per the specific Laboratory requirements here below.

vii) Personal Safety Lockers:

Personal Safety Lockers shall be supplied according to the following:

1. Material:
   a) Steel or
   b) Melamine
2. Colour:
   a) Steel – Siemens Grey Epoxy Painted
   b) Melamine – Same as Laboratory Furniture – White
3. Specification:
   a) Size:
      i. 1800 mm -Height
      ii. 300 mm - Width

iii. 450 mm - Depth

b) Design:
   i. One Door complete with Ventilation Openings
   ii. One Shelf
   iii. Hanging Hook/Rail
   iv. Free Standing

4. Quantity per Laboratory shall be supplied as per the specific laboratory requirements here below:

viii) Kim Roll:

1. Free Standing Kim Roll Stand complete with Kim Roll shall be supplied in the Forensic Laboratory.
2. Size of the Kim Roll shall not be less than 200mm Wide

ix) Biological waste: containers/bins

1. Biological Waste containers complete with waste instructions shall be supplied in the Forensic Laboratory.
2. Size of the Biological Waste containers shall be approved by the SAPS

1.3 EXTRACTION:

1.3.1 The Extraction Systems for the specialized safety equipment and Laboratories shall be as follows:

1. Each extraction item shall have it's own dedicated extraction fan and ducting:
2. Items that require their own extraction systems are:
   a) Cyanoacrylate Fuming Chamber
   b) Chemical Fuming Cabinet
   c) Etching Station Flexible Extraction arm
   d) Powder Down flow Bench
   e) Solvent Storage cabinets
   f) Acid Storage cabinets
3. Laboratories that require Central extraction are:
   a) Dark Room
   b) Mini Colour Lab
   c) Chemical Storage Area/Room
   d) Vehicle Inspection Booth

1.3.2 Extraction component specification:

The components used for the manufacture and installation of the various extraction systems shall comply with the following:

a) Ducting:

i) Specification:

1. Shall be that of a minimum of Class 4 uPVC

ii) Installation:

1. All Joints shall be heat welded
2. Bends shall be that of “Quick Lobster” type bends.
3. Horizontal Duct Runs shall be secured at least every two (2) meters.
4. Vertical Duct Runs shall be secured at least every three (3) meters.

b) Dampers:

i) Specification:

1. Shall be that of a minimum of Class 4 uPVC

ii) Installation:

1. All Joints shall be heat welded
2. Connection to Ducting shall be by continuous heat welding.

c) Bends:

i) Specification:

1. Shall be that of a minimum of Class 4 uPVC

ii) Installation:

1. All Joints shall be heat welded
2. Bends shall be that of “Quick Lobster” type bends.
3. Connection to Ducting shall be by continuous heat welding.

d) Transitions:

i) Specification:

1. Shall be that of a minimum of Class 4 uPVC

ii) Installation:

1. All Joints shall be heat welded
2. Connection to Ducting shall be by continuous heat welding.

e) Joints:

ii) Specification:

1. Shall be that of a minimum of Class 4 uPVC

iii) Installation:

1. All Joints shall be heat welded
2. Connection of Ducting shall be by continuous heat welding.

f) Sound Attenuator:

i) Specification

1. Shall be that of a minimum of Class 4 uPVC

iv) Installation:

1. All Joints shall be heat welded
2. Connection of Ducting shall be by continuous heat welding.
3. Shall be installed 1000mm in front of the intake of the extraction fan
4. Shall be manufactured for 200 mm Ø

g) Fan

i) Specification:

1. Shall be that of PVC or Polypropylene (external casing, internal and impeller)
2. Shall be weather, acid and spark resistant.
3. Shall be Centrifugal type complete with direct drive induction Motor
4. Shall have at least 1.2 mm gauge galvanised “foot”
5. Shall be 230 V 50 Hz - Single Phase
6. Duty shall be according to the extraction requirements of the specific extraction safety equipment.
7. Shall be capable of 24-hour operation.
8. Mains On/Off switch shall be supplied as part of the equipment and supplied by the equipment supplier.

2. Mounting
    1. Shall be secured to a plinth, casted at ground level by means of no less that four (4) M8 Rawl Bolts
    2. All fans shall be secured on Anti Vibration Mountings.
    3. If there are space constraints and the fans need to be installed against a perimeter wall – 650 mm Cab Struts shall be used and secured into the wall with four (4) M8 Rawl Bolts
    4. Shall be connected to the extraction equipment as specified in point 1.3 here above.
    5. Exhaust stack shall terminate not less than 1m above roof penetration.

1.4 CHEMICAL FILTRATION:

1.4.1 In certain installations of the Extraction Systems for the specialized safety equipment, the exhaust ducting needs to be chemical filtered.

The need for Chemical Filtration shall be determined by the SAPS and the building owner.

1. Each extraction system shall have it's own dedicated Chemical Filtration System that shall be installed prior to the extraction fan.
2. Items that require their own Chemical Filtration Systems are:
    a) Cyanoacrylate Fuming Chamber
    b) Chemical Fuming Cabinet
    c) Etching Station Flexible Extraction arm
    d) Powder Down flow Bench
    e) Solvent Storage cabinets
    f) Acid Storage cabinets
3. Laboratories that require Chemical filtration on the Central Extraction are:
    e) Dark Room
    f) Mini Colour Lab
    g) Chemical Storage Area/Room

1.4.2 Chemical Filtration component specification:

The components used for the manufacture and installation of the Chemical Filtration Systems shall comply with the following:

a) Chemical Filter Unit:

a) The Housing shall be that of – 700 x 700 x 650 mm
b) Material shall be that of 1.2 mm Cold Rolled Mild Steel
c) Finish shall be that of Epoxy Painted – Colour Structured White
d) The Side access panel shall allow for maintenance an access to Chemical filters
e) The side access panel shall have quick release clips that seal air tight when closed.
f) 13 mm Spanners shall be supplied with the Filter housing of the release (maintenance) of Chemical filters for replacement.
g) Pressure over filter shall be monitored by a Minihelic Pressure Gauge mounted on the Fan Filter Unit and clearly visible to the client.
h) Final Pressure / change-out of filter shall be clearly marked on the Minihelic Pressure Gauge.
i) Unit shall be capable of 24-hour operation.
j) Filter
    1. Size shall be that of 305 x 610 x 292
    2. Type - PM12 /Activates Carbon
    3. Efficiency - 99%
    4. Volume - 800m³/h each
    5. Pressure - 100 Pa static at 1.5 m/s
k) Inlet – Square to Round
    1. Size shall be that of 700 x 700 to 200 Ø
    2. Material- Cold Roller 1.2 mm Mild Steel

3. Finish - Epoxy Painted Colour – Structured White

l) Outlet – Square to Round

1. Size shall be that of 700 x 700 to 200 Ø
2. Material- Cold Roller 1.2 mm Mild Steel
3. Finish - Epoxy Painted Colour – Structured White

b) Mounting

1. Shall be secured to a plinth, casted at ground level by means of no less that four (4) M8 Rawl Bolts
2. Shall be secured on Anti Vibration Mountings.
3. If there are space constraints and the Chemical Filter Unit needs to be installed against a perimeter wall – 650 mm Cab Struts shall be used and secured into the wall with four (4) M8 Rawl Bolts

r) Connection to Ducting:

i) Specification:

1. Chemical Filter Housing shall connect to uPVC ducting and Fan by means of PVC Flexible Connectors.

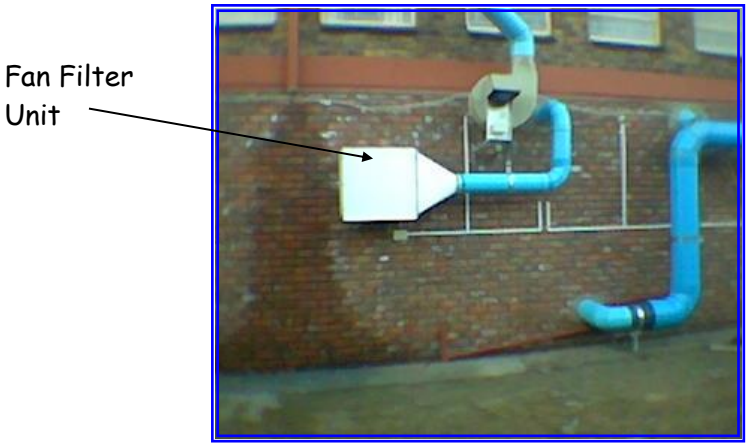
1.5 FRESH AIR SUPPLY:

Filtered Fresh Air supply shall be supplied to the following Laboratories:

- FORENSIC LABORATORY
- DARK ROOM
- DIGITAL PHOTOGRAPHIC ROOM *
- MINI COLOUR LAB

(* only applicable should there be no windows that can be opened)

1.5.1 Fan Filter Unit:



i. The Housing shall be that of – 700 x 700 x 650
ii. Material shall be that of 1.2 mm Cold Rolled Mild Steel
iii. Finish shall be that of Epoxy Painted – Colour Structured White
iv. The Side access panel shall allow for maintenance an access to filters
v. The side access panel shall have quick release clips that seal air tight when closed.
vi. 13 mm Spanners shall be supplied with the Filter housing of the release (maintenance) of filters for cleaning.
vii. Pressure over filter shall be monitored by a Minihelic Pressure Gauge mounted on the Fan Filter Unit and clearly visible to the client.
viii. Final Pressure / change-out of filter shall be clearly marked on the Minihelic Pressure Gauge.

ix. Fan

1. Shall be that of Centrifugal type
2. Shall be 230 V 50 Hz - Single Phase
4. kW - 0.55
5. Rpm - 1400
6. Db - 64.3
7. Volume - 2200m³/h (0.61m³/s)
8. ΔP - 380Pa
9. Shall be capable of 24-hour operation.
10. Speed shall be controlled by a fan speed controller where the control (POT) shall be mounted inside the Forensic Laboratory
11. Mains On/Off switch shall be supplied inside the Forensic Laboratory
12. Mains On/Off switch shall be mounted at 1.5m above finished Floor Height

x. Filter

1. Size shall be that of 595 x 595 x 48
2. Type - Washable Panel
3. Efficiency - 30% Ashrae 52-76
4. Arrestance - 95%
5. Volume - 3400m³/h (0.944m³/s)
6. Init. Pressure - 38 Pa
7. Final Pressure - 250 Pa

xi. Inlet – Whether Louvre

1. Size shall be that of 700 x 700
2. Type - Trox
3. Material- Aluminium anodised

xii. Outlet

1. Size shall be that of 700 x 700 to 200 Ø
2. Material- Cold Roller 1.2 mm Mild Steel
3. Finish - Epoxy Painted Colour – Structured White

xiii. Fan Speed Control

1. Fan speed controller shall be mounted within the Fan Filter Unit at the fan Position.
2. Fan Speed Controller (POT) shall be mounted inside the Forensic Laboratory

xiv. Isolator

1. 2 Pole
2. On/Off Clearly Marked
3. 220/230V
4. Should be mounted within 1000mm of Fresh Air Supply Unit

1.5.2 Ducting:

i) Specification:

1. Shall be that of a minimum of Class 4 uPVC
2. Shall be that of 200 mm Ø

ii) Installation:

i) All Joints shall be heat welded
ii) Bends shall be that of “Quick Lobster” type bends.
iii) Horizontal Duct Runs shall be secured at least every two (2) meters.
iv) Vertical Duct Runs shall be secured at least every three (3) meters.

1.5.3 Dampers:

i) Specification:

1. Shall be that of a minimum of Class 4 uPVC
2. Shall be that of 200 mm Ø

ii) Installation:

1. All Joints shall be heat welded

2. Connection to Ducting shall be by continuous heat welding.

1.5.4 Bends:

i) Specification:
1. Shall be that of a minimum of Class 4 uPVC
2. Shall be that of 200 mm Ø

ii) Installation:
1. All Joints shall be heat welded
2. Bends shall be that of "Quick Lobster" type bends.
3. Connection to Ducting shall be by continuous heat welding.

1.5.5 Joints:

i) Specification:
1. Shall be that of a minimum of Class 4 uPVC

ii) Installation:
1. All Joints shall be heat welded
2. Connection of Ducting shall be by continuous heat welding.

1.5.6 Louvers:

i) Specification:
1. Size shall be that of 300 x 300
2. Type - Trox
3. Material- Aluminium anodised

ii) Installation:
1. Ceiling:
   - Shall be Flush mounted against bottom of ceiling.
   - Connection to Ducting shall be done inside of ceiling

2. Wall:
   - Shall be attached to a 300 x 300 PVC plenum box.
   - Connection to Ducting shall be done through PVC Spigot

1.6 AIR-CONDITIONING:

Air-Conditioning shall be supplied in the following Laboratories:

- FORENSIC LABORATORY
- DARK ROOM
- DIGITAL PHOTOGRAPHIC ROOM
- MINI COLOUR LAB
- CHEMICAL STORE
- DCS-3 CAPTURING ROOM

1.6.1 The Air-conditioning units' duty shall be selected as per the requirements from the specific laboratory – Special care must be taken with regards to the Air being extracted as well as the Fresh Air being supplied in the laboratory.

1.6.2 Air-conditioning shall be approved, prior to installation, by the SAPS

1.6.3 Shall be the Split Unit type – recirculation

1.6.4 The Air-conditioning internal unit shall be mounted in close proximity to the fresh air supply louver.

1.6.5 The condensing units shall be mounted outside of the Laboratories, in close proximity to the extraction Fans.

1.7 LABORATORY EQUIPMENT:

All Laboratory equipment supplied shall have an 18 month unconditional warranty and shall excluding six (6) monthly filter inspections and testing as well as the replacement of such filters when deemed necessary.

The Warranty expiry date and a service schedule shall accompany each piece of equipment at installation and shall be verified at handover.

The Equipment shall be specified in the various laboratories as listed below:

i) Forensic Laboratory
ii) Dark Room
iii) Mini Colour Lab
iv) Digital Development Lab

v) DCS 3 Laboratory
vi) Store Room for Photographic Material
vii) Chemical Storage Area
viii) Locker Room
ix) Vehicle Investigation Booth

1.8 LABORATORY FURNITURE:

a) The Larger Laboratories shall have a Central Island Work Station.
b) All storage cabinets shall be lockable
c) Two (2) keys shall be supplied per Storage cabinet
d) The furniture in the DCS-3 Laboratory shall conform to the same specification as the Digital Laboratory
e) All Work surfaces shall be:
   i. Continuous moulded, seamless
   ii. Acid & Solvent resistant epoxy resin work surfaces
   iii. "Platinum Tempest" colour design
   iv. "Bull nose" post-form front and sides
   v. Splash back at least 80 mm high and the length of the work surfaces.
f) Sinks shall be moulded into the work surfaces so that the sink forms a joint free integral part of the work surface.
g) Furniture Frames shall be that of sectional modular type that can be assembled on site.
h) Furniture Frames shall be Colour Black Epoxy Painted
i) Furniture Frames shall be manufactured from 1.2 mm cold rolled mild steel square tubing.
j) All Furniture Frames shall be supplied with manual adjustable levelling feet.
k) Every Forensic Laboratory shall have at least one (1) Dustbin or Dustbin Unit – 500mm wide.
l) All Mini Colour Labs' paper and chemical storage cabinets shall be assessed according to the size of the Laboratory.
m) All Chemical and Solvent Storage Cabinets shall be equipped with an independent chemical filtration system mounted at the back of the Cupboard.

1.9 FILTERS:

TECHNICAL SPECIFICATION

HE EXTERIOR LIGHTING SYSTEMS

CONTENTS

HE 01 SCOPE

HE 01.01 This specification comprises all aspects regarding the maintenance of external lighting systems. External lighting comprises:

i) Area lighting
ii) Security lighting along perimeter fences
iii) Street lighting

HE 01.02 This specification shall form an integral part of the maintenance and servicing contract document and shall be read in conjunction with Part C, the Additional Specifications included with this document.

HE 02 STANDARD SPECIFICATIONS, REGULATIONS AND CODES

HE 02.01 The latest edition, including all amendments up to date of tender of the following specifications, publication and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof.

HE 02.02 SANS Specifications

02.02.01	SANS 10400	National Building Regulation
02.02.02	SANS 10142	Wiring code
02.02.03	SANS 10225	Lighting masts
02.02.04	SANS 1277	Read lighting luminaires
02.02.05	SANS 1088	Spigot entries
02.02.06	SANS 1749	Glass polyester poles
02.02.07	SANS 1250	Capacitors, ballasts & lamps
02.02.08	SANS 1279	Floodlight luminaires
02.02.09	SANS 1777	Daylight switches
02.02.10	SANS 763	Galvanised coatings
02.02.11	SANS 1266	Discharge lamps
02.02.12	ARP 035	Streetlighting maintenance

HE 02.03 **Department of Public Works Specification PW 774**

HE 02.04 **Occupational Health and Safety Act of 1993: Construction Regulations, 2003 as promulgated in Government Gazette No 25207 and Regulation Gazette No 7721 of 18 July 2003.**

HE 02.05 **Manufacturer's specifications and installation instructions**

HE 02.06 **Additional requirements**

Equipment and material supplied and installed shall be new and unused.
Luminaires and control gear shall bear the SANS stamp. The Contractor shall ensure that all safety regulations and measures are applied and enforced during repair and maintenance work on cabling, wiring, luminaires, lighting poles and high masts.

HE 03 OPERATING AND MAINTENANCE MANUALS

HE 03.01 The Contractor shall be responsible for the compilation of a complete set of Operating-and-Maintenance manuals.

This shall be done in accordance with the Additional Specification SB – Operating and Maintenance manuals.

All information shall be recorded and reproduced in electronic format as well as supplying the Engineer with seven sets of hard copies.

HE 03.02 Over and above what is specified in the Additional Specification – SB Operating and Maintenance manuals, the Operating and Maintenance Manual to be compiled shall be structured and shall at least include the following:

03.02.01 Description of Installation

Complete system description of the lighting system. This shall be done for each lighting installation individually. The system description shall contain detailed information regarding the supply configuration (Distribution board, cabling, distribution kiosks, pole mounted distribution board), the switching arrangement (timers, photocells, override facilities) and the lighting (luminaire detail, lamp detail) as well as the earthing and lightning protection arrangement.

03.02.02 Commissioning Data

Complete commissioning, test and inspection data of lighting system.

This shall be done for each lighting installation individually. The commissioning data will comprise start-up and running current measurements at each termination point e.g. distribution board, kiosk and mast. Full data on lamps fitted with installation dates.

03.02.03 Operating data

a) Safety precautions to be implemented.
b) Operation of lighting systems; automatic, manual and bypass switching.

03.02.04 Maintenance instructions

a) Projected frequency of lamp replacement per lighting system.
b) Procedure to verify operation of photocell – controlled circuits.
c) Procedure to verify operation of timer – controlled circuits.
d) Trouble shooting diagram.
e) Luminaire details, including manufacturers brochures / pamphlets, order number, list of components and lamp specification.

f) Schedule of serviceable components per lighting system. These schedules shall include lamps, starters, ignitors, ballasts, lenses, etc.

HE 04 TESTS AND INSPECTIONS PRIOR TO PRACTICAL COMPLETION OF REPAIR WORK

HE 04.01 It is the responsibility of the Contractor to provide all labour, accessories and properly calibrated and certified measuring instruments necessary to record the following parameters:

04.01.01 Phase voltages
04.01.02 Current per phase
04.01.03 Illumination levels in lux
04.01.04 Insulation testing at 500V
04.01.05 Earthing resistance testing by means of wheatstone bridge instrument

The Contractor is responsible for the arrangement of such tests. He shall give at least 72 hours notice to the Engineer prior to the test date.

HE 05 LOGGING AND RECORDING PROCEDURES

HE 05.01 The Contractor shall as part of this Contract institute a Recording system as part of his Maintenance Control Plan as defined in the Additional Specification SA – General Maintenance. This shall consist of a Record book which shall be utilised to log and record all faults, system checks, breakdowns, maintenance visits, inspections etc.

HE 05.02 The logbook shall be stored in a safe place inside the prison maintenance supervisor's office and shall only be utilised by the Contractor and Engineer. A copy of the monthly entries and recordings into this logbook shall be submitted by the Contractor together with his monthly report to the Engineer.

This logbook shall be structured to at least include the following:

05.02.01 Monthly lamp inspection and maintenance actions.
05.02.02 Bi-annual inspection and testing of lighting systems.
05.02.03 Annual earthing test report.
05.02.04 Breakdown / call out reports.

HE 06 QUALITY ASSURANCE SYSTEM

HE 06.01 Following formal approval of his Quality Assurance system by the Engineer, the Contractor shall implement the approved QA system.

HE 06.02 Records of this QA system shall be kept throughout the duration of the contract and shall be submitted to the Engineer as required by the Department.

HE 07 RE-COMMISSIONING OF INSTALLATION

HE 07.01 On practical completion of the repair work and lamp replacement, the lighting installations shall be put into operation.

HE 07.02 Lighting installations shall be energised for a minimum continuous period of 96 hours immediately prior to the Engineer's Practical Completion inspection to verify lamp stability and reliability of power reticulation

HE 08 REPAIR WORK TO EXTERIOR LIGHTING INSTALLATIONS

HE 08.01 The various lighting systems shall be repaired as part of installation H during the first phase of the repair and maintenance contract

HE 08.02 The scope of the repair work shall include, but shall not be limited to the activities listed below.

HE 08.03 The Contractor shall record the repair actions in tabular format before the Contractor's responsibility for maintenance commences.

HE 08.04 Repair work shall be executed within the approved period for repairs.

HE 08.05 New equipment and material shall be supplied with a written guarantee confirming a defects liability period of 12 months from date of practical completion. These guarantees shall be furnished in favour of the Department of Public Works.

HE 08.06 The following measurement and payment items shall apply for repair work

Item		Unit
HE 08.06(a)	**Excavate in all materials for trenches, backfill, compact and dispose of surplus material**	m^3

This rate shall apply to all the excavations.

The unit of measurement shall be the cubic metre of material excavated in trenches, classified according to the depth and width specified listed. The width classification shall be in accordance with the authorised dimensions and the depth classification in accordance with the total depth of the trench and not with the depth range in which the material is situated before excavation. The depth of excavation shall be measured to the underside of the bedding.

The tendered rate shall include full compensation for clearing and grubbing the trench areas and the temporary removal of improvements from the line of the trench, for excavating the trench, preparing the bottom of the trench, separating material unsuitable for backfill, keeping the excavations safe, dealing with any surface or subsurface water, measuring, classification and keeping of all records and for separating topsoil and selected backfill material where necessary.

The rate shall furthermore cover the costs of installing the 150mm sand bed and 200mm sand cover, backfilling, compacting and disposing of the surplus material.

Item		Unit
HE 08.06(b)	**Extra over item HE 08.06(a) for excavating in hard material**	**m^3**

The unit of measurement shall be the cubic metre of material excavated and classified as hard, in accordance with the classification set out hereunder.

The tendered rate shall be paid over and above the rate tendered for excavation in respect of items HD 08.06(a) in full compensation for the additional cost of excavating in hard material instead of soft.

The tendered rate shall include full compensation for any overbreak as well as the additional backfilling required, reinstating the trench bottom, and for any other incidentals resulting from overbreak.

The materials excavated shall be classified as follows for payment purposes:
Hard material:

Material which cannot be excavated efficiently except with the use of pneumatic tools, blasting or wedging and splitting, and shall include boulders exceeding 0,15 m3 in volume.

Soft material:
All material not classified as hard material.
Notwithstanding the above classification, all material excavated from previously constructed fills, embankments, pavement layers and from above existing services shall be classified as soft material.

The decision of the Engineer as to the classification of the material shall be final and binding and any objection as to the classification shall be made before the excavation has been backfilled.

	Item	Unit
HE 08.06(c)	**Extra over item 3.10.1.1 for excavating by hand in all materials**	m^3

The unit of measurement shall be the cubic metre of trench material excavated by means of hand tools as instructed or authorised in writing by the Engineer where the use of conventional excavating equipment is either impractical or likely to cause damage to services, trees or property or where the electrical Contractor has to excavate by hand where he cannot excavate by machine.

The volumes of the trench excavation will be computed from the length and the depth to the bottom of the specified bedding layer and the minimum base widths specified in the drawings. The rate shall cover the cost of complying with the safety and protection requirements specified except where particular items are scheduled to cover particular costs for the excavation.

The tendered rate shall be paid extra over the rates tendered for item HE09.06(a).1in full compensation for the additional expense of excavating by means of hand labour instead of conventional trenching equipment.

	Item	Unit
HE 08.06(d)	**Extra over item HD09.06(a) for using backfill material obtained from sources provided by the Contractor**	m^3

The unit of measurement shall be the cubic metre of imported backfill material.

Item HD09.06(d) above will not be measured for payment unless importation has been ordered in writing. The volume will be computed from the trench width and the depth from ground level to the top of the sand bed cover as shown on the tender drawings. The rate for material from designated borrow pits shall cover the cost of excavation and selection of suitable material, the moving of the material to the backfilling site, and the disposal of the material that becomes surplus as a result of the importation, all within 0,5 km.

The tendered rate for item HE09.06(d) paid extra over item HE09.06(a) shall cover the cost of the acquisition of the material and of the disposal of the surplus material resulting from the importation together with all the costs of transporting the material to the site regardless of distance.

	Item	Unit
HE 08.06(e)	**Supply and Install Cable Sleeves**	m

The unit of measurement shall be the linear length in meter of cable sleeves supplied and installed.

The tendered rate shall include full compensation for the supply, delivery, handling and installing the cable sleeves including all the required couplings, steel draw wires and plugs.

	Item	Unit
HE 08.06(f)	**Supply and Install Plastic Warning Tape**	m

The unit of measurement shall be the length in meter of plastic warning tape supplied and installed.

The tendered rate shall include full compensation for the supplying, handling and laying the plastic warning tape.

	Item	Unit
HE 08.06(g)	**Supply and delivery of low-voltage cable**	m

The unit of measurement shall be the length of low-voltage cable supplied.
The tendered rate shall include full compensation for the manufacture, supply and delivery of the specified cable to the site.

Separate items shall be scheduled under this payment item for each size and type of cable required.

	Item	Unit
HE 08.06(h)	**Lay LV-cable**	m

The unit of measurement shall be the linear length in meter of LV-cable installed.

The tendered rate shall include full compensation for the handling, inspecting, laying, cutting and testing the cable. Cables shall be measured linearly over all lengths laid. Separate items shall be scheduled for each size and each type of cable laid.

	Item	Unit
HE 08.06 (i)	**Termination of LV-cables**	No

The unit of measurement shall be the number of LV-cable terminations.

The tendered rate shall include full compensation for providing the cable glands, shrouds and lugs, the cost of handling, fitting and cutting the cable. Separate items shall be scheduled for each size and type of cable.

	Item	Unit
HE 08.06(j)	**Supply bare copper earth conductor**	m

The unit of measurement shall be the length in meter of bare copper earth conductor supplied.

The tendered rate shall include full compensation for procuring, furnishing and laying the specified earth continuity conductor.

	Item	Unit
HE 08.06(k)	**Installation of bare copper earth conductor**	m

The unit of measurement shall be the length in meter of bare copper earth conductor installed.
The tendered rate shall include full compensation for procuring, furnishing and laying the specified earth continuity conductor.

	Item	Unit
HE 08.06(l)	**Terminate and connect bare copper earth conductor**	No

The unit of measurement shall be the number of bare copper earth conductors terminated and connected.

The tendered rate shall include full compensation for supplying all the material required to terminate and connect the bare copper earth conductors and the connecting thereof to the earth bars.

	Item	Unit
HE 08.06(m)	**Jointing of low-voltage cable**	No

The unit of measurement shall be the number of LV-cables joints.

The tendered rate shall include full compensation for the cost of providing the kits, the cost of cutting the cable, handling and fitting the kits and the cost of testing the joints.

	Item	Unit
HE 08.06(n)	**Re-lamp luminaire**	No

The unit of measurement shall be the number of luminaire lamps replaced.

The tendered rate shall include full compensation for the supply and installation of the lamp according to the manufacturer's instructions.
Separate items shall be scheduled for each type of lamp.

	Item	Unit
HE 08.06(o)	**Supply and installation of internal luminaire components**	No

The unit of measurement shall be the number of internal luminaire components replaced.

The tendered rate shall include full compensation for the supply and installation of the components according to the manufacturer's instructions.
Separate items shall be scheduled for each component.

	Item	Unit
HE 08.06(p)	**Internal wiring of luminaire**	No

The unit of measurement shall be the number of luminaires rewired with silicone insulated wiring.

The tendered rate shall include full compensation for the supply and wiring of a luminaire with silicone insulated wiring where the wiring are specified seperately.

	Item	Unit
HE 08.06(q)	**Supply and install circuit breakers**	No

The unit of measurement shall be the number of circuit breakers supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the circuit breakers where the circuit breakers are specified separately.

	Item	Unit
HE 08.06(r)	**Supply and install isolators**	No

The unit of measurement shall be the number of isolators supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the isolators where the isolators are specified separately.

	Item	Unit
HE 08.06(s)	**Supply and install contactors**	No

The unit of measurement shall be the number of contactors supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the contactors where the contactors are specified separately.

	Item	Unit
HE 08.06(t)	**Supply and install of low tension fuses**	No

The unit of measurement shall be the number of fuses supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the fuses where the fuses are specified separately.

	Item	Unit
HE 08.06(u)	**Supply and install photocell (plug-in type)**	No

The unit of measurement shall be the number of photocells supplied and installed.

The tendered rate shall include full compensation for the supply and installing of the photocells where the photocells are specified separately.

	Item	Unit
HE 08.06(v)	**Supply and install QAT-R type electronic timer**	No

The unit of measurement shall be the number of timers supplied and installed.

The tendered rate shall include full compensation for the supply and installing of the timers where the timers are specified separately.

Item	Unit

HE 08.06(w) Supply and install 0-30A HRC fuses No

The unit of measurement shall be the number of fuses supplied and installed.

The tendered rate shall include full compensation for the supply and installing of the fuses where the circuit breakers are specified separately.

Item	Unit

HE 08.06(x) Supply and install end connectors and insulating sleeves No

The unit of measurement shall be the number of end connectors and insulating sleeves supplied and installed.

The tendered rate shall include full compensation for the supply and installation of the end connectors at the light pole or where cables forms a looping system.

Item	Unit

HE 08.06 (y) Replace pole

The unit of measure shall be the number of poles replaced.

The tendered rate shall include full compensation for the removal of all equipment from the existing pole, removal of the existing pole from site, ordering, supply and installation of the pole in the position specified.

The contractor shall install all existing equipment onto the new pole

Item	Unit

HE 08.06 (z) Replace Luminaire diffuser

The unit of measure shall be the number of luminaire diffusers replaced.

The tendered rate shall include full compensation for the removal of the diffuser from the existing luminaire, ordering, supply and installation of the new diffuser as specified according to manufactures instructions.

Item	Unit

HE 08.06 (aa) Replace pole mounted brackets

The unit of measure shall be the number of pole brackets replaced.

The tendered rate shall include full compensation for the ordering, supply and installation of the pole bracket including all fixing accessories as specified according to manufactures instructions.

The tendered rate shall further include for the removal of all old equipment from the pole and the supply and installation of the new equipment onto the pole bracket including the connection of the equipment.

Item Unit

HE 08.06 (ab) Replace pole cover

The unit of measure shall be the number of pole covers replaced.

The tendered rate shall include full compensation for the removal of the pole cover from the existing pole, ordering, supply and installation of the new pole cover as specified according to manufactures instructions.

Item Unit

HE 08.06(ac) Junction boxes including pole mount brackets. No.

The unit of measure shall be the number of junction boxes supplied and installed.

The tendered rate shall include full compensation for the supply and installation of junction boxes brackets and strapping. The junction box must be fitted with a neutral bar earth bar, din terminal rails and CBI circuit breaker clips to accommodate the maximum amount of terminals and circuit breakers.

Item Unit

HE 08.06(ad) Remove rust and paint kiosks

The unit of measurement shall be the total number of kiosks painted.
The tendered rate shall include full compensation for the removal of rust with a anti corrosion agent and the repainting of the whole kiosk.

Item Unit

HE 08.06(ae) Label kiosks No.

The unit of measure shall be the total number of kiosks labelled.

The tendered rate shall include full compensation for the labelling of kiosks circuit breakers, cable and the warning notification to be installed.

Item Unit

HE 08.06(af) Supply and install padlocks No.

The unit of measurement shall be the number of padlocks installed.

The tendered rate shall include full compensation for the ordering, supply, engraving and installation of the padlocks, locking devices and seals.

Lock shall be “keyed alike”.

Item Unit

HE 08.06(ag) Replace distribution meter kiosks. No.

The unit of measurement shall be the number of distribution kiosks replaced.

The tendered rates shall include full compensation for the removal, the ordering, supply and installation of the new 6/4 way meter boxes complete with watt hour meters, circuit breakers, gland plate, labelling and concrete foot strip as specified.

Consumer distribution kiosks

(a) General

The kiosks shall be of adequate size to accommodate the number of outgoing consumer circuits specified.

The kiosks shall have two sections, namely:

(i) one section containing all incoming and outgoing switchgear and cables, and

(ii) one section containing the consumer meters and circuit breakers.

(b) Fabrication

The kiosks shall be fabricated from 3CR12 stainless steel of minimum thickness 2,5 mm and shall be mounted on a channel iron steel base.

A metal frame work, manufactured from solid angle iron, channel iron, or 2,5 mm 3CR12 folded sheet steel shall be mounted on the base of the kiosk. The kiosk shell shall be completely independent from the frame and equipment so that the kiosk shell can be removed and replaced without disconnecting any equipment. The kiosk shall be bolted down onto the base by means of four M16 high tensile bolts which shall be accessible from the inside of the kiosk only.

The kiosks shall be weatherproof, vermin and insect-proof and proved against tampering. To prevent the ingress of water onto live equipment, the door entry surrounds shall have a channel shape, at least 12 mm deep, to accommodate the door edge. A rubber or neoprene closer strip shall be so fitted to the edges of each door as to provide a seal to keep rain water and dust out of the kiosk.

The kiosk shall have a pitched roof that slopes downwards at the front and at the back with an overhang of at least 75 mm all round.

The kiosks shall be fitted with a door in the front and at the back of the kiosk. The maximum width per door shall be 600 mm. The doors shall provide free access to the equipment and shall provide a full view of all meters. The doors shall have well returning edges to fit into the channel of the door entry surrounds. Each door shall have three robust solid brass hinges each of length at least 100 mm. The hinges shall be completely concealed. Doors shall be fitted with lever locks. The locking mechanism shall facilitate three point latching at the top, side and bottom of the doors. In the case of double doors the first door shall be locked with two slides on the inside onto the kiosk shell. The second door shall close over a lip on the first one. Nylon door restraints shall be provided. The fixing points of the restraints at the door and the canopy shall be reinforced. The doors shall be earthed bonded to the frame by means of a copper braided strap, tooth washers, bolts and nuts.

Ventilation louvres with approximate size 225 x 150 mm shall be provided on both sides of the kiosk. Each ventilation louvre shall be covered on the inside with perforated plates with 2,5 mm holes so that

- it is not possible to push a steel wire through it into the interior of the kiosk, and
- it prevents vermin from entering into the kiosk.

A mounting panel shall be positioned in the centre of each kiosk, fixed to the frame work, for the mounting of the specified equipment.

(c) Mounting panel

The mounting panel shall consist of a minimum 3 mm thick mild steel plate.

The one section of the panel shall be equipped with copper busbars mounted on porcelain or similar insulators and of sufficient length to accommodate three 12 mm brass bolts for the connection of distribution cables and six consumer meter connections per phase. The busbars shall be tinned after the drilling of holes. The busbars shall be able to carry 250 Ampere at a current density of not more then

1,5 A/mm². Each busbar shall be marked red, yellow and blue with black for the neutral bar. The busbars shall be able to withstand the thermal and dynamic forces resulting from short circuits without deformation taking place or parts breaking.

The specified consumer equipment shall be installed in the second section. The mounting panel and equipment shall be enclosed by a machine punched removable front panel through which the operating handles of the equipment and the face plates of the meters protrude.

(d) Equipment installed in kiosks

The equipment to be installed in the kiosks shall be as specified in the detail specification.

(e) Wiring of kiosks

The internal wiring in the kiosks shall be done with PVC insulated copper conductors. The wiring shall be done in neat horizontal and vertical columns. Each consumer circuit shall be wired from the phase busbars to the circuit breaker and from the circuit breaker to the meter.

Connections to busbars and terminals shall be done by means of cable lugs crimped in an approved manner to the conductor ends. Connections to the busbars shall be made by means of cadmium plated high tensile steel bolts and nuts with locking washers.

(f) Earthing

A 25 mm x 6 mm long tinned copper earth bar shall be installed at the bottom of the kiosk.

10 mm diameter holes shall be drilled through the earth bar to provide for the distribution cable and service cable earth conductors. All bolts used for the fixing of the earth conductors shall be cadmium plated and only one earth conductor shall be connected per bolt.

The metal work of the kiosk shall be earthed to the earth bar by means of a 70 mm² stranded copper conductor. An earth stud shall be provided on the kiosk housing for this purpose.

(g) Cable gland plate

The cables shall be terminated on a removable galvanised gland plate of suitable dimension and strength. The gland plate shall cover the full length of the kiosk.

The gland plate shall be at least 300 mm below the nearest terminal of switchgear allowing sufficient space for bending the cable ends. Sufficient space shall be provided underneath the gland plate to allow for the installation of the cables without removing the gland plate. The gland plate shall be earthed to the earthbar by means of a 70 mm² stranded copper earth conductor.

(h) Terminal blocks

A terminal block type suitable for the termination of 16 mm² stranded copper conductors shall be provided. Terminals shall be of the screw type and a terminal shall be provided for each service connection cable.

(i) Labels

The kiosks shall be supplied with the following labels:

(i) An aluminium label with 40 mm high letters and numeral indicating the kiosk number.

(ii) Engraved trafolite labels with 6 mm high numerals under each circuit breaker, meter, and terminal on the terminal block indicating the consumer stand number.

The labels shall have a white background and black letters. The 40 mm labels shall be fixed by means of rivets and the 6 mm high labels shall be inserted in 25 mm wide aluminium label holder mounted at the bottom of the relevant equipment.

(j) Danger signs

The requirements of Regulation C-52 of the Machinery and Occupational Safety Act No 6 of 1983 shall be complied with. All doors shall be fitted with a 150 x 100 mm Danger/Gevaar/Ingozi signs.

(k) Painting and finishing

(i) Post-weld cleaning and passivation of 3CR12

Post-weld cleaning shall be undertaken on all welded areas. One of the following cleaning methods may be used to remove all surface discolouration and scale from welded areas.

(1) Wire brushing : Where it is possible to remove the discolouration and detritus from weld areas by brushing, stainless steel wire brushes, that have not been used on other material other than 3CR12, may be used.

(2) Grinding : Dedicated grinding wheels and discs based on alumina shall be used for the dressing of welds. The use of silicon carbide wheels and discs shall not be used.

(3) Abrasive blast cleaning : The abrasive used shall be washed silica sand or alumina totally free of metallic iron, iron oxides or chlorides.

(ii) Chemical cleaning (pickling)

The pickling of 3CR12 shall be carried out using formulations based on nitric (HNO3) and hydrofluoric (HF) acid. Formulations based on hydrochloric acids shall not be used. Acids used shall conform to commercial purity standards. Where proprietary pickling formulations are used, the manufacturer's directions concerning the application procedures shall be strictly adhered to.

(iii) Passivation

The passivation of the 3CR12 shall be carried out as soon as possible after the post-weld cleaning has taken place. A solution made up of nitric acid shall be used for the passivation of the 3CR12. The solution shall be generously applied to the steel by brush, cloth, spray or dipping. Care shall be taken that the solution does not dry on the steel surface. The steel shall be thoroughly washed with clean cold water to remove all traces of the acid use.

(iv) General

The entire process of cleaning, pickling, passivation and neutralization shall be completed in one working day.

Tenderers shall submit full details of the post weld process their suppliers intend to use.

(v) Painting

All interior metal work shall be thoroughly derusted and degreased and shall be prepared for painting in accordance with SANS 066.

Immediately after cleaning a zinc chromate red oxide primer with a dry film thickness of 25 micrometre shall be applied in accordance with SANS 679. An intermediate enamel coat shall be applied to the primed surface and thereafter the finishing coat of white enamel paint shall be applied to the interior and "light stone", colour C37 SANS 1091 to the exterior.

The bases and under sides must be treated in an approved manner and finished with two coats epoxy-tar paint.

(l) Drawings and information

Tenderers shall submit full details of the cubicles offered with the following drawings with the tender

- a drawing indicating all dimensions of the kiosks
- a drawing indicating the dimensions of the plinth with fixing arrangements

- a drawing indicating the general internal equipment layout of the kiosks.

The successful tenderer shall, before the manufacturing of the kiosks commences, submit the final drawings to the Engineer for approval.

A schematic wiring diagram of the kiosk, as wired and colour coded, shall be submitted at the completion of the contract.

(m) Inspection

The successful tenderer shall allow the representative of the Engineer access to the manufacturer's works at all reasonable times to inspect the progress of the work and to witness all tests

Item		Unit
HE 08.06(ah)	**Replace door hinges on meter and distribution kiosks.**	No.

The tendered rate shall include full compensation for the removal of damaged hinges, the supply, delivery and installation of new hinges.

Item		Unit
HE 08.06(ai)	**Supply and install handles.** (Perano type lockable turn catch door handle (heavy duty)	No.

The unit of measure shall be the total number of handles installed.

The tendered rate shall include full compensation for the removal of the old handle and ordering, supply and installation of a lockable turn catch handle.

HE 09 AREA LIGHTING : TECHNICAL DETAILS

HE 09.01 Installation description

This section describes the electrical distribution network that will be repaired and maintained in terms of this contract.

Luminaries are suspended on fibreglass poles of various lengths. Area lights are controlled by means of photocells and manual on/off switches.

HE 09.02 **Scope of repair work**

Open each pole cover and inspect fuse or circuit breaker, tray and shield plate as well as earthing connection. Check and replace cover seal if required.

Service each luminaire, open control gear enclosures and treat for moisture ingress and corrosion. Wash luminaires with detergent and clean lenses. Check and replace neoprene seals.

Re-lamp luminaires.

Replace luminaires: Remove existing damaged luminaires, supply and install similar and approved luminaires complete with lamps and control gear, if applicable.

Open upstream distribution board. Check and fasten cable terminations, fit labelling and blank face-plate covers. Check locking mechanism and fit padlock.

Open distribution kiosk. Clean inside and add termite and rodent poison. Fit circuit labelling. Check locking mechanism and fit padlock.

Service luminaries by washing with detergent and re-lamping where necessary. Clean lenses. Check condition of seals and glands and test for earth continuity.

Check consistency of aiming angles and tighten mounting bracket bolts

HE 09.03 **Repair work: Measurement and payment**

Item		Unit
(a)	**Relamp luminaire**	No

The unit of measurement shall be the number of lamps replaced.

The tendered rate shall include full compensation for the supply and installation of the lamp according to the manufacturer's instructions.

Item		Unit
(b)	**Service luminaire**	No

The unit of measurement shall be the number of luminaires opened and serviced.

The tendered rate shall include full compensation for the servicing of the luminaire, including washing, corrosion protection, checking of seals and glands, cleaning of the lenses, tightening of stirrup bracket bolts and the checking of earthing continuity, connections and aiming angle.

Item		Unit
(c)	**Service light distribution kiosk or DB**	No

The unit of measurement shall be the number of distribution boards or kiosks serviced.

The tendered rate shall include full compensation for the cleaning and opening of kiosk or DB, vermin protection, checking of MCB's, checking and

tightening of wire terminations, fitting of labels and blank covers. The contractor is to submit a report on the general condition of the kiosk or distribution boards (damaged, rust marks, etc.)

Item		Unit
(d)	**Supply and install padlocks**	No

The unit of measurement shall be the number of 75mm padlocks installed.

The tendered rate shall include full compensation for the ordering, supply, engraving and installation of the padlocks, locking devices and seals. Locks shall be “key alike”.

Item		Unit
(e)	**Service area light pole**	No

The unit of measurement shall be number of area light poles opened and serviced.

The tendered rate shall include full compensation for the opening of pole cover, visual inspections, tightening all connections and straightening of pole

Item		Unit
(f)	**Replace luminaire**	No

The unit of measurement shall be number of luminaires replaced.

The tendered rate shall include full compensation for the supply and installation of the specified luminaire complete with lamp and control gear according to manufacturer’s instructions.

Item		Unit
(g)	**Replace pole**	No

The unit of measure shall be the number of poles replaced.
The tendered rate shall include full compensation for the removal of all equipment from the existing pole, removal of the existing pole from site, ordering, supply and installation of the pole in the position specified.

The contractor shall install all existing equipment onto the new pole

Item		Unit
(h)	**Supply and install 25m High Scissor Light Mast**	No

The unit of measurement shall be the number of 25m high scissor light mast hot dip galvanised to SANS 121 ISO 1461 specification supplied and installed.

The tendered rate shall include full compensation for the manufacturing, delivery, assemble and erection of the 25m high scissor light mast complete with brackets to carry 9 x 400W HPS Floodlight luminaries, cabling, ring, wiring of luminaries, electrical distribution board and splitter box.

The tendered rate shall further include full compensation for grouting the gap between the mast base plate and the foundation with a Prostruct 531 mixture.

The earthing, excavations and casting of foundation of the mast will be measured elsewhere.

HIGH MAST SPECIFICATION

1. Construction

The masts shall be constructed from conical sections which, when assembled, will form a tapered column of circular cross section. There shall be no fillet welds of the overlaps. The sections shall be joined by friction fit only.

The masts shall be of lightweight construction and a base plate shall be welded to the bottom end of the lowest section suitably drilled for foundation bolts.

All welding to be subject to S.A.B.S. Spec 044 Part 3 Grade B and shall be carried out by S.A.B.S. coded welders only. Proof that all welders have been tested by the S.A.B.S. must be submitted on request. Inspection and acceptance certificates shall be furnished on request.

The steel used in the manufacture of the mast shall have an ultimate tensile strength of between 450 and 620 MPa and identical to SABS 1431 grade 300WA steel.

Proof must be supplied that the manufacturer is ISO 9001 accredited.

2 Dimensions

The masts offered shall give an overall floodlight mounting height of 25 m. The cross-section and wall thickness of the mast is determined on the basis of the working loads.

3. Working Loads

The masts shall be designed in accordance with the S.A.B.S. 0225 Code of Practice for the design and construction of lighting masts. The following site factors shall be considered:

Design wind speed	=	40m/s
Class of structure	=	B
Category of terrain	=	2
Altitude of site	=	1200 m

The mast shall carry at its top 9 x 400W HPS Floodlights evenly around its circumference.

Data on wind induced oscillations and the dynamic behaviour of the mast shall be submitted.

4. Access Opening

An access door adequately protected against the weather shall be provided in the mast, with the bottom lintel 600mm above the base plate. The door shall be adequately protected against vandalism and secured by three screws requiring a special opening tool.

A doorframe shall reinforce the opening in the mast.

The mounting strips welded opposite the door opening shall be drilled for the mounting of a control board. Earth terminals, as well as a support bar for the incoming supply cables, shall be provided below the door opening.

5. Corrosion Protection

All parts of the mast and raising and lowering device, not specified as manufactured from stainless steel, shall be hot dip galvanised to SAB Specification No. 763/1977 and inspection certificates provided if required.

No welding, drilling, punching, bending or removal of burrs shall be carried out after galvanising.

6. Electrical Connection to the Luminaires

A fully enclosed distribution board shall be provided for each mast, containing:

1 x 3 pole isolator (main switch)

3 x single pole MCB's (lights)

1 x single phase switched socket outlet for the use of a power tool

1 x two pole earth leakage unit protecting the single phase outlet

1 x 7pinCEEsocket

1 x adequately rated contactor

1 x single pole MCB acting as by-pass switch

1 x single pole MCB protecting the contactor

All circuit breakers and isolators shall have a rupturing capacity of 5 kA and shall bear the mark of the S.A.B.S. and shall be accessible through cut-outs in the cover without having to remove the cover.

All equipment shall be clearly marked with engraved labels. No stick-on embossed tape shall be used.

The distribution board shall be fully wired and ready for connection to the incoming supply cables.

7. FOUNDATIONS

Each mast shall be supplied with foundation bolts and templates. The bolts shall be hot dip galvanised over their entire length to S.A.B.S. Specification No. 763/1977. Two galvanised nuts, two washers and one spring washer shall be supplied for each bolt. The number of foundation bolts shall be determined according to the design of I .3 above. Calculations shall be submitted upon request.

A foundation plan, adequately designed for the conditions as per I .3 of this specification, and based on a soil bearing capacity of 150 kPa, giving details of the reinforcing required shall be submitted. Soil pressure and overturning safety factor shall be stated.

All reinforcing and foundation bolts shall have a minimum of 100mm concrete cover. The 28 days cube strength of the concrete shall be 25 MPa.

All foundations shall have a circular flat base from which a square plinth shall rise to above the surrounding ground level.

One or two PVC, Class B cable sleeves shall be provided from the centre of the top of the foundation plinth, through the concrete to a point below ground level on the side of the plinth.

After casting of the foundation, the slab shall be covered by earth, properly compacted. The area around the plinth shall be brought to the original level and shall be left neat and tidy.

8. LUMINAIRES

- The floodlight luminaire shall be beam type 400W HPS.
- The floodlight shall be suitable for HST 1000W lamp.
- The body of the luminaire shall be of die-cast aluminium with polyurethane finish.
- The reflector shall be high purity bright anodised aluminium and shall provide a narrow asymmetrical beam.
- The peak intensity shall not be less than 48000 lumens.

- The front glass shall be heat resistant armoured glass.
- The gaskets shall be silicone rubber.
- The fasteners shall be stainless steel.
- The luminaire control gear shall be housed in an integral weatherproof container.

HE 10 SECURITY FENCE LIGHTING: TECHNICAL DETAILS

HE 10.01 Installation description

This section describes the electrical distribution network that will be repaired and maintained in terms of this contract.

Luminaires are suspended on fibreglass poles. Lights are controlled by means of photocells and manual on/off switches.

HE 10.02 Scope of repair work

Open each pole cover and inspect fuse or circuit breaker, tray and shield plate as well as earthing connection. Check and replace cover seal if required. Wash luminaire and lens, replace neoprene seal and re-lamp luminaires.
Replace luminaires: Remove existing damaged luminaires, supply and install similar and approved luminaires complete with lamps and control gear, if applicable. Check aiming angle and adjust if necessary.

Open upstream distribution board. Check and fasten cable terminations, fit labelling and blank face-plate covers. Check locking mechanism and fit padlock.

Open distribution kiosk. Clean inside and add termite and rodent poison. Fit circuit labelling. Check locking mechanism and fit padlock.

Open each distribution Kiosk, clean inside provide termile and rodent poison. Check earth bar and earth continuity. Check and fasten cable terminations, fit labelling and blank face-plate covers. Check locking mechanism and fit padlock. Check earth connection to electrode.

Service luminaires by washing with detergent and re-lamping where necessary. Clean lenses. Check condition of seals and glands and test for earth continuity.

HE 10.03 Repair work: Measurement and payment

Item		Unit
(a)	**Service security light pole**	No

The unit of measurement shall be the number of security light poles opened and serviced.

The tendered rate shall include full compensation for the opening of pole box, visual inspections, corrosion protection, straightening of poles if necessary, treating of wooden poles with cresote and securing circuit breakers and terminations.

The contractor shall give a general report on the condition of the pole and equipment. The report should indicate if poles are wrotten (wood poles), bent (steel poles), broken (wood, steel, concrete or fiberglass poles) or if the pole should be painted (steel). Strap all cable to pole.

Item		Unit
(b)	**Re-lamp luminaire**	No

The unit of measurement shall be the number of security lamps replaced.

The tendered rate shall include full compensation for the supply and installation of the lamp according to the manufacturer's instructions.

Item		Unit
(c)	**Service distribution kiosk**	No

The unit of measurement shall be the number of distribution kiosks or boards opened and serviced.

The tendered rate shall include full compensation for the opening of kiosk or distribution board, vermin protection, cleaning of circuit breakers, earth testing, secure circuit breakers and terminations and fitting of blank covers. The contractor is to submit a report on the general condition of the kiosk or distribution board (damaged, rust marks, etc.)

Item		Unit
(d)	**Replace luminaires**	No

The unit of measurement shall be the number of security floodlight luminaires replaced.

The tendered rate shall include full compensation for the supply and installation of the luminaire complete with the lamp and control gear according to the manufacturer's instructions.

Item		Unit
(e)	**Service luminaire**	No

The unit of measure shall be the number of luminaires serviced.

The tendered rate shall include full compensation for the service of the luminaire, including washing, corrosion protection, checking of seals and glands, cleaning of lenses, tightening of brackets bolts, checking of earthing continuity, checking of aiming angle and adjust if necessary

HE 11 STREETLIGHTING: TECHNICAL DETAILS

HE 11.01 Installation description

This section describes the electrical distribution network that will be repaired and maintained in terms of this contract.

Luminaires are suspended on steel, wood, concrete and fibreglass poles of various lengths. Street lights are controlled by means of photocells and manual on/off switches.

HE 11.02 Scope of repair work.

Open distribution kiosk, check locks, clean inside, provide termite and rodent poison.

Open each mast cover and inspect fuse or circuit breaker, tray and shield plate as well as earthing connection. Check and replace cover seal if required. Wash luminaire, replace neoprene seal, clean lens and re-lamp luminaires if required. Replace luminaires: Remove existing damaged luminaires, supply and install similar and approved luminaires complete with lamps and control gear, if applicable. Assess aiming angle and adjust if necessary

HE 11.03 Repair work: Measurement and payment

Item		Unit
(a)	**Service streetlight pole**	No

The unit of measurement shall be the number of security light poles opened and serviced.

The tendered rate shall include full compensation for the opening of pole cover, visual inspections, straightening of poles if necessary and securing circuit breakers and terminations.

The contractor shall give a general report on the condition of the pole and equipment. The report should indicate if poles are wrotten (wood poles), bent (steel poles), broken (wood, steel, concrete or fiberglass poles) or if the pole should be painted (steel). Strap all cable to pole.

Item		Unit
(b)	**Re-lamp luminaire**	No

The unit of measurement shall be the number of street light lamps replaced.

The tendered rate shall include full compensation for the supply and installation of the lamp according to the manufacturer's instructions.

Item		Unit
(c)	**Service street Luminaire**	No

The unit of measure shall be the number of luminaires serviced.

The tendered rate shall include full compensation for the service of the luminaire, including washing, corrosion protection, checking of seals and

glands, cleaning of lenses, tightening of brackets bolts, checking of earthing continuity, checking of aiming angle and adjust if necessary

Item		Unit
(d)	**Replace streetlight luminaire**	No

The unit of measurement shall be the number of streetlight luminaires replaced.

The tendered rate shall include full compensation for the supply and installation of the luminaire complete with the lamp and control gear as per manufacturer's instructions.

Item		Unit
(e)	**Supply and install photocell bypass**	No

The unit of measure shall be the number of photocell bypasses installed.

The tendered rate shall include full compensation for the design supply and installation of the photocell bypass.

Item		Unit
(f)	**Replace 125MV choke in control gear.**	No

The unit of measure shall be the number of chokes installed.

The tendered rate shall make full compensation for ordering, supply and installation of chokes.

Item		Unit
(g)	**Replace connection to streetlight luminaire.**	No

The unit of measure shall be the number of connections replaced from the streetlight luminaire to the overhead line.

The tendered rate shall make full compensation for ordering, supply and connection of the luminaire to the overhead line with silicon cable or airduct and cable clamps on to the overhead line.

HE 12 MAINTENANCE OF THE INSTALLATION

HE 12.01 The various lighting systems shall be maintained in perfect working order following the initial repair work. The maintenance contract shall run for the balance of the 36-month contract period.

HE 12.02 The following maintenance actions will be required under this phase of the contract:

12.02.01 Routine preventative maintenance
12.02.02 Corrective maintenance
12.02.03 Breakdown maintenance

These actions are defined in the Additional Specification SA – General Maintenance.

HE 12.03 The maintenance schedules and frequency of maintenance activities shall be developed under the maintenance control plan which will be instituted by the Contractor. The Contractors responsibility in this regard is specified in the Additional Specification SA – General Maintenance.

HE 12.04 The following shall be used as guidelines to ensure effective maintenance:

12.04.01 Scope of maintenance work on area lighting

a) Monthly

i) Verify operation of switching element
ii) Check lamps
iii) Check mast door for weatherproof seal
iv) Check earth connection at footing, record value

b) Annual

i) Service all luminaires
ii) Measure earth resistance of electrode
iii) Measure earth resistance of trench earth
v) Record values in record book

12.04.02 Scope of maintenance work on security lighting

a) Monthly

i) Verify operation of switching element.
ii) Check lamps.
iii) Check that all pole covers are secure.
iv) Visually check distribution kiosk.

b) Annual

Measure phase voltages and line currents in distribution kiosk or local distribution board. Record values in record book. Do vermin protection. Service all luminaires.

12.04.03 Scope of maintenance work on street lighting

a) Monthly

i) Verify operation of switching element.
ii) Check lamps.
iii) Check that all pole covers are secure.
iv) Visually check distribution kiosk.

b) Annual

Measure phase voltages and line currents in distribution kiosk. Record values in Record book. Do vermin protection. Service all luminaries and distribution kiosks.

HE.12.05 Maintenance shall include all repairs, replacing of components or materials, routine setting or any other actions necessary to ensure a perfect functional condition.

HE.12.06 **Maintenance work measurement and payment.**

Refer to clause SA06 of the ADDITIONAL SPECIFICATION : SA GENERAL MAINTENANCE

TECHNICAL SPECIFICATION

JC CONVENTIONAL FIRE FIGHTING EQUIPMENT

CONTENTS

JC 01 SCOPE

This specification covers the general maintenance of the conventional fire fighting equipment installations, which include the following:

(a) Fire hydrants
(b) Fire hose reels
(c) Fire extinguishers.

This specification shall form an integral part of the maintenance and servicing contract document and shall be read in conjunction with the additional and particular specifications compiled as part of this document.

This specification shall act as a guideline to the Particular Specification. In the event of any discrepancies between the Technical Specification and the Particular Specification, the latter shall take precedence.

JC 02 STANDARD SPECIFICATIONS

JC 02.01 GENERAL STANDARD SPECIFICATIONS, REGULATIONS AND CODES

The latest edition, including all amendments up to date of tender, of the following specifications, publications and codes of practice shall be read in conjunction with this specification and shall deemed to form part thereof.

JC 02.01.01 SANS and other specifications and codes

SANS 6172; ICS 13.220.10	-	Fire extinguishers, classification system, fire ratings
CKS 532; ICS 13.220.10	-	Fire extinguishers, foams
SANS 10105-1; ICS 13.220.10	-	Fire extinguishers, portable, classification system, control systems
SANS 1322; ICS 13.220.10	-	Fire extinguishers, portable, non-refillable
SANS 1567; ICS 13.220.10	-	Fire extinguishers, portable, rechargeable, carbon dioxide

SANS 1573; ICS 13.220.10	-	Fire extinguishers, portable, rechargeable, foams
SANS 1475-1; ICS 13.220.10	-	Fire extinguishers, portable, reconditioning
SANS 810; ICS 13.220.10	-	Fire extinguishers, powder, portable, rechargeable
SANS 1522; ICS 13.220.10	-	Fire extinguishers, powders
SANS 1571; ICS 13.220.10	-	Fire extinguishers, transportable, rechargeable
SANS 889; ICS 13.220.10	-	Fire extinguishers, water fire extinguishers, portable, rechargeable
SANS 10105-1; ICS 13.220.10	-	Fire fighting equipment, fire extinguishers, portable
SANS 1322; ICS 13.220.10, 23.020.30	-	Fire fighting equipment, fire extinguishers, portable, non-refillable
SANS 543; ICS 13.220.10	-	Fire fighting equipment, fire hose reels
SANS 10105-2; ICS 13.220.10	-	Fire fighting equipment, fire hose reels
SANS 1128-2; ICS 13.220.10, 23.040.60	-	Fire fighting equipment, fire hose, pipe couplings, pipe connections
SANS 1128-1; ICS 13.220.10, 23.060.99	-	Fire fighting equipment, fire hydrants
SANS 810; ICS 13.220.10	-	Fire fighting equipment, powder fire extinguishers, portable, rechargeable
SANS 1475-1; ICS 13.220.10	-	Fire fighting equipment, reconditioning, fire extinguishers, portable
SANS 889; ICS 13.220.10	-	Fire fighting equipment, water fire extinguishers, portable, rechargeable
SANS 543; ICS 13.220.10	-	Fire hose reels
SANS 10105-2; ICS 13.220.10	-	Fire hose reels, classification systems, control systems
SANS 1475-2; ICS 13.220.10	-	Fire hose reels, reconditioning
SANS 1456-5; ICS 13.220.10	-	Fire hoses, collapsible, delivery pipes (fire fighting), oil resistance tests, chemical resistance tests
SANS 1456-2; ICS 13.220.10	-	Fire hoses, collapsible, delivery pipes (fire fighting), percolating hoses
SANS 1456-1; ICS 13.220.10	-	Fire hose, collapsible, delivery pipes (fire fighting), testing
SANS 1456-4;	-	Fire hoses, collapsible, delivery pipes, coated materials,

ICS 13.220.10		non-percolating hoses
SANS 1456-3; ICS 13.220.10	-	Fire hoses, collapsible, delivery pipes, uncoated materials, non-percolating hoses
SANS 1128-2; ICS 13.220.10, 23.040.60	-	Fire hoses, pipe couplings, pipe connections
SANS 1128-1; ICS 13.220.10, 23.060.99	-	Fire hydrants, fire-fighting equipment
SANS 1056-1; ICS 23.060.20	-	Fire safety, ball valves
SANS 10400	-	Application of the NBR
SANS 10287	-	Automatic sprinkler installations for fire fighting purposes.
FPO/82/6E(STS 10)	-	Standard technical specification for a pump installation for automatic sprinkler fire extinguishing systems.

JC 02.01.02 **Department of Public Works Specifications:**

F.P.O/G.61/3E	-	Fire Security: A guide to Architects
PW 371	-	Specification of Materials and Methods to be used

JC 02.01.03 **Occupational Health and Safety Act of 1993: Construction Regulations, 2003 as promulgated in Government Gazette No 25207 and Regulation Gazette No 7721 of 18 July 2003.**

JC 02.01.04 **Manufacturers' specifications, codes of practice and installation instructions**

All equipment and materials shall be installed, serviced and repaired strictly in accordance with the manufacturers' specifications, instructions and codes of practice.

In the event of a discrepancy between the statutory codes and the manufacturer's codes, the discrepancy shall be brought to the attention of the Engineer, who, in collaboration with the Employer and Local Authority, will prescribe the steps to be taken.

JC 02.01.05 **Municipal regulations, laws and by-laws**

All municipal regulations, laws, by-laws and special requirements of the Local Authority shall be adhered to unless otherwise specified.

JC 03 OPERATING AND MAINTENANCE MANUALS

No operating and maintenance manuals will be developed for this section.

The contractor shall use the Maintenance Control Plan (see SA Maintenance) to schedule routine preventative maintenance activities.

Over and above the afore-mentioned, the Contractor shall also be responsible for the compilation of the following:

(a) Cataloguing of the fire-fighting equipment

All the fire-fighting equipment must be catalogued under the following headings:

(i) Location and details of equipment
(ii) Service date
(iii) Service frequency
(iv) Condition of equipment
(v) History: Usage incidents, breaking, etc.

(b) Provision of a "Fire Plan"

The Contractor shall provide a Fire Plan indicating positions, and keeping up to date any changes of the equipment position, status and operation.

JC 04 TRAINING OF OPERATORS FOR THE OPERATION OF THE INSTALLATION AND EQUIPMENT

The end user shall be trained by the supplier of the fire fighting equipment to operate the individual fire fighting equipment.

Fire fighting training shall be done by a nationally accredited training institute (Fire Protection Association of South Africa).

JC 05 LOGGING AND RECORDING PROCEDURES

The Contractor shall under this repair and maintenance contract institute a logging and recording system as part of his maintenance control plan as defined in Additional Specification SA: General Maintenance. This shall consist of a log and record book, which shall be utilised to log and record all service records, system checks, breakdowns, maintenance visits, inspections, etc.

The logbook shall be stored in a safe place as agreed with the User Client and the Engineer and shall only be utilised by the Fire Protection Officer, the Contractor and the Engineer. The Contractor shall submit copies of the monthly entries and recordings into the logbook , together with his monthly report, to the Engineer.

The logbook shall be structured to include at least the following:

(a) Service records
(b) Inspection and maintenance actions
(c) Breakdown reports
(d) Fire safety officer's comments
(e) Inspection and test comments and reports.

The Contractor shall also institute an attendance register, which shall be kept in a safe place as agreed with the User Client and Engineer. This register shall be completed by all persons visiting the installation, including:

(a) Fire safety officer
(b) Contractor
(c) Inspectors
(d) Department personnel
(e) Engineer.

The register shall state the date, time-in, time-out, name, company and reason for visit.

A copy of the register shall be submitted by the Contractor together with his monthly report.

JC 06 REPAIR WORK TO INSTALLATIONS, SYSTEMS AND EQUIPMENT

JC 06.01 GENERAL

During the repair and maintenance contract all the systems, installations and equipment shall be repaired as specified in the Particular Specification. This repair work shall include, but no be limited to the specified Particular Specification details.

All repair work shall be executed using approved materials and equipment suitable to the systems and/or installations they serve. The said repair work shall be executed in accordance with the relevant codes of practice, standards, regulations, municipal laws and by-laws, manufacturer's specifications and codes of practice and all applicable additional and particular specifications included in this document.

The repair work items are listed in the Particular Specification and Schedule of Quantities with all relevant details, such as capacity, size, manufacturer, model number, etc.

All repair work shall be executed within the specified durations listed in the Appendix to Tender. All new equipment, materials and systems shall be furnished with a written guarantee of a defects liability period of 12 months commencing on the date of issue of a certificate for completion of the repair work. These guarantees shall be furnished in favour of the Department of Public Works.

Repair work items for the fire fighting equipment shall be categorised under the following headings:

(a) Fire hydrants
(b) Fire hose reels
(c) Fire extinguishers.

JC 06.02 REPAIR WORK TO EXISTING EQUIPMENT

The Contractor shall at the start of the repair and maintenance contract inspect, record and report on all the existing fire fighting equipment listed in this specification.

This inspection and report shall comprise the following:

(a) Establishing the condition of all equipment;

(b) Reporting all defects to equipment;

(c) Compliance of equipment in respect of the governing regulations at the start of the Contract;

(d) Recording all equipment with an identifying system;

(e) Details of all equipment;

(f) Suitability of equipment regarding the purpose it serves;

(g) Water supply pressure;

(h) Listing of latest service.

The Contractor shall report on the above in writing to the Engineer. No repair, service and/or replacement work shall commence prior to approval by or directives from the Engineer.

JC 06.03 FIRE HYDRANTS

Repair work to the fire hydrants system is detailed in the Particular Specification and shall include, but not be limited to the following:

(a) Replacement of damaged, broken, leaking, corroded pipe work and fittings;

(b) Replacement of main hydrant seal;

(c) Repair/replacement of quick coupling catches;

(d) Replacement of damaged shaft ends (right angle wheel type);

(e) Replacement of damaged and expired or missing 65 mm diameter hose streamers;

(f) Replacement of damaged or missing 65 mm diameter hose nozzle;

(g) Replacement of damaged valve stem seal;

(h) Replacement, repair and repainting of concrete pedestals;

(i) Replacement of fire damaged, missing or shortfall fire signage to equipment;

(j) Hydrants shall be labelled with identifying tags and details recorded.

JC 06.04 FIRE HOSE REELS

Repair work to the fire hose reel systems is detailed in the Particular Specification and shall include but no be limited to the following:

(a) Replacement of the hose drum seal where leaks occur;

(b) Replacement of the 30 m hose where perished, damaged or missing;

(c) Repair damaged hose drums and, where directed by the Engineer, replace with new;

(d) Replace gland packing and gaskets to hose reel shut-off valve;

(e) Replace missing hose reel shut-off valve wheel handles;

(f) Number and catalogue hose reel;

(g) Where hose reels shut-off valves are damaged beyond repair, these shall be replaced with new;

(h) All hose reel mountings shall be checked and where loose or damaged, replaced with new;

(i) Where paintwork of equipment has deteriorated, such equipment items shall be replaced and repainted in accordance with the manufacturer's specification;

(j) Hose reels shall be labelled with identifying tags and details recorded, including service record.

JC 06.05 FIRE EXTINGUISHERS

Repair work to the fire extinguishers is detailed in the Particular Specification and shall include, but not be limited to the following:

(a) Replace wall mounting boards and brackets where damaged or missing.

(b) Dry chemical powder extinguishers shall be repaired and serviced and shall include at least the following:

(i) Replace discharge hose and nozzle where damaged or missing;

(ii) Replace gauge on bottle where reading is incorrect, damaged or missing;

(iii) Check, service and repair activation mechanism;

(iv) Replace DCP powder;

(v) Recharge discharge cylinder to the required capacity;

(vi) Reseal discharge mechanism;

(vii) Replace instructions on extinguishers where necessary;

(viii) Extinguishers shall be labelled with identifying tags and details recorded, including service record.

(c) CO_2 extinguishers shall be repaired and serviced and shall include at least the following:

(i) Replace discharge nozzle and pipe where damaged or missing;

(ii) Replace gauge on bottle where reading is incorrect, damaged or missing;

(iii) Repair activation mechanism;

(iv) Recharge with CO_2 to required capacity;

(v) Reseal discharge mechanism;

(vi) Replace instructions on extinguishers where necessary;

(vii) Extinguishers shall be labelled with identifying tags and details recorded, including service record.

(d) Water extinguishers shall be repaired and serviced and shall include at least the following:

(i) Check cylinder for corrosion and report to Engineer. Where directed, the complete unit shall be replaced;

(ii) Replace discharge hose and nozzle where damaged and missing;

(iii) Replace gauge on bottle where damaged, missing or where reading is incorrect;

(iv) Check service and repair activation mechanism;

(v) Replace water content;

(vi) Recharge discharge cylinder to the required capacity;

(vii) Reseal discharge mechanism;

(viii) Replace instructions on extinguisher where damaged or missing;

(ix) Extinguishers shall be labelled with identifying tags and details recorded, including service record.

(e) Foam type extinguisher shall be serviced and repaired and shall include at least the following:

(i) Check cylinder for corrosion and report to Engineer. Where directed, the complete unit shall be replaced;

(ii) Replace discharge hose and nozzle where damaged or missing;

(iii) Replace gauge on bottle where damaged, missing or incorrect;

(iv) Check, service and repair activation mechanism;

(v) Replace foam concentrate content;

(vi) Recharge discharge cylinder to required capacity;

(vii) Reseal discharge mechanism;

(viii) Replace instructions on extinguisher where damaged or missing;

(ix) Extinguishers shall be labelled with identifying tags and details recorded, including service record.

JC 07 MAINTENANCE TO INSTALLATIONS, SYSTEMS AND EQUIPMENT

JC 07.01 GENERAL

Annual maintenance responsibilities for each installation including all units and components as specified shall commence with access to the site. A difference shall be made in payment prior to and after practical completion of the work.

Maintenance of the completed installation shall commence upon the issue of a certificate of practical completion for repair work, and shall continue for the remainder of the 36-month contract period.

This part of the Contract shall include:

(a) Routine preventative maintenance;
(b) Corrective maintenance, and
(c) Breakdown maintenance,

as defined in Additional Specification SA: General Maintenance, for the specified installations described under JC 01 of this specification.

The maintenance work to be performed and executed shall be done strictly in accordance with Additional Specification SA: General Maintenance and as specified in Particular Specification PJC and this specification.

The said maintenance work shall be executed in accordance with the relevant codes of practice, statutory regulations, standards, regulations, municipal laws and by-laws and the manufacturers' specifications and codes of practice.

The maintenance schedules and frequency shall be developed under the maintenance control plan to be instituted by the Contractor, as specified in Additional Specification SA: General Maintenance.

All new equipment, components and materials supplied and installed under the maintenance contract shall be furnished with a prescribed manufacturer's guarantee.
The maintenance work and items are to be categorised for each maintenance activity under the following headings:

(a) Fire hydrants
(b) Fire hose reels
(c) Fire extinguishers.

The Contractor shall be remunerated monthly, based on his performance, for maintaining the complete installation in a perfect functional condition.

JC 07.02 ROUTINE PREVENTATIVE MAINTENANCE

The routine maintenance of the installations, systems and equipment shall be done in accordance with Additional Specification SA: General Maintenance, and the Particular Specification related to this work.

The routine maintenance work to be performed and executed shall include, but not be limited to the items listed below under the respective headings.
These actions and findings shall be logged and reported on the relevant approved schedules and reports.

JC 07.02.01 Fire hydrants

Maintenance work shall include at least the following actions and shall be scheduled in accordance with the relevant regulations and requirements and include monthly and six-monthly inspections and services.

(a) Check hydrant valve seal.

(b) Check right angle wheel for tightness.

(c) Check valve stem and or top for damage.

(d) Check valve stem seal and readjust.

(e) Check operation of quick couplers.

(f) Check operation (opening and closing movement of valve).

(g) Check water pressure and flow.

(h) Check stand pipe for rigidness and leaks.

(i) Log maintenance schedule.

(j) Report defects for processing and repair.

(k) For fire water pipe systems see Technical Specification AA.

(l) For fire pump see Technical Specifications FN and JA.

JC 07.02.02 Fire hose reels

Maintenance work shall include at least the following actions and shall be scheduled in accordance with the relevant regulations and requirements and include monthly and six-monthly inspections and services.

(a) Check drain seal.

(b) Roll down hose and check for cracks or perishing.

(c) Check operation of PWD type nozzle.

(d) Check operation of drain.

(e) Check operation of fire hose reel valve.

(f) Lubricate moving parts of drum.

(g) Check pressure and flow of fire hose reel.

(h) Check piping for leaks and damages.

(i) Log maintenance schedules.

(j) Report defects for processing and repair.

(k) For fire water pipe systems see Technical Specification AA.

(l) For fire pumps see Technical Specifications FN and JA.

JC 07.02.03 Fire extinguishers

Maintenance work shall include at least the following actions and shall be scheduled in accordance with the relevant regulations and requirements and include monthly and six-monthly inspections and services.

(a) General

(i) Check mounting of backboard and bracket.

(ii) Check charge of the extinguisher.

(iii) Check the condition of the discharge.

(iv) Check the mechanism condition of the discharge hose.

(v) Update the log entry on the extinguisher.

(vi) Log maintenance schedule.

(vii) Report defects for processing and repair.

(b) Individual types of extinguishers

Over and above the preceding requirements, the following shall apply to individual types of extinguishers.

(i) DCP extinguishers:
Check charge and replace powder at prescribed intervals.

(ii) CO_2 extinguisher:
Check charge.

(iii) Water extinguisher:
Replace water at pre-described intervals.

(iv) Foam extinguisher:

Check foam mix and replace at predetermined intervals.

JC 07.03 CORRECTIVE MAINTENANCE

This corrective maintenance of the installations, systems and equipment shall be done in accordance with Additional Specification SA: General Maintenance, and the Particular Specification related to this work.

The Contractor shall inspect and check all equipment, materials, systems and installations for any pending breakdowns, maladjustments or anomalies of equipment.

The Contractor shall report and take actions to correct such shortfall.

JC 07.04 BREAKDOWN MAINTENANCE

Breakdown maintenance of the installations, systems and equipment shall be done in accordance with Additional Specifications SA: General Maintenance.

All breakdown problems experienced shall be acted upon within the time limitations allowed in the General Maintenance specifications.

All breakdown maintenance shall be done in accordance with the relevant specifications, standards, regulations and codes.

The Contractor shall have access to the necessary spares, equipment and tools for any possible breakdowns.

PARTICULAR SPECIFICATION

PAA PLUMBING AND DRAINAGE INSTALLATION

CONTENTS

PAA 01 SCOPE

(a) This specification covers the particulars of the repair and maintenance work to the plumbing and drainage installations. This particular specification shall be read in conjunction with the Technical Specification AA: Plumbing and Drainage Installation, and all additional and technical specifications compiled as part of this document, in particular the following Additional Specifications:

SA: General Maintenance
SB: Operating and Maintenance Manuals
SC: General Decommissioning, Testing and Commissioning Procedures
SD: General Training
SE: Development of Affirmable Business Enterprise.

The intended repair and maintenance work to this installation will restore the existing installation to a safe, efficiently functional system that complies with all statutory regulations and applicable standards, in the process repairing all defects and shortfalls. On completion of the repair work, the completed installation shall be maintained and serviced by the Contractor for the remainder of the allocated Contract period.

(b) The complex consists of various areas as listed below, which form part of the repair and maintenance contract for plumbing and drainage installation, as well as the fire water piped reticulation installations.

(i) Kitchen,
(ii) Stores,
(iii) Single cells and
(iv) Communal cells.

PAA 02 GENERAL DESCRIPTION OF INSTALLATION

The existing plumbing and drainage installation provides potable hot and cold water to the various areas on this site.

The potable cold water installation is provided with supply points from the reticulation network inside the buildings at very kitchen area and chased into walls to outlet points.

The potable hot-water installation is provided with supplies from various hot-water geyser units where applicable.

Central hot-water systems are not dealt with under this contract but all domestic water geysers form part of this contract.

This contract also provides for repair and maintenance of the fire water piped reticulation network, excluding the fire fighting equipment which is dealt with under Particular Specification PJC: Conventional Fire Fighting equipment.

Technical details of sanitary and brassware, as well as the plumbing and drainage installations are given in PAA 03.

PAA 03 TECHNICAL DETAILS OF EXISTING INSTALLATION

At the time of compilation of this document the existing installation consisted of the equipment and plant listed below with their relevant technical details.

PAA 03.01 SANITARY AND BRASSWARE: GENERAL

	SANITARY WARE	BRASSWARE	TRAP
WCs (cistern)	Armitage Shanks/Suda/ Vaal, white, floor-mounted, vitreous china,	Brass shut-off valves	Not applicable
WCs (flush)	Armitage Shanks, white, floor-mounted, vitreous china. White, vitreous china, Vaal. Cape Stainless, stainless steel	Flush valve, concealed type wear and tear not to effect the body work	Not applicable
Cistern (WC)	Wall-mounted, white, CI. Wall-mounted, white, plastic	Brass shut-off valves	Not applicable
Urinals (cistern)	Elgin / City Metal, floor-mounted, stainless steel. Armitage Shanks, white, wall-mounted, vitreous china	Brass shut-off valves	Not applicable
Urinals (flush)	Elgin/City Metal, floor-mounted, stainless steel. Armitage Shanks, white, wall-mounted, vitreous china. Cape Stainless, stainless steel	Jnr flush valve, concealed and exposed type, shut-off valves	CP bottle trap. Flexi P-trap
WHBs	Armitage Shanks, white wall-mounted, white enamel CI, stainless steel	Pillar taps handles fixed to spindle by factory press fit pillar taps	Flexi P-trap CP bottle trap lead P-trap
Showers	Vandal proof shower heads. Channel drain type	15 mm CP undertile stop-cocks, water saver shower heads	Brass P-trap with CP grating
Wash troughs	Stainless steel, double bowl, wall-mounted	Wall type taps hndles fixed to spindle by factory press fit wall type taps	Flexi P-trap
Baths	Steel enamel, white, 2 m long	Cobra 20 mm, CP star handle wall type taps	Not applicable

	SANITARY WARE	BRASSWARE	TRAP
Sinks	Stainless steel, cabinet-mounted	20 mm CP handles fixed to spindle by factory press fit, 20 mm sink mixer with overarm swivel outlet	Flexi P-trap , lead P-trap
Wash tubs	Concrete double bowl	CP wall type taps	Lead P-trap
S Hopper	Wall-mounted white porcelain	15 mm CP star handle taps	Not applicable

PAA 03.02 **SANITARY DRAINAGE PIPING: GENERAL**

	PIPE	FITTINGS	EQUIPMENT
Gullies	VCP	CI grating	Not applicable
Waste pipes	GMS	Brass	Not applicable
Soil pipes	S&S CI	S&S CI	Not applicable
Cleaning eyes	CI (ABC)	Not applicable	Not applicable
Vent pipes	S&S CI	S&S CI	Not applicable

PAA 03.03 **DOMESTIC WATER PIPING: GENERAL**

	PIPE	FITTINGS	EQUIPMENT
Cold-water piping	Cu GMS	Conex, soldered GMS	Brass gate shut-off valve Brass gate shut-off valve
Hot-water piping	Cu GMS	Conex, soldered GMS	Brass gate shut-off valve Brass gate shut-off valve

PAA 03.04 **FIRE WATER PIPING: GENERAL**

	PIPE	FITTINGS	EQUIPMENT
Fire water piping	GMS	GMS	See specifications

PAA 03.05 **PLUMBING FIXTURE QUANTITIES**

At the time of completion of this document the various facilities were equipped with the number of plumbing fixtures as tabled below.

PAA 03.06 **FIRE WATER INSTALLATION QUANTITIES**

The following quantities of fire fighting equipment currently installed, are tabled below. The piped reticulation networks to these equipment items shall form part of this contract.

PAA 04 STATUS OF EXISTING INSTALLATION

At the time of compilation of this document the status of the equipment and installation was briefly as follows:

PAA 04.01 FACILITIES

PAA 04.01.01 Sanitary and brassware

The sanitary and brassware can be grouped into three categories:

- installations that were installed a long time ago;
- installations that have been refurbished by the maintenance department in recent years, and
- The general condition of these installations varies accordingly, and the following are common occurrences for every category.

(a) Old installations:

(i) Recessed flush valve links and push buttons are missing.
(ii) Flush valves in ducts are leaking.
(iii) Cast-iron cisterns are corroded, broken and damaged.
(iv) Shower heads are missing or broken.
(v) Shower and tap handles are generally missing.
(vi) WCs and WHBs are damaged, ripped out of walls, etc.
(vii) Shower and urinal gratings are missing, resulting in excessive blockages.

(b) Refurbished installations:

(i) Recessed flush valve links and push buttons are missing.
(ii) Shower heads are missing or broken.
(iii) Shower and tap handles are generally missing.
(iv) Shower and urinal gratings are missing, resulting in excessive blockages.

PAA 04.01.02 Plumbing and drainage installation

The general condition of the plumbing and drainage installation can also be grouped into three categories:

(a) Old installations:

The installations are generally in poor condition and require extensive repairs and replacements. The following common problems were noticed:

(i) Regular blockages on drainage pipe installation;
(ii) Regular leaks developing on the water reticulation network above and underground;
(iii) Missing gully gratings, IE covers and CE covers on drainage system, and broken manhole covers;
(iv) Surface-mounted temporary hot-water pipes are prone to damage by inmates.

(b) Refurbished installations:

The installations are generally in good condition and require limited repairs:

(i) Water pipe bracketing and hot-water pipe insulation require attention;
(ii) Regular blockages on drainage pipe installation;
(iii) Missing gully gratings, IE covers and CE covers on drainage system, and broken manhole covers.

(c) Problems experienced with hot-water supply to certain areas are due to the following:

(i) Insufficient storage and heating capacity for the number of users
(ii) Overcrowding of facilities;
(iii) Leaks developing on piping and equipment;
(iv) Incorrect functioning and failure of hot-water generating plants at

(d) There are problems with the floor drainage installation in the old kitchen at, currently being used as a serving kitchen and scullery. This is due to constant blockages, caused by age, insufficient straining facilities, and the absence of a grease trap that can lead to fat build-up inside drainage lines.

PAA 04.02 RESIDENTIAL BUILDINGS

These facilities are in varying conditions, corresponding to the age of the installation. The following common problems have been observed:

(a) Old houses (previously accommodation for non-white members) and old single quarters:

(i) The sanitary and brassware, the plumbing and drainage installations, and geysers have been damaged by corrosion and vandalism to such an extent that extensive replacement is necessary.

(b) Old houses and flats:

(i) Extensive damage to sanitary ware such as baths, WHBs and WCs.
(ii) Old geyser installations result in frequent failures and low hot-water pressure;
(iii) Corrosion and damage to a large proportion of domestic water and drainage installations.

(c) New houses, flats and single quarters:

(i) Limited damage to sanitary and brassware, and plumbing and drainage installations;
(ii) A latent problem is experienced with geyser pressure-reducing valves.

PAA 04.03 RECREATIONAL FACILITIES

These facilities are generally in a fair and functional condition. The following problems have been observed:

(a) Sanitary and brassware are damaged in some ablutions, due to corrosion and vandalism in isolated cases.

(b) Blockages occur in drainage pipes at rugby stadium.

(c) There is insufficient hot water in staff kitchen due to inadequate geyser installation.

(d) Most areas have insufficient fire protection equipment.

(e) There are isolated leaks on underground water pipes due to corrosion.

PAA 04.04 WORKSHOPS, STORAGE, MAINTENANCE AND TRANSPORT FACILITES

(a) Facilities are generally in a fair condition and require limited repairs to sanitary and brassware, and plumbing and drainage pipes.

(b) Extensive repairs and replacements to inmates ablutions are necessary.

(c) Most areas have inadequate fire protection.

PAA 04.05 OFFICE AND SUPPORT SERVICES FACILITIES

(a) Facilities are generally in a fair condition and require limited repairs to sanitary and brassware, and plumbing and drainage pipes.

(b) Extensive repairs and replacements to inmates' ablutions are necessary.

(c) Most areas have inadequate fire protection.

PAA 04.06 AGRICULTURAL FACILITIES

The installations that form part of these facilities are in varying condition. The following problems were identified:

(a) Old GMS water pipe installations in some areas are badly corroded and frequent leaks occur.

(b) Equipment, plumbing and drainage in inmates' ablutions and some other ablutions are in a poor state and necessitate extensive replacements.

(c) Inadequate floor/drainage at dairy leads to unhygienic conditions.

(d) Unprotected underground GMS pipes at piggery are very corroded.

PAA 04.07 TRAINING AND EDUCATIONAL FACILITIES

These installations are generally in a fair condition and require limited repairs to and replacements of equipment and piped reticulation.

The services to primary school ablutions are in a poor condition and require complete replacement.

PAA 04.08 MAIN KITCHEN AND BAKERY, ABATTOIR AND LAUNDRY

There are various problems at these installations, in particular with regard to drainage systems. The following items were identified:

(a) Equipment in inmates' ablution areas and kitchen are damaged, and will require repairs and replacement.

(b) The lack of a floor drainage system and grease trap in the kitchen, a lint trap at the laundry, and blood accumulating pit and blood drying bank at the abattoir are against regulations and cause build-up in the sewer pipes and subsequently frequent leaks.

PAA 04.09 MAIN GATE HOUSE

These installations are generally in a fair condition with limited repairs and replacements required to equipment and piped reticulation.

PAA 05 DETAILS OF REPAIR WORK

The following work shall form part of the repair work to Building Services. This work shall be done in accordance with the relevant regulations, codes, specifications and Technical Specification AA: Plumbing and Drainage Installations, as set out in this document. The work to be included is set out in PAA 05.01 and PAA 05.02 below and shall be read in conjunction with the Schedule of Quantities and Technical Specifications.

The repair work shall be carried out in accordance with the requirements of Additional Specification SC: General Decommissioning, Testing and Commissioning Procedures.

PAA 05.01 GENERAL DESCRIPTION OF REPAIR WORK

PAA 05.01.01 The Contractor shall at the start of the Repair Contract inspect the items, systems, equipment, components and installations listed below. This inspection shall include the establishing of any defects, leaks, damages, shortfalls, structural soundness, repairs required, details of existing equipment, suitability of equipment for the purpose it serves, etc. The Contractor shall report back to the Engineer in writing on all the above and the following items. No repair work shall commence prior to approval by the Engineer:

(a) Sanitary and brassware, including traps, brackets, piping, pan connectors, etc;

(b) Sanitary drainage installation, including fittings, traps, floor drains, gullies, cleaning eyes, manholes, grease and oil separators, etc;

(c) Domestic water piped installation, including fittings, valves, strainers, lagging and cladding, non-return valves, safety valves, etc;

(d) Fire water piped installation, including fittings, valves, non-return valves, pressure gauges, etc;

(e) Bracketing system;

(f) Domestic geysers including valves, pressure reducing valves, strainers, vacuum breakers, safety valves, non-return valves, lagging and cladding, etc.

PAA 05.01.02 The general scope of work at the time of going on tender is defined as follows:

(a) Replacing of irreparably damaged, missing and unsuitable sanitary- and brassware, including the isolation, removal and stripping of the existing equipment;

(b) Replacing of irreparably damaged, corroded and unsuitable sanitary drainage piping, including fittings, brackets, traps, floor drains, oil and grease separators, cleaning eyes and gullies, etc;

(c) Replacing of irreparably damaged, corroded and unsuitable domestic water piping, including fittings, brackets, valves, strainers, water meters, lagging and cladding, etc;

(d) Replacing of irreparably damaged, corroded and unsuitable fire water piping, including fittings, brackets, valves, non-return valves, pressure gauges, etc;

(e) Replacing of irreparably damaged and corroded domestic geysers, including valves, pressure-reducing valves, air release valves, strainers, non-return valves, vacuum breakers and safety valves;

(f) Servicing, cleaning and repair of existing sanitary ware including removal of stains, repair of chipped-off enamel, replacing of damaged seats and lids, de-scaling and cleaning of cisterns and servicing of filling and flushing mechanisms, fixing of loose fixtures and brackets, cleaning of traps, etc;

(g) Servicing, overhauling and cleaning of existing brassware, including dismantling, de-scaling, replacing of washers, gland packings and gaskets, replacing of missing tap handles and flushing assemblies, etc;

(h) Servicing, cleaning and repair of existing domestic water and drainage pipe installations, including traps, floor drains, gullies, manholes, valve chambers, grease and oil separators, brackets, valves, vacuum breakers, strainers, pipe lagging and cladding, etc;

(i) Servicing and repair of existing fire water piped reticulation, including fittings, valves, pressure gauges, brackets, etc;

(j) Servicing, cleaning and repair of domestic geysers, including de-scaling, testing for leaks, replacing of elements, safety valves and thermostats if required, etc;

(k) Handing over of complete systems on completion of the repair work to the satisfaction of the Engineer, when the maintenance period shall commence;

(l) The supply and compilation of operating and maintenance manuals;

(m) The testing, adjusting and commissioning of all systems;

(n) The introduction of a maintenance control plan, including logging, recording and control procedures.

PAA 05.02 REPAIR WORK TO PLUMBING AND DRAINAGE INSTALLATION

The repair work to this installation shall at least include, but not be limited to the work listed below. Any items, components or installations not detailed in particular but found to be defective or inoperative during the inspection and report phase, shall be repaired or replaced as instructed by the Engineer.

PAA 05.02.01 Ablutions and communal ablutions

(a) ablutions and communal ablutions

(i) Replace aboveground GMS cold-water pipe installation complete with copper pipes with capillary soldered fittings.

(ii) Service and repair copper hot-water installation, including insulation and bracketing, and replace pipes and fittings that are beyond repair.

(iii) Service and repair sanitary drainage installation, and replace items that are missing or beyond repair, including traps and inspection eyes.

(iv) Service and repair brassware with repair kits and replace with the following approved items, if missing or damaged beyond repair:

(1) WHB, wash trough, bath and shower taps with non-removable tap handles;
(2) Shut-off valves intended as flushing mechanisms for urinals, to be replaced with concealed junior flush valves where possible or exposed junior flush valves, regardless of condition of existing valves;
(3) Cistern and concealed senior flush valves to be replaced with concealed senior flush valves;
(4) Rubber flexi-traps for WHBs, wash troughs and urinals;
(5) Vandal-proof shower gratings;
(6) Vandal-proof water saving shower heads;

(7) Brace wall-mounted taps in washing areas with approved brackets.

(v) Service and repair sanitary ware, including destaining and chip repair of enamelled or vitreous china equipment, dent removal from stainless steel equipment, replacement of missing or damaged parts such as toilet seats with vandal-proof alternatives, and replace missing or irreparably damaged equipment with the following approved items:

(1) Stainless steel braced WHBs and wash troughs;
(2) Stainless steel wall-mounted and urinals;
(3) Stainless steel WCs.

(vi) Equipment such as concealed flush valve mechanisms that are installed in areas accessible to inmates, such as courtyards, are to be enclosed in a lockable cabinet constructed from an angle iron frame and expanded metal panels, fixed to wall with expansion bolts.

(b) Visitors ablution

(i) Replace GMS water pipe installation with copper pipes with capillary soldered fittings.

(ii) Service and repair sanitary drainage installation and replace items that are missing or beyond repair, including traps and inspection eyes.

(iii) Service and repair brassware with repair kits and replace with the following approved items, if missing or damaged beyond repair:

(1) Shut-off valves intended as flushing mechanisms for urinals, to be replaced with concealed junior flush valves where possible or exposed junior flush valves, regardless of condition of existing valves;
(2) Cisterns and concealed senior flush valves to be replaced with concealed senior flush valves;
(3) Rubber flexi-traps for WHBs, wash troughs and urinals.

(iv) Service and repair sanitary ware, including destaining and chip repair of enamelled or vitreous china equipment, dent removal from stainless steel equipment, replacement of missing or damaged parts such as toilet seats with vandal-proof alternatives, and replace missing or irreparably damaged equipment with the following approved items:

(1) Stainless steel urinals;
(2) Vitreous china floor-mounted WC pans.

(c) Guard towers

(i) Replace GMS water pipes with copper pipe and soldered fittings, and service and repair copper pipe installation.

(ii) Service and repair sanitary drainage installation, and replace items that are missing or beyond repair, including traps and inspection eyes.

(iii) Service and repair brassware with repair kits and replace with the following approved items, if missing or damaged beyond repair:

(1) WHB, wash trough, bath and shower taps with non-removable tap handles;
(2) Replace corroded cast-iron cistern with plastic cisterns;
(3) Rubber flexi-traps for WHBs, wash troughs and urinals.

(iv) Service and repair sanitary ware, including destaining and chip repair of enamelled or vitreous china equipment, dent removal from stainless steel equipment, replacement of missing or damaged parts such as toilet seats with vandal-proof alternatives, and replace missing or irreparably damaged equipment with the following approved items:

(1) Stainless steel braced WHBs and wash troughs;
(2) Vitreous china floor-mounted WC pans.

(d) Hospital

(i) Service and repair of copper domestic water installation, including insulation of hot-water pipes and replacement of unsuitable brackets, and irreparable sections of pipes and fittings.

(ii) Service and repair sanitary and brassware with repair kits, and replace missing or irreparably damaged equipment.

(e) Administration offices

(i) Replace GMS water pipe installation with copper pipes with capillary soldered fittings.

(ii) Service and repair sanitary drainage installation, and replace items that are missing or beyond repair, including traps and inspection eyes.

(iii) Service and repair brassware with repair kits and replace with the following approved items, if missing or damaged beyond repair:

(1) WHB, wash trough, bath and shower taps with non-removable tap handles;
(2) Shut-off valves intended as flushing mechanisms for urinals, to be replaced with concealed junior flush valves where possible or exposed junior flush valves, regardless of condition of existing valves;
(3) Rubber flexi-traps for WHBs, wash troughs and urinals;
(4) Vandal-proof shower gratings;
(5) Vandal-proof water saving shower heads.

(iv) Service and repair all sanitary ware, including destaining and chip repair of vitreous or enamelled surfaces, dent removal from stainless steel equipment, replacement of missing or damaged parts such as WC seats and lids, or replacement of irreparable equipment.

(f) Facility main reticulation installations

(i) Service and repair domestic water installations, including insulation and bracketing, pressure testing of installations, replacement of damaged, corroded or leaking sections of piping and fittings and unsuitable brackets.

(ii) Service and repair sewer pipes, including rodding of system and visual inspection by means of a video survey if required. Replace damaged and leaking sections of sewer and fittings, damaged or broken inspection eyes, cleaning eyes and manhole covers.

(iii) Install a dedicated fire water supply network to existing and new fire hose reels and hydrants, including a fire water booster.

(iv) Replace underground cold-water ring supplying garden taps in cell block courtyard.

(v) Install a strainer to domestic water supply.

PAA 05.02.02

(a) Old youth cell ablutions

(i) Replace aboveground GMS cold-water pipe installation complete with copper pipes with capillary soldered fittings.

(ii) Service and repair copper hot-water installation, including insulation and bracketing, and replace pipes and fittings that are beyond repair.

(iii) Service and repair sanitary drainage installation, and replace items that are missing or beyond repair, including traps and inspection eyes.

(iv) Service and repair brassware with repair kits and replace with the following approved items, if missing or damaged beyond repair:

(1) WHB, wash trough, bath and shower taps with non-removable tap handles;
(2) Shut-off valves intended as flushing mechanisms for urinals, to be replaced with concealed junior flush valves where possible or exposed junior flush valves, regardless of condition of existing valve;
(3) Cistern and concealed senior flush valves to be replaced with concealed senior flush valves;
(4) Rubber flexi-traps for WHBs, wash troughs and urinals;
(5) Vandal-proof shower gratings;
(6) Vandal-proof water saving shower heads;
(7) Brace wall-mounted taps in washing areas with approved brackets.

(v) Service and repair sanitary ware, including destaining and chip repair of enamelled or vitreous china equipment, dent removal from stainless steel equipment, replacement of missing or damaged parts such as toilet seats with vandal-proof alternatives, and replace missing or irreparably damaged equipment with the following approved items:

(1) Stainless steel braced WHBs and wash troughs;
(2) Stainless steel wall-mounted type urinals;

(3) Stainless steel WCs.

(vi) Equipment such as concealed flush valve mechanisms that are installed in areas accessible to inmates, such as courtyards, are to be enclosed in a lockable cabinet constructed using an angle iron frame and expanded metal panels, fixed to wall with expansion bolts.

(b) Refurbished cell ablutions and single cell ablutions

(i) Service and repair copper domestic water installation, including insulation of hot-water pipes and replacement of unsuitable brackets and irreparable sections of pipes and fittings.

(ii) Service and repair sanitary drainage installation and replace items that are missing or beyond repair, including traps and inspection eyes.

(iii) Service and repair brassware with repair kits and replace with the following approved items, if missing or damaged beyond repair:

(1) WHB, wash trough, bath and shower taps with non-removable tap handles;
(2) Shut-off valves intended as flushing mechanisms for urinals, to be replaced with concealed junior flush valves where possible or exposed junior flush valves, regardless of condition of existing valves;
(3) Cistern and concealed senior flush valves to be replaced with concealed senior flush valves;
(4) Rubber flexi-traps for WHBs, wash troughs and urinals;
(5) Vandal-proof shower gratings;
(6) Vandal-proof water-saving shower heads;
(7) Brace wall-mounted taps in washing areas with approved brackets.

(iv) Service and repair sanitary ware, including destaining and chip repair of enamelled or vitreous china equipment, dent removal from stainless steel equipment, replacement of missing or damaged parts such as toilet seats with vandal-proof alternatives, and replace missing or irreparably damaged equipment with the following approved items:

(1) Stainless steel braced WHBs and wash troughs;
(2) Stainless steel wall-mounted type urinals;
(3) Stainless steel WCs.

(v) Equipment such as concealed flush valve mechanisms that are installed in areas accessible to inmates, such as courtyards, are to be enclosed in a lockable cabinet constructed using an angle iron frame and expanded metal panels, fixed to wall with expansion bolts.

(vi) Disconnect and remove geysers in single cell ablutions and connect to nearby hot-water distribution lines from central hot-water plant.

(c) Non-refurbished cell ablutions

(i) Replace GMS water pipe installation with copper pipes with capillary soldered fittings.

(ii) Service and repair sanitary drainage installation, and replace items that are missing or beyond repair, including traps and inspection eyes.

(iii) Replace all brassware with the following approved equipment:

(1) WHB, wash trough, bath and shower taps with non-removable tap handles;
(2) Shut-off valves intended as flushing mechanisms for urinals, to be replaced with concealed junior flush valves where possible or exposed junior flush valves, regardless of condition of existing valves;
(3) Cistern and concealed senior flush valves to be replaced with concealed senior flush valves;
(4) Rubber flexi-traps for WHBs, wash troughs and urinals;
(5) Vandal-proof shower gratings;
(6) Vandal-proof water-saving shower heads.
(7) Brace wall-mounted taps in washing areas with approved brackets.

(iv) Replace all sanitary ware with the following approved equipment:

(1) WHB, wash trough, bath and shower taps with non-removable tap handles;
(2) Shut-off valves intended as flushing mechanisms for urinals, to be replaced with concealed junior flush valves where possible or exposed junior flush valves, regardless of condition of existing valves;
(3) Cistern and concealed senior flush valves to be replaced with concealed senior flush valves;
(4) Rubber flexi-traps for WHBs, wash troughs and urinals;
(5) Vandal-proof shower gratings;
(6) Vandal-proof water-saving shower heads;
(7) Brace wall-mounted taps in washing areas with approved brackets.

(v) Replace all sanitary ware with the following approved equipment:

(1) Stainless steel braced WHBs and wash troughs;
(2) Stainless steel wall-mounted and recessed urinals;
(3) Stainless steel WCs.

(vi) Equipment such as concealed flush valve mechanisms that are installed in areas accessible to inmates, such as courtyards, are to be enclosed in a lockable cabinet constructed using an angle iron frame and expanded metal panels, fixed to wall with expansion bolts.

(d) School, education and training centre, clothing store, social workers' and parole offices

(i) Replace GMS water pipe installation with copper pipes with capillary soldered fittings.

(ii) Service and repair sanitary drainage installation, and replace items that are missing or beyond repair, including traps and inspection eyes.

(iii) Connect washhand basin at training centre that currently drains into rainwater channel to sewer system.

(iv) Service and repair brassware with repair kits and replace with the following approved items, if missing or damaged beyond repair:

(1) WHB, wash trough, bath and shower taps with non-removable tap handles;
(2) Shut-off valves intended as flushing mechanisms for urinals, to be replaced with concealed junior flush valves where possible or exposed junior flush valves, regardless of condition of existing valves;
(3) Cistern and concealed senior flush valves to be replaced with concealed senior flush valves;
(4) Rubber flexi-traps for WHBs, wash troughs and urinals;
(5) Vandal-proof shower gratings;
(6) Vandal-proof water-saving shower heads;
(7) Brace wall-mounted taps in washing areas with approved brackets.

(v) Service and repair sanitary ware, including destaining and chip repair of enamelled or vitreous china equipment, dent removal from stainless steel equipment, replacement of missing or damaged parts such as toilet seats with vandal-proof alternatives, for inmates ablution, and replace missing or irreparably damaged equipment with the following approved items:

(1) Stainless steel WHBs and wash troughs;
(2) Stainless steel wall-mounted and recessed urinals;
(3) Stainless steel WCs.

(vi) Service and repair sanitary ware, including destaining and chip repair of enamelled or vitreous china equipment, dent removal from stainless steel equipment, replacement of missing or damaged parts such as toilet seats with vandal-proof alternatives, for members ablution, and replace missing or irreparably damaged equipment with the following approved items

(1) Stainless steel braced WHBs and wash troughs;
(2) Vitreous china floor-mounted WC pans;
(3) Stainless steel cabinet-mounted sink.

(vii) Equipment such as concealed flush valve mechanisms that are installed in areas accessible to inmates, such as courtyards, are to be enclosed in a lockable cabinet constructed using an angle iron frame and expanded metal panels, fixed to wall with expansion bolts.

(viii) Service and repair domestic geyser installation and replace geysers that are beyond repair.

(e) Hospital section

(i) Replace GMS water pipe installation with copper pipes with capillary soldered fittings.

(ii) Service and repair sanitary drainage installation and replace items that are missing or beyond repair, including traps and inspection eyes.

(iii) Service and repair brassware with repair kits and replace with the following approved items, if missing or damaged beyond repair:

(1) WHB, wash trough, bath and shower taps with non-removable tap handles;
(2) Shut-off valves intended as flushing mechanisms for urinals, to be replaced with concealed junior flush valves where possible or exposed junior flush valves, regardless of condition of existing valves;
(3) Cistern and concealed senior flush valves to be replaced with concealed senior flush valves;
(4) Rubber flexi-traps for WHBs, wash troughs and urinals;
(5) Vandal-proof shower gratings;
(6) Vandal-proof water-saving shower heads;
(7) Brace wall-mounted taps in washing areas with approved brackets.

(iv) Service and repair sanitary ware, including destaining and chip repair of enamelled or vitreous china equipment, dent removal from stainless steel equipment, replacement of missing or damaged parts such as toilet seats with vandal-proof alternatives, and replace missing or irreparably damaged equipment with the following approved items:

(1) Stainless steel WHBs and wash trough;
(2) Stainless steel wall-mounted and recessed urinals;
(3) Stainless steel WCs.

(v) Service and repair sanitary ware, including destaining and chip repair of enamelled or vitreous china equipment, dent removal from stainless steel equipment, replacement of missing or damaged parts such as toilet seats with vandal-proof alternatives, and replace missing or irreparably damaged equipment with the following approved items:

(1) Stainless steel braced WHBs and wash troughs;
(2) Vitreous china floor-mounted WC pans;
(3) Stainless steel cabinet-mounted sink.

(vi) Equipment such as concealed flush valve mechanisms that are installed in areas accessible to inmates, such as courtyards, are to be enclosed in a lockable cabinet constructed using an angle iron frame and expanded metal panels, fixed to wall with expansion bolts.

(vii) Disconnect and remove geysers and connect to nearby hot-water distribution lines from central hot-water plant.

(f) Kitchen and dining hall

(i) Replace GMS water pipe installation with copper pipes with capillary soldered fittings.

(ii) Service and repair sanitary drainage installation, and replace items that are missing or beyond repair, including traps and inspection eyes.

(iii) Install stainless steel floor drains to kitchen and dining hall sculleries, and a 4 litre stainless steel grease trap, including drainage pipes and connection to sewer system, and disconnection of existing redundant kitchen floor drainage.

(iv) Service and repair brassware with repair kits and replace with the following approved items, if missing or damaged beyond repair:

(1) WHB, wash trough, bath and shower taps with non-removable tap handles;
(2) Shut-off valves intended as flushing mechanisms for urinals, to be replaced with concealed junior flush valves where possible or exposed junior flush valves, regardless of condition of existing valves;
(3) Cistern and concealed senior flush valves to be replaced with concealed senior flush valves;
(4) Rubber flexi-traps for WHBs, wash troughs and urinals;
(5) Vandal-proof shower gratings;
(6) Vandal-proof water-saving shower heads;
(7) Brace wall-mounted taps in washing areas with approved brackets.

(v) Service and repair sanitary ware, including destaining and chip repair of enamelled or vitreous china equipment, dent removal from stainless steel equipment, replacement of missing or damaged parts such as toilet seats with vandal-proof alternatives, and replace missing or irreparably damaged equipment with the following approved items:

(1) Stainless steel braced WHBs and wash troughs;
(2) Vitreous china floor-mounted WC pans;
(3) Stainless steel cabinet-mounted sink;
(4) Stainless steel pot sinks.

(vi) Equipment such as concealed flush valve mechanisms that are installed in areas accessible to inmates, such as courtyards, are to be enclosed in a lockable cabinet constructed using an angle iron frame and expanded metal panels, fixed to wall with expansion bolts.

(vii) Service and repair domestic geyser installation and replace geysers that are beyond repair.

(g) Administration building

(i) Replace GMS water pipe installation with copper pipes with capillary soldered fittings.

(ii) Service and repair sanitary drainage installation, and replace items that are missing or beyond repair, including traps and inspection eyes.

(iii) Service and repair brassware with repair kits and replace with the following approved items, if missing or damaged beyond repair:

(1) WHB, wash trough, bath and shower taps with non-removable tap handles;
(2) Shut-off valves intended as flushing mechanisms for urinals, to be replaced with concealed junior flush valves where possible or exposed junior flush valves, regardless of condition of existing valves;
(3) Rubber flexi-traps for WHBs, wash troughs and urinals;
(4) Vandal-proof shower gratings;
(5) Vandal-proof water-saving shower heads;

(iv) Service and repair all sanitary ware, including destaining and chip repair of vitreous or enamelled surfaces, dent removal from stainless steel equipment, replacement of missing or damaged parts such as WC seats and lids, or replacement of irreparable equipment.

(h) Facility main reticulation installations

(i) Service and repair domestic water installations, including insulation and bracketing, pressure testing of installations, replacement of damaged, corroded or leaking sections of piping and fittings and unsuitable brackets.

(ii) Service and repair sewer pipes, including rodding of system and visual inspection by means of a video survey if required. Replace damaged and leaking sections of sewer and fittings, damaged or broken inspection eyes, cleaning eyes and manhole covers.

(iii) Install fire water supply network to existing and new fire hose reels and hydrants from the existing water network.

(iv) Install a strainer to domestic water supply.

(v) Install proper supports and protection to elevated hot-water circulation pipes spanning between buildings.

PAA 05.02.03 Residential facilities

(a) Houses, flats and single quarters

(i) Service and repair domestic hot and cold-water installations, including pressure testing of existing systems, and replace items that are beyond repair. Where necessary, replace entire system with capillary soldered copper pipe system.

(ii) Service and repair drainage system, including rodding of system, and replace damaged or leaking pipes and fittings, manhole covers, cleaning and inspection eyes and gully gratings.

(iii) Service and repair brassware such as taps, stop-cocks and flushing mechanisms with repair kits, and replace items that are missing or beyond repair.

(iv) Service and repair sanitary ware, including chip repair, destaining and re-coating of baths, WC bowls and washhand basins, dent removal and destaining of wash troughs and kitchen sinks and replacement of damaged or missing parts such as WC seats and lids and cistern lids. Replace missing or irreparably damaged equipment. The following replacement items shall be installed where required:

(1) Plastic cisterns
(2) Steel enamel bath tubs
(3) Stainless steel wash troughs.

(v) Service and repair domestic geysers, including descaling, testing for leaks, replacement of elements if required, servicing or replacement of valves, or replace geysers that are damaged beyond repair.

(vi) Replace interior safety valves on geysers at new houses with approved alternatives.

(vii) Geyser overflows to be piped down to ground level from penetrations through external walls at flats.

PAA 05.02.04 Agricultural facilities

(a) Tractor store and stables

(i) Replace GMS water pipe installation with copper pipes with capillary soldered fittings.

(ii) Service and repair sanitary drainage installation and replace items that are missing or beyond repair, including traps and inspection eyes.

(iii) Replace all sanitary and brassware.

(iv) Install piped reticulation for a fire hose reel at tractor store.

(b) Dairy and surrounding buildings

(i) Replace aboveground GMS cold-water pipe installation complete with copper pipes with capillary soldered fittings.

(ii) Service and repair copper hot-water installation, including insulation and bracketing and replace pipes and fittings that are damaged beyond repair.

(iii) Service and repair sanitary drainage installation and replace items that are missing or beyond repair, including traps and inspection eyes.

(iv) Service and repair brassware with repair kits and replace with the following approved items, if missing or damaged beyond repair:

(1) WHB, wash trough, bath and shower taps with non-removable tap handles;
(2) Shut-off valves intended as flushing mechanisms for urinals, to be replaced with concealed junior flush valves where possible or exposed junior flush valves, regardless of condition of existing valves;
(3) Cistern and concealed senior flush valves to be replaced with concealed senior flush valves;
(4) Rubber flexi-traps for WHBs, wash troughs and urinals;
(5) Vandal-proof shower gratings;
(6) Vandal-proof water saving shower heads;
(7) Brace wall-mounted taps in washing areas with approved brackets.

(v) Service and repair sanitary ware, including destaining and chip repair of enamelled or vitreous china equipment, dent removal from stainless steel equipment, replacement of missing or damaged parts such as toilet seats with a vandal-proof alternatives for inmates' ablution, and replace missing or irreparably damaged equipment with the following approved items:

(1) Stainless steel washhand basins;
(2) Stainless steel wall-mounted and recessed urinals;
(3) Stainless steel WCs.

(vi) Service and repair underground domestic water installations, including insulation and bracketing, pressure testing of installations, replacement of damaged, corroded or leaking sections of piping and fittings and unsuitable brackets.

(vii) Replace wash troughs in milk room and connect waste to drainage system.

(viii) Install floor channels and sump to dairy and connect to drainage system.

(c) Piggery

(i) Service and repair domestic hot and cold water installation, including insulation and bracketing and replace leaking sections of pipes and fittings.

(ii) Service and repair sanitary drainage installation and replace items that are missing or beyond repair.

(iii) Replace underground water pipe installation and install a strainer on the main supply to this installation.

(iv) Replace damaged and missing drinking nozzles.

(d) Agriculture head office, implement store at dam, Eerstevallei store

(i) Replace existing GMS water pipes with capillary soldered copper pipe.

(ii) Repair and service copper water pipes, including bracketing, and replace leaking and damaged sections of pipes and fittings.

(iii) Repair and service sanitary and brassware, where necessary with repair kits, in members' ablutions, replace missing parts such as WC seats and lids, and replace damaged missing or excessively corroded equipment.

(iv) Replace sanitary and brassware in inmates' ablutions as per Prison's approved equipment.

(v) Service and repair domestic geysers, including descaling, testing for leaks, replacement of elements if required, servicing or replacement of valves, or replace geysers that are damaged beyond repair.

(vi) Replace majority of sanitary and brassware, as well as plumbing and drainage installations at implement store and Eerstevallei store, with the following:

(1) Approved sanitary and brassware;
(2) Copper water pipe and capillary soldered fittings;
(3) Plain ended cast-iron soil pipes and fittings and GMS waste pipes with brass fittings.

PAA 05.02.05 Club, entertainment and sport facilities

(a) Staff dining room, hall bar and a la carte

(i) Replace aboveground GMS cold-water pipes with copper pipes and service and repair copper pipes, replacing damaged or leaking sections of pipes.

(ii) Service and repair copper hot-water pipe installation and replace missing or leaking sections.

(iii) Inspect underground water piping, service and repair and replace leaking or damaged sections.

(iv) Service and repair sanitary drainage installations and replace items that are missing or beyond repair, including traps and inspection eyes.

(v) Service and repair sewer pipes, including rodding of system and visual inspection by means of video survey if required. Replace damaged and leaking sections of sewer and fittings, damaged or broken inspection eyes, cleaning eyes and manhole covers.

(vi) Install a fire water supply to new fire hose reels.

(vii) Install a strainer to domestic water supply.

(viii) Service and repair brassware, such as taps, stop-cocks and flushing mechanisms with repair kits, and replace items that are missing or beyond repair.

(ix) Service and repair sanitary ware, including chip repair, destaining and re-coating of baths, WC bowls and washhand basins, dent removal from and destaining of wash troughs and kitchen sinks and replacement of damaged or missing parts such as WC seats and lids and cistern lids. Replace missing or irreparably damaged equipment. The following replacement items shall be installed where required:

(1) Plastic cisterns
(2) Stainless steel wash troughs.

(x) Install a properly sized stainless steel grease trap and floor drainage system to kitchen and preparation area.

(xi) Service and repair domestic geysers including descaling, testing for leaks, replacement of elements if required, servicing or replacement of valves, or replace geysers that are damaged beyond repair.

(b) Swimming pool and ablutions, rugby stadium, gym, dam hall, bowls clubhouse

(i) Service and repair GMS domestic water installation, including pressure testing, and replace damaged or leaking sections of pipes and fittings.

(ii) Service and repair sanitary drainage installation and replace items that are missing or beyond repair, including traps and inspection eyes.

(iii) Service and repair sewer pipes, including rodding of system and visual inspection by means of video survey if required. Replace damaged and leaking sections of sewer and fittings, damaged or broken inspection eyes, cleaning eyes and manhole covers.

(iv) Service and repair brassware, such as taps, stop-cocks and flushing mechanisms with repair kits, and replace items that are missing or beyond repair.

(v) Service and repair sanitary ware, including chip repair, destaining and re-coating of baths, WC bowls and washhand basins, dent removal and destaining of wash troughs and kitchen sinks and replace damaged or missing parts such as WC seats and lids and cistern lids. Replace missing or irreparably damaged equipment. The following replacement items shall be installed where required:

(1) Plastic cisterns
(2) Steel enamel bath tubs
(3) Stainless steel wash troughs.

(vi) Service and repair domestic geysers including descaling, testing for leaks, replacement of elements if required, servicing or replacement of valves, or replace geysers that are damaged beyond repair.

PAA 05.02.06 Workshops, storage, maintenance and transport facilities, boiler house

(a) Service and repair GMS domestic water installation, including pressure testing, and replace damaged or leaking sections of pipes and fittings.

(b) Replace GMS water pipes with copper at maintenance building where there is a mixture of GMS and copper.

(c) Service and repair sanitary drainage installation and replace items that are missing or beyond repair, including traps and inspection eyes.

(d) Service and repair sewer pipes, including rodding of system and visual inspection by means of video survey if required. Replace damaged and

leaking sections of sewer and fittings, damaged or broken inspection eyes, cleaning eyes and manhole covers.

(e) Service and repair brassware, such as taps, stop-cocks and flushing mechanisms with repair kits, and replace items that are missing or beyond repair.

(f) Service and repair sanitary ware, including chip repair, destaining and re-coating of baths, WC bowls and washhand basins, dent removal from and destaining of wash troughs and kitchen sinks and replacement of damaged or missing parts such as WC seats and lids and cistern lids. Replace missing or irreparably damaged equipment. The following replacement items shall be installed where required:

(i) Plastic cisterns
(ii) Stainless steel wash troughs.

(g) Service and repair domestic geysers including descaling, testing for leaks, replacement of elements if required, servicing or replacement of valves, or replace geysers that are damaged beyond repair.

(h) Install fire water piped reticulation system to areas where fire hose reels are to be installed at workshops.

(i) Clean and service oil and sand traps at workshops and transport storage building.

PAA 05.02.07 <u>Office and support services facilities at inmates' ablutions, head office, doctor, instructors' offices, SAPS building, instructing office</u>

(a) Service and repair domestic water installation, including pressure testing, and replace damaged or leaking sections of pipes and fittings.

(b) Replace GMS water pipes with copper at SAPS building where there is a mixture of GMS and copper.

(c) Service and repair sanitary drainage installation and replace items that are missing or beyond repair, including traps and inspection eyes.

(d) Service and repair sewer pipes, including rodding of system and visual inspection by means of video survey if required. Replace damaged and leaking sections of sewer and fittings, damaged or broken inspection eyes, cleaning eyes and manhole covers.

(e) Replace all brassware with the following approved equipment at inmates' ablutions:

(i) WHB, wash trough, bath and shower taps with non-removable tap handles;
(ii) Shut-off valves intended as flushing mechanisms for urinals, to be replaced with concealed junior flush valves where possible or exposed junior flush valves, regardless of condition of existing valves;
(iii) Cistern and concealed senior flush valves to be replaced with concealed senior flush valves;
(iv) Rubber flexi-traps for WHBs, wash troughs and urinals;
(v) Vandal-proof shower gratings;
(vi) Vandal-proof water-saving shower heads;
(vii) Brace wall-mounted taps in washing areas with approved brackets.

(f) Replace all sanitary ware with the following approved equipment at inmates' ablutions:

(i) WHB, wash trough, bath and shower taps with non-removable tap handles;
(ii) Shut-off valves intended as flushing mechanisms for urinals, to be replaced with concealed junior flush valves where possible or exposed junior flush valves, regardless of condition of existing valves;
(iii) Cistern and concealed senior flush valves to be replaced with concealed senior flush valves;
(iv) Rubber flexi-traps for WHBs, wash troughs and urinals;
(v) Vandal-proof shower gratings;
(vi) Vandal-proof water-saving shower heads;
(vii) Brace wall-mounted taps in washing areas with approved brackets.

(g) Service and repair brassware, such as taps, stop-cocks and flushing mechanisms with repair kits, and replace items that are missing or beyond repair, at members' ablutions.

(h) Service and repair sanitary ware, including chip repair, destaining and re-coating of baths, WC bowls and washhand basins, dent removal from and destaining of wash troughs and kitchen sinks and replacement of damaged or missing parts such as WC seats and lids and cistern lids. Replace missing or irreparably damaged equipment. The following replacement items shall be installed where required at members' ablutions:

(i) Plastic cisterns
(ii) Stainless steel wash troughs.

(i) Service and repair domestic geysers, including descaling, testing for leaks, replacement of elements if required, servicing or replacement of valves, or replace geysers that are damaged beyond repair.

PAA 05.02.08 **Training and education facilities (crèche, primary school, training centre, inmates training centre)**

(a) Service and repair domestic water installation, including pressure testing, and replace damaged or leaking sections of pipes and fittings.

(b) Replace GMS water pipes with copper at primary school building where there is a mixture of GMS and copper.

(c) Service and repair sanitary drainage installation and replace items that are missing or beyond repair, including traps and inspection eyes.

(d) Service and repair sewer pipes, including rodding of system and visual inspection by means of video survey if required. Replace damaged and leaking sections of sewer and fittings, damaged or broken inspection eyes, cleaning eyes and manhole covers.

(e) Service and repair brassware, such as taps, stop-cocks and flushing mechanisms with repair kits, and replace items that are missing or beyond repair.

(f) Service and repair sanitary ware, including chip repair, destaining and re-coating of baths, WC bowls and washhand basins, dent removal and destaining of wash troughs and kitchen sinks and replacement of damaged or missing parts such as WC seats and lids and cistern lids. Replace missing or irreparably damaged equipment. The following replacement items shall be installed where required:

(i) Plastic cisterns.
(ii) Steel enamel bath tubs.
(iii) Stainless steel wash troughs.

(g) Replace all sanitary and brassware at primary school ablutions.

(h) Service and repair domestic geysers, including descaling, testing for leaks, replacement of elements if required, servicing or replacement of valves, or replace geysers that are damaged beyond repair.

PAA 05.02.13 Main gate house

(a) Service and repair domestic water installation, including pressure testing, and replace damaged or leaking sections of pipe and fittings.

(b) Service and repair sanitary drainage installation and replace items that are missing or beyond repair, including traps and inspection eyes.

(c) Service and repair sewer pipes, including rodding of system and visual inspection by means of video survey if required. Replace damaged and leaking sections of sewer and fittings, damaged or broken inspection eyes, cleaning eyes and manhole covers.

(d) Service and repair brassware, such as taps, stop-cocks and flushing mechanisms with repair kits, and replace items that are missing or beyond repair.

(e) Service and repair sanitary ware, including chip repair, destaining and re-coating of baths, WC bowls and washhand basins, dent removal from and destaining of wash troughs and kitchen sinks and replacement of damaged or missing parts such as WC seats and lids and cistern lids. Replace missing or irreparably damaged equipment.

(f) Install a strainer to domestic water supply.

PAA 06 DETAILS OF MAINTENANCE WORK

[Note: There will be no maintenance work required for this installation and equipment in this contract.]

PAA 06.01 GENERAL

The Contractor shall be responsible for the complete maintenance of all the equipment, components, installations and systems forming part of this repair and maintenance contract. The Contractor shall strictly adhere to Additional Specification SA: General Maintenance, and Technical Specification AA: Plumbing and Drainage Installations, with regard to the maintenance period, obligations, responsibilities, actions and activities, etc, which shall also include the following maintenance actions:

(a) Preventative maintenance. A guideline to the required actions is provided in specification AA. The actions will not be limited to these guidelines, but shall include all additional actions, work, materials, etc, necessary to maintain this installation at an acceptable level.

(b) Corrective maintenance as described and defined in Additional Specification SA: General Maintenance.

(c) Breakdown maintenance as described and defined in Additional Specification SA: General Maintenance.

For this particular installation there shall be no fatal breakdown definition.

Emergency breakdown shall be defined as a failure of any equipment, components and systems which prevents the provision of water and the drainage of the equipment to the consumer points.

PAA 07 MEASUREMENT AND PAYMENT

All new building work and repair work to existing structures and buildings necessitated by repairs to the plumbing and drainage services as scheduled, shall be done in accordance with the structural and building section of the technical and Particular Specifications. The costs of such building and repair works shall be deemed to be included in the tendered rates for the applicable items as scheduled in this section.

PAA.01 **INSPECTION AND REPORT ON EXISTING INSTALLATIONS**.. ……Unit: inumber

The unit of measurement shall be the number of times inspections of and reports on the installation are carried out on the instructions of the Engineer.

The tendered rate shall include full compensation for the inspection and written report on all items, systems, components, equipment and installations, including the establishment of defects, leaks, damage, shortfalls, structural soundness, repairs required, details of existing equipment and suitability of the equipment for the purpose it serves.

PAA.02 **OPERATING AND MAINTENANCE MANUALS**.....Unit: set

The unit of measurement shall be the set of operating and maintenance manuals provided.

The tendered rate for the set shall include full compensation for obtaining, verification, compilation and submission of a full set of as-built drawings, inventory lists and operating and maintenance manuals in accordance with Additional Specification SB: Operating and Maintenance Manuals.

The tendered rate shall also include full compensation for all equipment necessary to establish the exact position and depth of underground services as well as the recording of all information on electronic drawing format.

PAA.03 **ISOLATION, STRIPPING, DISMANTLING AND REMOVAL OF EXISTING BRASSWARE, SANITARYWARE AND PIPING INSTALLATIONS**.....Unit: number, metre

The unit of measurement shall be the number of each item of brassware and sanitaryware and metre of piping removed, including fixtures and fittings.

The tendered rates shall include full compensation for the isolation, dismantling and removal of irreparably damaged, broken and/or unsuitable brassware (flush valves, taps, mixers, shower roses, undertile stop-cocks, demand bib taps, hose bib taps, shut-off valves, etc) and sanitary ware (water closets, cisterns, basins, urinals, baths, wash troughs, sinks, etc) including all associated pipework, brackets, traps, pan connectors, etc.

The tendered rates shall also include full compensation for the isolation, stripping, dismantling and removal of irreparably damaged, broken or unsuitable pipework installed on surface, underground, chased into walls, in ceiling voids and/or service ducts, as well as the plugging off of connections to this pipework as for the removal off site and/or to storage of all removed items as mentioned above.

PAA.04 **ISOLATION, STRIPPING, DISMANTLING AND REMOVAL OF EXISTING GEYSER INSTALLATIONS** .....……..Unit: number

The unit of measurement shall be the number of each geyser installation removed, including associated pipework and fittings.

The tendered rates shall include full compensation for the isolation, stripping, dismantling and removal of irreparably damaged, broken and/or corroded domestic geysers, including shut-off valves, non-return valves, strainers, pressure-reducing valves, vacuum breakers, air release valves, safety valves, etc, and the removal thereof off site.

PAA.05 **SUPPLY AND INSTALLATION OF SANITARY- AND BRASSWARE** ..... ……..……Unit: number

The unit of measurement shall be the number of each item of sanitary and brassware supplied and installed, including all associated pipework and fittings.

The tendered rate shall include full compensation for the supply, delivery, positioning, installation, testing, cleaning, commissioning and hand-over of sanitary- and brassware including all necessary pipework, traps, brackets, fittings, bends, junctions, cleaning eyes, etc, to connect the sanitary- and brassware to the existing water supply and/or drainage installation.

The tendered rate shall also include full compensation for chasing and/or building into walls and the reinstating of existing surfaces such as floors, walls, ceilings, etc.

PAA.06 **SUPPLY AND INSTALLATION OF DRAINAGE PIPING INSTALLATION** ..... ……..……....Unit: metre

The unit of measurement shall be the metre of each type of piping in the installation supplied and installed, including all fixtures and fittings.

The tendered rates shall include full compensation for the supply, delivery, installation, testing, cleaning, commissioning and handover of new drainage piping, installed on surface against walls or soffits, underground, in ceiling voids, chased and built into walls and/or service ducts, including all necessary bends, junctions, tees, cleaning eyes, covers, traps, floor drains, gratings, brackets, hangers, etc, to hand over a complete and effective installation that complies with local government regulations.

The tendered rates shall also include full compensation for the necessary underground works such as excavation, pipe bedding, fill blanket, backfilling and compaction and for the reinstatement of existing surfaces such as floors, walls, ceiling, roads, paving, etc, as well as connection to the existing drainage installation.

PAA.07 **SUPPLY AND INSTALLATION OF DOMESTIC WATER PIPING INSTALLATION** ..... Unit: metre

The unit of measurement shall be the metre of each type of piping in the installation supplied and installed, indicating all fixtures and fittings.

The tendered rates shall include full compensation for the supply, delivery, installation, testing, cleaning, sterilising, commissioning and hand-over of new water piping installed on surface against walls or soffits, underground, in ceiling voids, chased and built into walls and/or in service ducts, including all necessary bends, tees, reducers, elbows, valves, strainers, adapters, brackets, hangers, etc, to hand over a complete and effective installation that complies with local government regulations.

The tendered rates shall also include full compensation for the supply and installation of hot-water pipe insulation and cladding.

The tendered rates shall also include full compensation for the necessary underground works such as excavation, pipe bedding, fill blanket, backfilling and compaction and for the reinstatement of existing surfaces such as floors, walls, ceilings, roads, paving, etc, as well as connection to the existing domestic water installation.

PAA.08 **SUPPLY AND INSTALLATION OF DOMESTIC GEYSER INSTALLATION** .....Unit: number

The unit of measurement shall be the number of each geyser installation supplied and installed, including all associated pipework and fittings.

The tendered rates shall include full compensation for the supply and installation of domestic geysers, including shut-off valves, non-return valves, strainers, pressure-reducing valves, vacuum breakers, air release valves, safety valves, etc, as well as connection to existing piping and electrical supply.

PAA.09 **SUPPLY AND INSTALLATION OF FIRE WATER RETICULATION PIPEWORK** ..... Unit: metre

The unite of measurement still be the metre of each type of pipework supplied and installed in the fire water reticulation, including all fixtures and fittings.

The tendered rate shall include full compensation for the supply, delivery, installation, testing, cleaning, commissioning and hand-over of new fire water reticulation pipework installed on surface against walls or soffits and/or underground, including all necessary bends, tees, reducers, elbows, valves, adapters, brackets, hangers, pressure gauges, etc, to hand over a complete and effective installation that complies with local government regulations.

The tendered rates shall also include full compensation for the necessary underground work such as excavation, pipe bedding, fill blanket, backfilling and compaction and for the reinstatement of existing surfaces such as floors, walls, ceilings, roads, paving, etc, as well as connection to the existing fire water reticulation network.

PAA.10 **SERVICING, CLEANING AND REPAIR OF SANITARY WARE** .....Unit: number

The unit of measurement shall be the number of each item of sanitary ware serviced, cleaned and repaired, including all associated pipework and fittings.

The tendered rate shall include full compensation for the repair or replacement of all damaged or missing parts, servicing of all movable parts, cleaning of stained sanitary ware with approved cleaning agent, fixing of loose fixtures and brackets according to manufacturer's specifications, de-scaling and cleaning of cisterns and servicing of filling and flushing mechanisms, cleaning of all traps, fixing or replacing of damaged or missing shower, urinal and channel outlet gratings and any other work or action required to hand over an effective system that complies with local government regulations.

PAA.11 **SERVICING, OVERHAULING AND CLEANING OF BRASSWARE** ..... Unit: number

The unit of measurement shall be the number of each item of brassware serviced, overhauled or cleaned, including all associated pipework and fittings.

The tendered rate shall include full compensation for dismantling, cleaning and descaling, replacement of all gaskets, gland packings and seals on all valves, repair or replacement of all damaged or missing parts, replacement kits for worn or leaking flush valves, taps and mixers, repair or replacement of leaking, corroded or damaged flush pipes, readjusting of timing mechanisms on flush valves and metering taps and any other work or action required to hand over an effective system that complies with local government regulations.

PAA.12 **VIDEO SURVEYING OF UNDERGROUND DRAINAGE PIPEWORK**……... ..... Unit: metre

The unit of measurement shall be the metre of pipe surveyed irrespective the pipe material and diameter as authorised by the Engineer but not by the Engineer's Representative.

The tendered rate shall include full compensation for supplying and utilising the specialised equipment, for the operator's costs, for transport, for reporting on the fundings and for all else that may be required to carry out the survey successfully.

Reporting on the fundings of this video survey is over and above the reports carried out in terms of payment item PAA.01.

PAA.13 **SERVICING, CLEANING AND REPAIR OF DOMESTIC WATER AND DRAINAGE PIPE INSTALLATIONS**..... ……... Unit: metre

The unit of measurement shall be the metre of each type of pipe installation serviced, cleaned and repaired, including all fixtures and fittings.

The tendered rates shall include full compensation for inspection, sampling testing, servicing, cleaning and repair of existing piping and equipment such as:

(a) Initial unblocking only of all blocked drainage pipework, traps, floor drains and gullies;

(b) Pressure testing of piping and taking of water piping samples to determine state of corrosion and scaling;

(c) Repair work to damaged manholes, gullies, cleaning eyes, valve chambers, etc, including builders' work and benching;

(d) Repair of existing bracketing systems including fixing and repair of existing brackets and hangers, as well as the supply and installation of additional brackets where required;

(e) Emptying, cleaning, checking, testing and repair of oil and grease separators;

(f) Service and repair of all valves, strainers, pressure-reducing valves, water meters, non-return valves, air release valves and vacuum breakers, including new gaskets, gland packings and seals;

(g) Taking of water samples and bacteriological testing to determine the compliance with the relevant codes of practice;

(h) Repairing and/or replacement of damaged hot-water pipe lagging and cladding;

(i) Preparation, painting and repainting of pipework and equipment in accordance with Technical Specification BH: Fittings;

(j) Any other work or action to hand over an effective installation that complies with local government regulations.

PAA.14 **SERVICING, CLEANING AND REPAIR OF DOMESTIC GEYSERS** ..... Unit: number

The unit of measurement shall be the number of domestic geyser serviced, cleaned and repaired, including all fixtures and fittings.

The tendered rate shall include full compensation for the isolation, servicing, cleaning and repair of domestic geysers in accordance with the manufacturer's specifications, including descaling, testing for leaks, replacing of elements if required, checking of safety valve operation and replacement if required, testing of thermostat operation and set point and replacement if required, and any other work or action to hand over an effective system that complies with local government regulations.

PAA.15 **SERVICING AND REPAIR OF FIRE WATER PIPED RETICULATION NETWORKS** ..... Unit: metre

The unit of measurement shall be the metre of each type of piping in the fire water network serviced and repaired, including all fixtures and fittings.

The tendered rates shall include full compensation for the inspection, testing, servicing and repair of existing piping and equipment such as:

(a) Pressure testing of piping and taking of pipe samples to determine the extent of corrosion and scaling;

(b) Repair or replacement of damaged, leaking, broken and corroded pipework or fittings;

(c) Repair and service of all valves, including new gaskets, gland packings and seals;

(d) Repair, service, adjustment and calibration of all pressure gauges;

(e) Repair and fixing of existing brackets and hangers and the installation of additional brackets and hangers where required;

(f) Any other work or action to hand over an effective system that complies with local government regulations.

PARTICULAR SPECIFICATION

PJC CONVENTIONAL FIRE FIGHTING EQUIPMENT

CONTENTS

PJC 01 SCOPE

(a) This specification covers the particulars of the repair and maintenance work to the conventional fire fighting equipment installation. This Particular Specification shall be read in conjunction with Technical Specification JC: Conventional Fire Fighting Equipment, and all additional and technical specifications compiled as part of this document, in particular the following Additional Specifications:

SA: General Maintenance
SB: Operating and Maintenance Manuals
SC: General Decommissioning, Testing and Commissioning Procedures
SD: General Training
SE: Development of Affirmable Business Enterprise.

The intended repair and maintenance work to this installation will restore the existing installation to a safe, efficiently functional system that complies with all statutory regulations and applicable standards, in the process repairing all defects and shortfalls. Monthly maintenance responsibilities for each installation shall commence with access to the site. A difference shall be made in payment for maintenance prior to and after practical completion of repair work. On completion of the repair work, the completed installation shall be maintained and serviced by the Contractor for the remainder of the 36-month Contract period.

(b) The fire fighting equipment to this complete complex shall form part of this repair and maintenance contract. The piped fire water reticulation network to the equipment, such as hydrants and hose reels, are dealt with under and form part of the plumbing and drainage repair and maintenance contract.

PJC 02 GENERAL DESCRIPTION OF INSTALLATION

The various buildings on the site are generally fed by means of a project reticulation network which feeds the fire fighting equipment such as hose reels and hydrants.

The buildings are also equipped with fire extinguishers.

PJC 03 TECHNICAL DETAILS OF EXISTING INSTALLATION

At the time of compilation of this document the existing installation consisted of the equipment listed below:

PJC 03.01 FIRE FIGHTING EQUIPMENT

PJC 04 STATUS OF EXISTING INSTALLATION

At the time of compilation of this document the status of the equipment and installation was briefly as described below.

PJC 04.01 LAST SERVICE

The fire fighting equipment was last serviced between 2009 and 2011.

PJC 05 DETAILS OF REPAIR AND SERVICE WORK

The following work shall form part of the intended repair work to the fire fighting equipment. This work shall be done in accordance with the relevant regulations, codes, specifications and Technical Specification JC: Conventional Fire Fighting Equipment.

The description of the repair work included as set out below shall be read in conjunction with the Schedule of Quantities and Technical Specifications.

PJC 05.01 GENERAL DESCRIPTION OF REPAIR WORK

PJC 05.01.01 The Contractor shall at the start of the Repair and Maintenance Contract inspect the items, systems, equipment and installations listed below. This inspection shall include the establishing of any defects, leaks, conditions, damages, shortfalls, repairs required, details of existing equipment, suitability of equipment for the purpose it serves, etc. The Contractor shall report back to the Engineer in writing on all the above and the following items. No repair work shall commence prior to approval by the Engineer.

(a) Correlation of all fire fighting equipment;
(b) Last service record;
(c) Inventory list of all equipment;
(d) Compliance with present governing regulations;
(e) Accessibility to equipment;
(f) Dynamic water pressure under flow conditions of equipment;
(g) As-built information.

PJC 05.01.02 The general scope of work at the time of going on tender, is defined as follows:

(a) Replacing of irreparable damaged, missing and unsuitable fire fighting equipment;
(b) Servicing and overhauling of all fire hose reels and fire hydrants;
(c) Servicing and recharging of all fire extinguishers;
(d) Replacing of missing and damaged fire extinguisher brackets;
(e) Replacing damaged fire hose reel cabinets;
(f) Supply and installation of additional fire hose reels, hydrants and extinguishers where necessary, in accordance with the requirements of SABS 0400;
(g) Servicing and overhauling of fire booster connections;
(h) Supply and/or replace missing or damaged safety signs;
(i) Compilation of fire plan for each section of complex;
(j) Compilation of inventory list with all relevant details and an identification system to all equipment.

PJC 05.02 REPAIR WORK TO FIRE FIGHTING EQUIPMENT

The repair work to this installation shall include, but not be limited to at least the following items. Any items, components or installations not detailed in this specification but found to be defective or inoperative during the inspection and report phase, shall be repaired or replaced as instructed by the Engineer.

PJC 05.02.01 **Site reticulation network**

(a) Service and overhaul all fire fighting equipment with respect to service schedule dates, including replacement of seals, reseating and cleaning of valve seats, replacement of missing wheel handles, etc.
(b) Supply and install additional fire equipment, piping measured under the Repair Schedule of Quantities for plumbing and drainage.
(c) Test the flow conditions of all equipment.

PJC 06 MEASUREMENT AND PAYMENT

All new building work and repair work to existing structures and buildings resulting from repairs to the conventional fire fighting equipment as scheduled, shall be done in accordance with the Specifications for the structural and building section included elsewhere in this Tender Document. The costs of such building and repair works shall be deemed to be included in the tendered rates for the applicable items scheduled in this section.

PJC.01 **INSPECTION AND REPORT ON EXISTING INSTALLATIONS** ..... Unit: item

The tendered sum shall include full compensation for the inspection and written report on all items, systems, components, equipment and installations, including the establishment of any defects, leaks conditions, damages, shortfalls, structural soundness, repairs required, details of existing equipment and suitability of the equipment for the purpose it serves.

PJC.02 **AS-BUILT INFORMATION AND OPERATING AND MAINTENANCE MANUALS** ..... Unit: set

The tendered sum shall include full compensation for the compilation and submission of inventory lists and operating and maintenance manuals in accordance with Additional Specification SB: Operating and Maintenance Manuals.

The tendered sum shall also include full compensation for all equipment necessary to establish the exact position and level of underground services, as well as the recording of all information on electronic drawing format.

PJC.03 **ISOLATION, STRIPPING, DISMANTLING AND REMOVAL OF EXISTING FIRE FIGHTING EQUIPMENT**..... Unit: number

The tendered rates shall include full compensation for the isolation, stripping, dismantling and removal of irreparable damaged, broken or unsuitable fire hydrants, fire hose reels and fire extinguishers, including all valves, cabinets, mounting brackets, streamers, etc, as well as removal off site and/or storage of all removed items mentioned above.

PJC.04 **SUPPLY AND INSTALLATION OF FIRE HYDRANTS** .....Unit: set

The tendered rate shall include full compensation for the supply, delivery, positioning, installation, testing, commissioning and hand-over of fire hydrants, including all necessary pipework, cabinets, cupboards, valves, brackets, fittings, bends and the reinstating of existing surfaces such as walls, floors, ceilings, etc.

The tendered rate shall also include full compensation for the supply, delivery and positioning and fixing of all fire signage as required by regulation.

The tendered rate shall also include full compensation for the labelling with identifying tags and recording of details of all equipment.

PJC.05 **SUPPLY AND INSTALLATION OF FIRE HOSE REELS** ..... Unit: number

The tendered rate shall include full compensation for the supply, delivery, positioning, installation, testing, commissioning and hand-over of fire hose reels, including all necessary pipework, cabinets, cupboards, valves, brackets, fittings, bends and the reinstating of existing surfaces such as walls, floors, ceilings, etc.

The tendered rate shall also include full compensation for the supply, delivery and positioning and fixing of all fire signage as required by regulation.

The tendered rate shall also include full compensation for the labelling with identifying tags and recording of details of all equipment.

PJC.06 **SUPPLY AND INSTALLATION OF FIRE EXTINGUISHERS** ..... Unit: number

The tendered rate shall include full compensation for the supply, delivery, positioning, installation and hand-over of the fire extinguishers, including all necessary brackets, backboards, etc.

The tendered rates shall also include full compensation for the supply, delivery, positioning and fixing of all fire signage as required by regulation.

The tendered rate shall also include full compensation for the labelling with identifying tags and recording of details of all equipment.

PJC.07 **SERVICING, CLEANING AND REPAIR OF FIRE HYDRANTS**.....Unit: number

The tendered rate shall include full compensation for the repair or replacement of damaged, broken, leaking or corroded pipework and fittings, main hydrant seals, quick coupling catches, shaft ends for right-angle hand wheel type hydrants, streamers, hose nozzles, valve steam seals, fire cupboard doors and locks, damaged, missing or shortfall fire signage, etc.

The tendered rate shall also include full compensation for the labelling with identifying tags and recording of details of all equipment.

PJC.08 **SERVICING, CLEANING AND REPAIR OF FIRE HOSE REELS**..... Unit: number

The tendered rate shall include full compensation for the repair or replacement of damaged hose drums, mountings and shut-off valves, replacement of damaged or missing 30 m hoses, hose nozzles, shut-off valve wheel handles, hose drum seals where leaks occur, gland packing and gaskets of shut-off values, repainting of deteriorated paintwork, replacement of fire cupboard doors and locks, damaged, missing or shortfall fire signage, etc.

The tendered rate shall also include full compensation for the labelling with identifying tags and recording of details of all equipment.

PJC.09 **SERVICING, CLEANING, RECHARGING AND REPAIR OF FIRE EXTINGUISHERS**..... Unit: number

The tendered rate shall include full compensation for the repair or replacement of all damaged, faulty or missing discharge hoses and nozzles, pressure gauges, operating instructions, the recharging of discharge cylinder to required capacity for DCP, water and foam extinguishers, and the recharging of CO_2 extinguisher to capacity, repair, resealing of CO_2 discharge mechanism, checking, servicing and repairing of activation mechanisms, replacement of water and foam extinguishers that have corroded cylinders, replacement of DCP, water or foam content of extinguishers, the replacement of fire cupboard and cabinet doors and locks, damaged, missing or shortfall fire signage, brackets and backboards, etc.

The tendered rate shall also include full compensation for the labelling with identifying tags and recording of details of all equipment.

PJC 07 DETAILS OF MAINTENANCE WORK

PJC 07.01 GENERAL

The Contractor shall be responsible for the complete maintenance of all the equipment, components, installations and systems forming part of this repair and maintenance contract for Installation. The Contractor shall strictly adhere to Additional Specification SA: General Maintenance, and Technical Specification JC: Conventional Fire Fighting Equipment, with regard to the maintenance period, obligations, responsibilities, actions and activities, etc, which shall also include the following maintenance actions:

(a) Routine preventative maintenance. A guideline to the required actions is provided in Technical Specification JC. The actions will not be limited to these guidelines, but shall include all additional actions, work, materials, etc, necessary to maintain this installation at an acceptable level.

(b) Corrective maintenance as described and defined in Additional Specification SA: General Maintenance.

(c) Breakdown maintenance as described and defined in Additional Specification SA: General Maintenance.

For this particular installation a fatal breakdown shall be defined as any equipment, systems and installations prohibiting fire fighting to any area of the complex as a whole.

Emergency breakdown shall be defined as a failure of equipment, components and systems of this particular installations.

PW 371-B

EDITION 2.1

Department:
Public Works

REPUBLIC OF SOUTH AFRICA

CONSTRUCTION WORKS: SPECIFICATIONS

PARTICULAR SPECIFICATION

First Edition October 1983
Second Edition January 2013
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Particular Specification

(read with PW371-A)

This specification falls under the Scope of Work as defined in *Standard for Uniformity in Construction Procurement,* published by the Construction Industry Development Board (CIDB), and is based on national or international standards, where such exist.

Works: ……..Ref no: …….

 NOTE TO THE COMPILER

> Make an office print-out of this part of PW371 for marking up during documentation.

> Delete irrelevant clauses and add variations or additional requirements where necessary. Do not change heading numbers – they should correllate with PW371-A.

> Choose the desired attribute or value where choices are separated with a double space-slash-double space. Delete unwanted attribute(s) or value(s). Asterisk (*) denotes the preferred attribute or value.

> The specification data for SANS 2001 standards as listed in this publication is for guidance only. See Annex A of the relevant standard for the full list of specification data, and follow instructions when required.

> Where the reader is directed to <see drawings>, ensure the relevant item is shown in the drawings.

> Dimensions presented are preferred dimensions according to the relevant SANS standard. Check availability or other dimensions with manufacturers/suppliers.

> Delete all guidance notes (framed text) on completion (click just outside frame on text box and press <delete>).

> Print out and hand in with drawings.

 NOTE TO THE TYPIST

> Text in this document is “styled”. All styles are listed in the Quickstyle box at the top of your screen under the HOME tab. Use the same styles throughout, and do not create new styles.

> Heading 1 has autonumbering on (to keep footer text intact).

> Heading 2 and 3 styles have autonumbering “off” in order to be consistent with Part A. You have to number these headings manually.

> To update the Table of Contents, click anywhere on the table to highlight and press F9.

TABLE OF CONTENTS

1 Earthworks

1.1 Site clearance

Applicable standard: SANS 2001 – Construction Works Part BS1: Site clearance

Specification data[1]:

SANS 2001 standard specifications are deemed to satisfy the provisions of SANS 10400. SANS 2001-BS1 covers removal of vegetation, fences, guard rails and posts, litter and building rubble, boulders of size up to 0,15 m3, and surface and subsurface obstructions, and demolition and removal of structures (including their basements, if any), not directly associated with or incidental to any excavation.

- designated area/site in which work is to be carried out: see drawings
- level of finished earthworks: see drawings
- site clearing activity numbers: …

1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / 11 / 12 1 removal and disposal of vegetation; 2 removal and disposal of structures by means of bulldozing; 3 demolition, breaking up and removal of buildings to ground level; 4 demolition, breaking up and removal of underground structures; 5 ditto septic tanks, soak pits; 6 ditto litter, rubble, rocks on surface; 7 removal and stacking of re-useable materials; 8 removal of asphalt layers; 9 removal of paving; 10 removal of kerbs, channels, haunching; 11 scarifying, ripping to blocks <200 mm; 12 removal of disused foulwater and stormwater drains and watermains

- description of materials to be reused: …

Activity 7 requires description of reuseable materials

- depth of underground structures to be demolished: see drawings

Activity 4 requires depth of demolition of underground structures to be specified.

- depth for ripping or excavation: see drawings

Activity 11 requires depth for ripping or excavation to be specified

- designated sites for disposal of materials: see drawings
- designated sites for disposal of reusable materials: see drawings
- trees, turf, plants, bushes, shrubs and flora to be preserved and/or replanted: see drawings

Look up tree distance guidelines in SANS 10400-H Annex E.

- topsoil: select and stockpile

Topsoil is mostly a precious commodity.

1.2 Earthworks (general)

Applicable standard: SANS 2001-Construction works Part BE1: Earthworks (general).

Specification data:

SANS 2001-BE1 covers: excavation, filling, compaction and finishing of general excavations for buildings, bridges and structures, terracing, landscaping and private railway sidings, carried out with heavy construction equipment or light construction equipment, or by hand.

- topsoil: select and stockpile
- areas where surplus and unsuitable materials shall be disposed of: see drawings
- areas to be topsoiled: see drawings

[1] The specification data for SANS 2001 standards as listed in this publication is a selection of importance mainly for buildings. See Annex A of the relevant standard for the full list of specification data, and follow instructions when required for civil works.

- areas to be grassed or vegetated: see drawings
- degree of accuracy required : II

Relevant standards:
SANS 10400-F Site Operations.
SANS 10400-G Excavations.
To be published: SANS 2001- Construction works Part BE2: Earthworks (small works).

2 Concrete works

2.1 Structural works (SANS 2001-CC1)

Omit this part if not relevant, or SANS 2001-CC2 Concrete Works (Minor Works) is specified.

SANS 2001-CC1 covers: structural concrete in buildings and structures where the design and supervision of reinforced, prestressed and precast concrete are under the direct control of appropriately qualified engineers and technologists. Does not cover piles, harbour and marine works, and underground works in mines.

Specification data:

materials

- strength concrete grade: see drawings

10 / 15 / 20 / 25 / 30 / 40

Omit if prescribed mix concrete is specified.

Contractor is responsible for design of strength concrete.

Strength concrete is designated by its characteristic strength followed by the size of stone used in its manufacture, for example, grade 30/19 refers to a 30 MPa mix made with 19 mm stone. Stone size has little influence on strength but does affect workability and water demand.

Grades for typical applications are

10 (plain [unreinforced] concrete strip foundations, or surface beds where the slab does not serve as the final wearing surface);

15 (plain concrete strip foundations, floors on the ground that will serve as the final wearing surface);

20 (reinforced concrete subject to non-aggressive (dry) conditions; base courses of lightly loaded floors (no trucking) and one-course domestic and office floors on the ground that will serve as the final wearing surface; landscape footpaths);

25 (general reinforced concrete construction in buildings, bridges, culverts, silos, machine foundations, slab-on-the-ground foundations, unplastered walls above ground);

30 (machine foundations subject to vibration and shock; concrete roads; paving and floors on the ground to carry fork-lift trucks), precast concrete;

40 (specially watertight walls and tanks; highly stressed rc members; precast structural units; concrete subject to severe vibration and shock, abrasion and wear).

- prescribed mix concrete: SANS 2001-CC2 table 5 / …

Omit if strength concrete is specified. SANS 2001-CC2 table 5 (19 mm aggregate) and table 6 (13 mm aggregate) contains generic prescribed concrete mixes for strength grade 10, 15, 20, 25, 30, or specify bespoke requirements.

- characteristic strength of tendon steel for prestressing: …
- joint fillers, sealants, waterstops, bearings and accessories: … / see Section 6
- steel joint cover plate finish: not galvanized / galvanized

off-form surfaces

- concrete off-form surface finish (smooth-special): steel forms, uniform texture, appearance and colour

Specify special off-form and exposed aggregate surfaces only with permission: timber boards, special patterned finish (hardboard, rubber, plastic), brushed, tooled, sand-blasted or aggregate transfer. See SANS 2001-CC1 table 1.

construction joints

- type: see drawings

construction joint / movement joint / contraction joint / expansion joint

In general, in off-form surfaces, construction joints should be shown where a day's casting starts and ends, e.g. bottom and top of slab/column.

- joint sealing requirements: see Section 6

SANS 2001-CC1 specifies the finishing of exposed horizontal cast in situ concrete surfaces excluding industrial floors. Public ramps must have a safe gradient and frequent landings for disabled persons. Check with SANS 10400-S. See note on stairways at end of section.

- parts of the structure which need to be watertight: see drawings
- degree of accuracy required: II

precast/prestressed concrete

- surface finish required to precast units: special off-form / exposed aggregate / mosaic / …
- prestressing particulars: …
- order of loading and magnitude of load for each component of prestressing tendon: …
- prestressing test requirements: …
- position of lifting and supporting points, method of lifting, type of equipment and transport used in handling and erection of precastunits: …
- method of assembly and erection of precast units: …
- design requirements for structural connections of precast units: …
- degree of accuracy required: II

additional requirements

- low-density concrete if not breeze (clinker) concrete at 800-960 kg/m^3

60-160 (vermiculite) / 120-240 (perlite) / 450-720 (foamed slag) kg/m^3

- form drip joint or downstand under all exposed off-form slab edges; chamfer exposed edges of off-form columns, slabs, joints etc.; use standard plastic joint formers

2.2 Minor works (SANS 2001-CC2)

Omit this part if SANS 2001-CC1 is specified.

SANS 2001-CC2 covers concrete works in foundations, slabs, stairways, masonry walls, pipelines, manholes, latrines, conservancy tanks, septic tanks and the like where the design and supervision of plain, reinforced and precast concrete are not necessarily under the direct supervision of approved, qualified engineers and technologists and no special finishes to the concrete are required. Use SANS 2001-CC1 when special finishes are required.

Specification data:

- horizontal surfaces that need to be non-skid: see drawings

2.3 Foundations (SANS 2001-CM2)

SANS 2001-CM2 covers construction requirements for strip footings, pad footings and slab-on-the-ground foundations to receive masonry walling, and the construction of lightly loaded concrete surface beds.

Specification data:

- site class designation: see drawings

R / H / C / S / P / H1 / C1 / S1 / H2 / C2 / S2 / H3

R rock; H heaving (expansive) soils; C collapsible soils; S compressible sand; P fill, dolomite, marshy areas, mine waste, very soft clays. Site class designations R, H, C,S indicate that the expected range of total soil movements arising from ground movements is such that no special precautionary measures are required to minimize the effects of differential ground movements on buildings. Number denotes higher range of movement. Behaviour of P is variable and the reason for such classification should be given in brackets, e.g. P (fill).

- foundations: in accordance with the requirements of SANS 10400-H for strip footings, slab-on-the-ground foundations or modified normal construction for category of expected damage 1 or 2 / rational design by competent person

See SANS 10400-H for geotechnical and/or structural solutions for foundations on problem soils.

- construction of steps in foundations in excess of 400 mm: see drawings
- minimum founding depth: see drawings

Required where the geotechnical report indicates a deeper requirement than that provided for in SANS 10400-H.

additional requirements

- protection against termites: SANS 10124.

2.4 Concrete floors and paving on the ground

- industrial floors: direct-finished one course slab as designed and constructed to SANS 10109 under direction of a competent person

Direct-finished one-course concrete floors on the ground are superior to concrete bases with screed or topping, and should be used if floor is to be left as is, or if to be covered with resilient floor finishes like thermoplastic tiles or carpet.

concrete

- concrete grade: see drawings

20 / 30

Show grades on drawings.

Default: (grade 20 for base courses of lightly loaded floors [no trucking] and one-course domestic and office floors on the ground that will serve as the final wearing surface, or grade 30 for paving and floors on the ground to carry fork-lift trucks) is acceptable.

damp-proof under-surface membrane

- DPM under floor area: required / not required

Dpm normally not required under external floors.

fabric reinforcement

- fabric reinforcement ref. no. 100 / … / not required
- floor/paving thickness: see drawings

Floor thickness ranges between 120 and 360 mm, depending on loading, use

placing

- levels and gradients: see drawings

joints

- joint sealing: left open / sealed

Joints should be sealed when the floor is used under wet conditions, or where hygiene or dust has to be controlled.

2.5 Strongrooms

- fire rating, burglar resistance and wall thickness class: see drawings

1 / 2 / 3 / 4

Class: 1 (4h, no burglar resistance, 200 mm wall, 125 mm floor/ceiling); 2 (4h, limited burglar resistance, 300 mm); 3 (4h, medium burglar resistance, 450 mm); 4 (4h, high burglar resistance, 525 mm)

NOTE ON STAIRWAYS

The rule in SANS 10400 – M of a minimum going of 250 mm and a maximum rise of 200 mm often leads to a disregard for two other rules, i.e, "*the dimension of each step of the stairway shall be such that the sum of the going and twice the riser is not less than 570 mm and not more than 650 mm*", and "*any stairway … shall have dimensions appropriate to its use*" (NBR part M Stairways). A maximum rise of 180 and a minimum going of 280 is a more comfortable and safer proportion, and should be used in most public buildings.

The full range of a more comfortable and safer proportion would be (rise/going):

180/280 mm; 170/280 – 320 mm; 150/280 – 350 mm; 120/280

3 Masonry

3.1 Masonry Walling (SANS 2001-CM1)

SANS 2001-CM1 Masonry Walling covers requirements for masonry walls, materials, the laying of masonry units in unreinforced and reinforced applications, the building in of door and window frames, holes and chases, the securing of timber roof structures and the fixing of slips.

Specification data:

masonry units

Bricks and blocks are collectively termed *masonry units,* whether solid or hollow. A block has dimensions which satisfy any one of the following conditions: a length of 300–650 mm, width of 130–300 mm, or height of 120–300 mm.

- type: burnt clay / concrete
- masonry units: SANS 2001-CM1 clause 4.1.1.3

Omit if masonry units to SANS 227 and SANS 1215 are specified.

SANS 2001 CM1 clause 4.1.1.1 states "Masonry units shall comply with the requirements of either 4.1.1.2 (SANS *227 and* SANS *1215*) or 4.1.1.3". Clause 4.1.1.3 is a generic description, which may be more practical in areas where bricks to SANS 227 are unobtainable. Specify to clause 4.1.1.3 only with permission.

burnt clay masonry units (SANS 227*[2])

Omit if requirements of SANS 2001-CM1 clause 4.1.1.3 are acceptable.

- nature of face unit: hollow / solid / contractor's choice
- class of face units: FBS / FBX / FBA

Class E bricks are any class of masonry unit produced for structural or load-bearing purposes in face or non-face work, and is supplied to an agreed compressive strength e.g. FBSE2, where the number equals the nominal compressive strength in megapascals.

- nominal dimensions: 222 x 103 x 76 mm

See SANS 227 for modular sizes, e.g. 190 x 90 x 90 mm.

- colour of face units: …

concrete masonry units (SANS 1215*)

Omit if requirements of SANS 2001-CM1 clause 4.1.1.3 are acceptable.

- nature of unit: hollow / solid
- colour of face units: …
- nominal dimensions: 190 x 90 x 90 / 290 x 90 x 90 / 390 x 90 x 190 / 390 x 190 x 190 mm

mortar

- sand: SANS 1090*

Omit if default (clause 4.1.4.1) is acceptable.

Clause 4.1.4.1 states that "Sand shall either comply with all of the following requirements or, if required in terms of the *specification data*, the requirements of SANS 1090 for mortar sand (natural or manufactured)"

- mortar class: II

[2] Asterisk (*) denotes the preferred attribute or value.

Class I mortar is *suitable* for highly stressed masonry, e.g. multi-storey loadbearing buildings; class II is *suitable* for normal loadbearing applications, including parapets, balustrades, retaining structures, freestanding and garden walls, and walls exposed to severe dampness; class III mortar (not mentioned in SANS 2001-CM1) is *suitable* for lightly stressed bearing walls where exposure to dampness is not severe, or for renovation to unburnt clay masonry walling.

- pigments for mortar: … ; colour: ... ; other requirement(s) : …

reinforcement

- prestressing steel (hot-rolled bars or high tensile steel wire and strand) : …

Provide particulars or omit if not required.

NOTE on metal wall ties: SANS 204 requires masonry walls enveloping habitable portions of the building fabric in all climatic zones to be cavity or insulated cavity walls. Note that existing wire tie types may not be able to be centred centrally and conform to the minimum embedment rule of 50 mm. Note that crimp wire ties are not for use on cavity walls.

work

- face work jointing: struck* / flush / recessed / drip

Struck (half-round) joints are denser with better resistance to water penetration. Flush joints require careful cleaning of face work. Face work includes fair face work.

- face work pointing shape, colour: …

Pointing is the raking out of brickwork joints 20 mm deep, then filling with mortar, usually coloured. Joint faces can be left flush, projecting, or shaped in the same way as jointing.

- multi-leaf wall bond: stretcher and brickforce / English bond (header course every second course) / collar-jointed bond

SANS 2001-CM1 specifies collar-jointed walls as default. Collar-jointed walls have a narrow cavity (<25 mm) between the leaves (the collar joint) which is filled solid with mortar or grout as the work progresses (not to be confused with *grouted cavity* construction where the cavity is wider and filled with concrete). Collar-jointing is intended for walls that require an effective thickness equal to the actual overall thickness of the wall. The success of this construction depends heavily on proper supervision. Collar-jointing is not mentioned in SANS 10249 Masonry Walling.

- position of control and articulation joints: see drawings

additional requirements

- wall type: see drawings

single leaf / multileaf / cavity / insulated cavity / grouted cavity / sealed multileaf

Sealed multileaf walls (outside face of inner leaf treated with a bitumen sealer) may be used in place of cavity walls in areas of prolonged, heavy, wind-driven rains, or where wall is faced with masonry-type facings (see *Masonry-type facings*)

- special shape face bricks: see drawings

single bullnose / double bullnose / single cant / double cant

- lintels in face work: see drawings

bed joint reinforced masonry / prestressed concrete lintels / galvanized steel / wood

For timber lintels see Section 4.

- cavity reveals around windows/doors: open / closed / see drawings

In energy rated buildings, at cavity reveals around openings, cavity insulation should continue up to window or door frames to prevent thermal bridging, therefore “open”.

A bituminous damp-proofing type may be required where bituminous waterproofing is to be bonded to damp-proofing – see Section 8.

3.2 Glass blockwork

glass blocks

- nominal dimensions: …

- surface pattern: …
- opacity: …
- colour: …

3.3 Stone masonry

Loadbearing stone masonry. For stone cladding see *Masonry-type facings.*

- type: rubble / dimension stone

3.3.1 Rubble

Rubble (koppieklip) is stone with irregular faces as found in nature on or near surface.

- bedding of stones: set in mortar / dry set, with smaller stones to achieve stability.

3.3.2 Dimension stone

- stone type: freestone / granite / marble / slate / cast stone

Freestone (makklip) is building stone soft enough to be cut with tools and uniform enough to be carved in any direction, typically sandstone.

- face dressing: plain / polished / rusticated / vermiculated / boasted / drafted margin
- shape and size: square sawn in modular rectangular sizes / …
- bond to homogenuous pattern: random coursed / regular coursed
- jointing: flush / keyed
- pointing colour: …

3.4 Masonry-type facings

SANS 10073 The Safe Application of Masonry-type Facings to Buildings was withdrawn in May 2011 and "replaced" by SANS 10400-K Walls which does not yet touch on this important subject.

Thin panel cladding, e.g. marble, should be rail-fixed, leaving a cavity between facing and backing. The advantages of this system are avoidance of staining of the stone face, more reliable support, faster erection, smaller joints and less dependency on skilled labour. Consult specialist stonework contractors.

Facings wholly dependent on fixing to the backing with proprietary adhesive only may lead to failure.

- facing type: precast concrete / natural stone / burnt clay units / concrete units of design, size, colour and finish: …

Joints should be sealed to prevent ingress of water and to provide for thermal and structural movement.

Relevant standards

SANS 993Modular co-ordination

SANS 10021 The waterproofing of buildings (in the case of facings this depends on climatic region, facing material and backing).

SANS 10073 The safe application of masonry-type facings to buildings (withdrawn).

SANS 10145 Concrete masonry construction.

SANS 10164 The structural use of masonry.

SANS 10249 Masonry walling.

SANS 10400-H Foundations.

SANS 10400-K Walls.

SANS 10400-M Stairways.

SANS 10400-P Drainage.

4 Structural timberwork

4.1 Structural timberwork (flooring) (SANS 2001-CT1)

SANS 2001-CT1 covers the installation of suspended timber floors in buildings to be constructed for occupancy class H3 (domestic residence) and H4 (dwelling house) buildings, as described in SANS 10400-J Floors, and that have a distance that does not exceed 7 m between supports, and a beam/joist spacing that does not exceed 600 mm. Modify to make this part of SANS 2001 applicable for the installation of suspended timber floors designed for other occupancies or for greater dimensions between beams or supports.

For wood floors on solid substrates see Section 13.

Specification data:

softwood timber joists

- type: solid / laminated
- cross section: see drawings

Omit if default description (to SANS 10400-J) is acceptable.

hangers, masonry anchors

- size/strength: …

Omit if default description in SANS 2001-CT1 (hangers: 4,0 kN; masonry anchors: 10 dia x 45 mm length, 2,5 kN) is acceptable.

softwood flooring boards

Omit this part if default description in SANS 2001-CT1 is acceptable. NOTE SANS 629 withdrawn 2012 without replacement. Most req'd data kept except marking.

- softwood flooring boards:
  - genus: Pinus / Cedrus / Podocarpus / Cupressus
  - nature: solid / laminated
  - grade: clear flooring / select flooring / flooring
  - density group: light / heavy

Density group: light (400-550 kg/m^3); heavy (550 kg/m^3, for example squash court floor boards)

  - cross section: see drawings

Omit if default (50 – 140 x ≥22 mm) is acceptable. Also 33 mm thickness.

  - length: >1 800 mm when square sawn at ends, >600 mm when matched
  - finger joints: not prominent

Omit if default (prominent) is acceptable.

hardwood strip flooring

NOTE SANS 281 Hardwood block and strip flooring withdrawn 2009 without replacement.

- species: …
- dimensions: ≥460 x 57 – 90 x ≥20 mm

additional requirements

- hardwood species: …
- hardwood prefinish: required / not required
- exposed faces of sawn structural timber: planed, sandpapered, and arris rounded to 3 mm radius.

4.2 Structural timberwork (roofing) (SANS 2001-CT2)

SANS 2001-CT2 covers the construction of timber roof assemblies in buildings. It includes the manufacture of bolted trusses that are designed in accordance with the requirements of SANS 10400, the erection of prefabricated timber trusses, the erection of rafters and purlin rafters, the fixing of purlins and battens, and the fixing of brandering to roofing members to support ceilings that comprise gypsum plasterboard, fibre-cement board or similar boards

Specification data:

softwood roofing timber

- type: solid / laminated
- cross section, grade: see drawings / to SANS 10400-L Roofs / to standard …

roofing poles ("fence poles" SANS 457)

"fence" poles are normally used for roofs. See also "transmission" poles below

- roofing pole type: softwood SANS 457-2 / hardwood SANS 457-3 / to standard …
- top diameter (thin end, colour-coded) : see drawings

50-79 (red), 80-99 (yellow), 100-119 (blue), 120-139 (white), 140-159 (orange), 160-179 (green), 180-199 (black) mm; ditto posts: 145-174, 175-199, 200-230 mm.

hangers, clips, masonry anchors

- size/strength: …

Omit if default requirements (hangers: 4,0 kN; hurricane clips: 1,2 kN; masonry anchors: 10 dia x 45 mm length, 2,5 kN) are suitable.

additional clauses

- truss type: monoplanar prefabricated rational design to SANS 10243 or SANS 1900 / lapped and bolted within scope of SANS 10400-L/10243

In case of lapped and bolted trusses, show all member sizes and connection details on drawings. SANS 10243 provides guidance on the manufacture, erection and bracing of timber roof trusses. SANS 1900 covers a rational design prepared by a *Competent Person* and inspected by such a person during installation.

- "transmission" poles, diameter: softwood poles SANS 753 / hardwood poles SANS 754

Omit if "fence" poles to SANS 457 as required by SANS 2001-CT2 are acceptable. "Transmission" poles to SANS 753/754 should only be used when high strength is specifically required. See SANS 753 for lengths, minimum top diameter of poles.

- gang planks: two 150 x 38 mm softwood grade S5, nailed onto tie beams where shown on drawings / nailed onto tie beams of two adjoining trusses on both sides of geysers

Gang planks for walking/crawling in roof space, when required.

- timber lintels type and size: see drawings

softwood / hardwood / structural laminated timber / composite structural plywood web and solid timber flanges; grade: 5 / 7 / 10

4.3 Structural laminated timber (SANS 1460)

- material: see drawings

softwood (Pinus) / hardwood (Eucalyptus) / board (fibreboard, plywood, composite board)

- exposure class: 1 (exterior), 2 (semi-exterior), 3 (humid interior), 4 (dry interior)
- type: G (stocklam) / C (customlam)
- appearance and finish: rough-sawn (R), fine-sawn (F), planed (P), sanded (S), smoothed (G), coated (C), special (X)
- stress grade: 5 / 7 / 10 / 14
- fire retardant treatment: required / not required

- cross section: see drawings.

Relevant standards:
SANS 1288 Preservative treated timber.
SANS 1900: Monoplanar prefabricated timber roof trusses (nail-plated).
SANS 10005: Preservative treatment of timber.
SANS 10043:The laying of wood floors.
SANS 10082: Timber buildings.
SANS 10096: Manufacturing of finger-jointed structural timber.
SANS 10163 The structural use of timber.
SANS 10243 The design, manufacture and erection of timber trusses.
SANS 10400-J Floors.
SANS 10400-L Roofs.
SANS 10400-M Stairways.
SANS 10400-T Fire Protection.

5 Structural steelwork

5.1 Structural steelwork (SANS 2001-CS1)

SANS 2001-CS1 covers structural steelwork for buildings and other structures, excluding bridges, offshore structures, mobile equipment (stackers, reclaimers, draglines, cranes, etc.), mine shaft steelwork (buntons and guides) and mining conveyances, but does not cover roof and side cladding, or the detailed aspects of sundry items such as handrails, ladders, steel flooring and the like, neither does it cover protection of steelwork against corrosion or fire.

Specification data:

- class and grade of fasteners: …
- format of drawings: …

State in which format and to which standards each category of drawings shall be prepared.

- hole sizes for holding-down bolts in excess of 36 mm diameter: …
- connections to allow movement: …
- requirements for machining: …
- requirements for non-destructive tests on welds: …

5.2 Sundry steelwork

5.2.1 Material

cold-formed structural steel (SANS 10162)

- commercial quality steel: permitted if yield stress equals 200 MPa, tensile strength 365MPa; obtain proof.

Cold-formed profiles are often made from commercial quality steel of which the yield stress is seldom less than 210 MPa.

structural steel tubes SANS 657-1

- coating: uncoated / hot dip galvanized coating SANS 32 quality B
- size/profile: see drawings

Size/profile: 21, 27, 32, 34, 38, 42, 48, 51, 60, 76, 89, 102, 114, 127, 140, 152, 165, 178, 219 mm ø (general purpose); 20 x 20, 25 x 25, 30 x 30, 40 x 40, 50 x 50, 60 x 60, 70 x 70, 80 x 80, 90 x 90, 100 x 100, 115 x 115, 120 x 120, 135 x 135, 140 x 140, 150 x 150, 160 x 160, 175 x 175, 180 x 180 mm (square); 40 x 20, 50 x 30, 60 x 40, 80 x 40, 90 x 50, 100 x 50, 100 x 60, 120 x 60, 120 x 80, 140 x 90, 150 x 100, 160 x 80, 180 x 100, 200 x 100, 200 x 120, 220 x 140, 250 x 150 mm (rectangular)

corrosion resistant (weathering) steel

Corrosion resistant steel also known as COR-TEN, a registered trademark of USX Corporation. Corrosion resistant steel is weldable. Available in sheet (<2,0 mm) and strip (2,5 – 6,0 mm). Consult Mittal Steel.

- grade: 1 / A

steel wire rope (cables)

- class: 6 x 7 / 6 x 24 / 6 x 37 / 8 x 19 mm
- diameter: 6 / 7 / 8 / 9 / 10 mm.

5.3 Coating

- type: hot dip galvanising / prepainting / hot dip galvanising and prepainting (duplex system)

Other coating types on steel are vitreous enamel, plastic or protective tape.

SANS 121 provides for one set of coating thickness only – see NOTES at end of Section. Thicker (25%) coatings may be requested without affecting specification conformity. The primary influencer on hot dip galvanized coating is the steel composition. See SANS 14713 for design guidelines.

hot dip galvanising

The Hot Dip Galvanizers Association South Africa (HDGASA) is the industry representative body.

- significant (architectural) surfaces: see drawings

NOTE on appearance of galvanized coatings

SANS 121:

"The primary purpose of the galvanized coating is to protect the underlying iron or steelwork against corrosion. Considerations related to aesthetics or decorative features should be secondary. Where these secondary features are also of importance it is highly recommended that the galvanizer and customer agree the standard of finish that is achievable on the work [in total or in part], given the range of materials used to form the article. This is of particular importance where the required standard of finish is beyond that set out in this section. It should be noted that 'roughness' and 'smoothness' are relative terms and the roughness of coatings on articles galvanized after fabrication differs from mechanically wiped products, such as galvanized sheet, tube and wire. It is not possible to establish a definition of appearance and finish covering all requirements in practice.

The occurrence of darker or lighter area (e.g. cellular pattern or dark grey areas) or some surface unevenness shall not be cause for rejection: also wet storage stain (white or dark corrosion product – primarily basic zinc oxide – formed during storage in humid conditions after hot dip galvanising) shall not be cause for rejection, providing the coating thickness remains above the specified minimum value."

- sample: required / not required
- special pre-treatments: …
- special coating thickness: …
- any after treatments: …
- method of site repair and maximum allowable size of repair: …

Omit if default (repair by either zinc metal thermal spraying, zinc rich epoxy or a *suitable* zinc rich paint, provided that the repaired surface receive an additional 30 µm over and above that required in terms of the specification; HDGASA recommends a practical repair area of ± a R5 coin) is acceptable.

- architectural work to be packaged: required / not required

paint or varnish

SANS 12944 covers the following suitable surfaces for painting: uncoated steel; thermally sprayed with zinc, aluminium or their alloys; hot dip galvanized; zinc-electroplated; sherardized; prefabrication primed; other painted surfaces. Part 2 deals with the principal environments and the corrosivity of these environments to which steel structures are exposed: atmospheric corrosivity category: C1 very low / C2 low / C3 medium / C4 high / C5-I very high (industrial) / C5-M (marine); immersed category for water and soil: Im1 (fresh water) / Im2 (sea or brackish water) / Im3 (soil). Part 5 deals with paint systems.

- paint system: alkyd / chlorinated rubber / PVC / acrylic / epoxy / ethyl silicate / polyurethane / bitumen

Protective paint systems not covered: powder coating; stoving enamel; heat-cured paints; linings of tanks; products for the chemical treatment of surfaces.

5.4 Fire protection

The yield strength of steel is halved at temperatures exceeding 550°C. Consider placing columns outside building.

- protection of structural steel against fire: see drawings

reinforced concrete grade 25 / solid masonry / sprayed vermiculite-cement/perlite-cement / metal lath and plaster

Relevant standards:

SANS 1921 Construction and management requirements for works contracts.

SANS 10094 The use of high-strength friction-grip bolts.

SANS 10162 The structural use of steel.

SANS 14713 Protection against corrosion of iron and steel in structures – zinc and aluminium coatings – guidelines.

HDGASA code of practice no 1-1990 The Surface Preparation and Application of Organic Coatings to New, Unweathered Hot Dip Galvanized Steel (Sheet and Section) Excluding In-line Coil Coatings.

HDGASA code of practice no 2-1990 Specification for the Performance Requirements of Coating Systems Applied to New Unweathered Hot Dip Galvanized Steel (Sheet and Section) excluding In-line Coil Coating (Duplex Systems).

NOTES on hot dip zinc coating thickness and service life:

Consult the Hot Dip Galvanizer's Association of South Africa (HDGASA) for determination of high corrosivity areas.

All hot dip galvanising specifications state the minimum *suitable* coating thickness and not average coating thickness. The thickness actually achieved varies with steel composition and thickness of steel, and can range from the minimum up to >50% greater. As life expectancy predictions are normally based on the minimum coating thickness, they are usually conservative.

Hot dip galvanized coating on structural steel should in most cases provide a service-free life of 40 – 50 years. This is determined by dividing the minimum achieved coating thickness taken on the thinnest steel component by the corrosion rate per year for the location in question (see table).

HDGASA uses *SANS ISO* 9223 to determine corrosivity categories, based on three factors:
1) Time of wetness, being the period that the zinc surface is covered by liquid containing the corrosive elements (electrolyte); 2) Airborne pollution containing sulphur dioxide (SO_2); 3) Airborne pollution containing salinity, usually in the form of chlorides carried on prevailing sea winds.

Estimated service life of hot dip galvanized steel complying with SANS 121				
Corrosivity Category ISO 9223	Zinc corrosion rate / yr	55 µm for steel 1.5 – 3mm thick	70 µm for steel 3 – 6 m m thick	85 µm for steel >6 mm thick
C 1 very low	<0.1 µm	>100 yrs	>100 yrs	>100 yrs
C 2 low	0.1 – 0.7	<78.5 yrs	>100 yrs	>100 yrs
C 3 medium	0.7 – 2.1	26 – 78.5 yrs	33 – 100 yrs	40 – >100 yrs
C 4 high	2.1 – 4.2	13 – 26 yrs	16 – 33 yrs	20 – 40 yrs
C 5 very high	4.2 – 8.4	6.5 – 13 yrs	8.3 – 16 yrs	10 – 20 yrs

Source: HDGASA Information sheet No 8.

Coating thickness in µm can be converted to approximate coating mass per unit area in g/m² by multiplying by the nominal density of the coating (7,2 g/cm³): thus 55 µm = 395 g/m²; 70 µm = 505 g/m²; 85 µm = 610 g/m²

Source: SANS 121 / SANS 14713.

Z275 is the designation for 275 g/m² zinc/surface area on both sides of steel sheet (for sheet that would mean 137.5 g/side) which equals a mean coating thickness of 19 µm. Similarly, Z450 equals 22 µm, and Z600 equals 43 µm).

6 Insulation, sealants, seals

6.1 Thermal insulation

6.1.1 Materials

Consider insulation materials with recycled content, e.g. polystyrene, glass fibre, cellulose and polyester fibre. Consult TIASA (Thermal Insulation Association of SA) or EPSASA (Expanded Polystyrene Ass. of SA).

- type: bulk (rigid board, fibre matts or batts) / reflective (foil) / composite bulk / loose fill / pipe / spray foam
- required R-value/thickness: SANS 204

Show all insulation thicknesses on drawings. Actual R-value test results may be obtained from the South African Fenestration and Insulation Energy Rating Association (SAFIERA).

- required fire performance classification of thermally insulated building envelope systems: SANS 428
  - combustability: A / B

A (non combustible); B (combustible)

  - surface fire spread properties: 1 / 2 / 3 / 4 / 5 / 6

1 (no flame spread) / 2 – 6 (rapid flame spread)

  - application: vertical / horizontal / vertical and horizontal / see drawings

Consult SANS 10400-T for fire performance requirements.

rigid board

- material: EPS / XPS / EPU
- expanded polystyrene (EPS) grade: 16D-85 / 24D-170 / 32D-225

16D-85 (standard); 24D-170 (high); 32D-225 (extra high) (density kg/m³–compressive strength kPa)

EPS is combustible on its own but claimed to be fire-safe in a masonry cavity with closed reveals (see EPSASA leaflet *EPS Cavity Wall Insulation*). EPS will resist the passage of moisture. Panel width: 600 mm; thicknesses: 25, 30, 40, 50 (ex stock), 60, 70, 80 (to order)

- face: plain / foil / …
- edge: square / shiplap / tongue and groove

fibre mats/batts

- form: mats (flexible) / batts (rigid)
- face: plain / foil / …

Typical fibres are mineral (rock wool, glass wool), synthetic (polyester, polyethylene), and natural (wool). Fibre insulation is not recommended in partial fill masonry cavity construction – consult manufacturer.

reflective foil

- reflective foil class: A / B / C / D

A (reinforced, both surfaces reflective), B (reinforced, one surface reflective), C (unreinforced, both surfaces reflective), D (unreinforced, one surface reflective). Foil may double as an effective vapour barrier. See additional notes on foil at end of this section.

The thermal resistance of reflective insulation varies with the direction of heat flow through it, i.e. vertical, horizontal or sloped, and the number and defined thicknes of air spaces it faces. It is important that bright surfaces facing air spaces remain untarnished on at least one surface.

The difference in direction of heat flow is generally marginal for bulk insulation but can be pronounced for reflective insulation. Reflective insulation is more effective at reducing summer heat gain than reducing winter heat loss.

Reflective foils are valuable when used in combination with bulk insulation for improved performance.

Composite bulk and reflective materials are available that combine some features of both types. Examples include foil bonded to bulk insulation, whether blankets, batts or boards, i.e. foil faced blankets, foil faced batts and foil faced boards.

metal faced insulation panels

For use in buildings, cold rooms and hot rooms, interior and exterior.

- corrosion comparison index of panel-facing coating: 1 / 2 / 3 / 4
- core insulation: calcium silicate / mineral fibre / polyisocyanurate / polyphen / polystyrene / polyurethane / rockwool
- facing: chromadek / galvanized steel / PVC laminated galvanized steel / stainless steel / zincalume

Metal faced insulation panels are typically used in cold storage systems. Consult TPMA (Thermal Panel Manufacturer's Association).

loose fill

- loose fill: pellets or granules / cellulose.

6.1.2 Installation

- system: SANS 204 / rational design

masonry cavity wall insulation

- type: full fill cavity / partial fill cavity / loose fill / see drawings

Insulation can be installed full fill in cavities in most areas where cavity walls are not required to prevent moisture migration, or where walls are plastered and painted or protected by roof overhangs of >750 mm.

Insulation should be installed partial fill in cavities where the cavity also serves as a moisture barrier against wind-driven rain, mostly in winter rainfall areas, but also in cases of exposed face brick walls in general (e.g. gable walls, walls without roof overhangs, high buildings).

In exposed walls, filling cavities with loose fill insulation may result in insulation becoming wet, losing its insulation value and causing dampness on the inner leaf.

Filling of concrete block cores with any type of insulation offers little energy savings since the majority of heat is conducted through the webs and mortar joints.

masonry wall external face insulation

- masonry wall external face insulation: …

Omit if default (patent system of EPS external insulation bonded and mechanically fixed to dry, sound and flat surface, finished with reinforced polymeric plaster) is acceptable, or specify alternative.

Installing insulation against internal face of envelope wall would result in losing capacitive insulation of internal leaf (thermal mass).

pitched roof/ceiling insulation

- system: reflective foil under roof covering / bulk insulation on ceiling / foil + bulk / see drawings

flat roof insulation

- material: rigid EPS insulation density 32D
- flat roof insulation position: over waterproofing / under screed

Insulation on flat trafficable concrete roofs should be firm enough to support the waterproofing system and foreseeable loadings, i.e.under screed. See Section 8 for further particulars.

floor insulation

- under floor slab insulation: required / not required

In case of in-slab heating as required by SANS 204.

6.2 Vapour barriers

- type: …
- position: see drawings

Clay brick and concrete block masonry is able to accommodate moisture migration (damp open), normally rendering a vapour barrier unnecessary. SANS 204 advises that designers should consider that interstitial condensation occurs in walling systems which are not able to prevent or accommodate moisture migration. Also, that artificial cooling of buildings in some climates can cause condensation to form inside the layers of the building envelope. Such condensation can cause significant structural or cosmetic damage to the envelope before it is detected. Associated mould growth may also create health risks to the occupants. Effective control of condensation is a complex issue. In some locations a fully sealed vapour barrier may need to be installed on the more humid, or generally warmer, side of the insulation.

6.3 Sound absorption

materials

- structure-borne sound insulation: mineral fibre mats SANS 1381 / cork
- airborne sound absorption: mineral fibre mats SANS 1381 + perforated 10 mm plywood / plasterboard / hardboard / metal / see drawings.

6.4 Joint fillers/sealants

- joint filler/sealant colour: …

Industrial sealants compatible with bitumen may not be available in SA.

Two-part sealants are generally more effective and costly than one-part sealants.

See also SANS 2001-CC1 for specification of waterstops.

6.5 Architectural seals

- type: patent extruded aluminium carriers with flexible seal inserts of synthetic rubber, rigid PVC, nylon brush filaments, polypropylene pile, or silicone rubber / patent PVC, pile or neoprene door and window frame seals / patent silicone intumescent seals (fire and smoke) / patent external extruded aluminium threshold plate seals

Architectural seals need careful study by the designer – consult supplier.

- aluminium extrusion finish: mill / anodised / painted
- intended use of seal: energy (draughts, dust, insects) / intumescent (fire and smoke) / acoustic (noise) / finger-pinch protection (schools, day-care centres) / threshold plate / access (mobility, disabled persons)

Intumescent seals are designed to expand when subjected to heat.

- duty level: light / medium / heavy

Duty level: light (domestic); medium (commercial); heavy (hospitals, airports, shopping malls).

- mounting: fully morticed / semi morticed / surface mounted / grooved.

NOTE: Additional notes on reflective foil thermal insulation:

The difference in direction of heat flow is generally marginal for bulk insulation but can be pronounced for reflective insulation. Reflective insulation is more effective at reducing summer heat gain than reducing winter heat loss.

The thermal resistance of reflective insulation varies with the direction of heat flow through it, i.e. vertical, horizontal or sloped, the number of air spaces and defined thicknesses of the air spaces. Furthermore, that the bright surfaces facing the air space/spaces remains untarnished on at least one surface.

Reflective foils are valuable when used in combination with bulk insulation for improved performance.

Composite bulk and reflective materials are available that combine some features of both types. Examples include foil bonded to bulk insulation, whether blankets, batts or boards, i.e. foil faced blankets, foil faced batts and foil faced boards.

7 Roof coverings, cladding

To be published: SANS 2001-CR2 Tiled and sheeted roofs.

7.1 General

- type of cover, cladding: see drawings

tile / profiled sheet / fully-supported sheet / thatch

- roof pitch: see drawings

Check minimum roof pitches with SANS 10400-L. Roof pitches below that recommended by the manufacturer can be achieved by laying plywood boarding over the rafters and covering with waterproofing before tiling. Check with manufacturer.

underlay

- underlay type: reflective foil / polymer / the subject of an active Agrément Certificate

See Section 6 for reflective foil. Reflective foil doubles as thermal insulation and should be first choice in hot climates.

7.2 Tile roofing/cladding

7.2.1 Materials

- type of tile: concrete / clay / slate / fibre-cement / metal

concrete roof tiles

Concrete roof tiles have a mass of ±55 kg/m² laid.

- pattern and colour: …
- type: plain / interlocking
- body colour or surface coating category: 1 / 2 / 3 / 4

1 (none); 2 (surface coating only); 3 (body colour only); 4 (both).

- finish: throughcolour / granular / sanded

clay roof tiles

- type: Broseley (plain) / Marseilles (interlocking) / …
- colour: …

natural slate tiles

- size, colour: …

fibre-cement slates

- texture, colour: plain / textured / natural / …

Mass of fibre-cement tiles is 25 kg/m² laid.

metal roofing tiles

- material, finish: hot dip galvanized steel / aluminium alloy / stainless steel / coated / uncoated

fixing materials

- fixing materials: galvanized steel / stainless steel or aluminium

Galvanized steel in inland regions. Stainless steel or aluminium in *coastal regions* or corrosive atmospheres, except for clay tiles where all fixings shall be stainless steel.

7.2.2 Roof tiling

preparation

- terrain category: 1 / 2 / 3 / 4

Terrain category 1: exposed open/ *coastal areas* (generally the area within 5km from the coast-line unless otherwise defined locally); 2: exposed with scattered obstructions; 3 : well-wooded areas and suburbs, town and industrial areas; 4: large city centres.

- design wind speed: 40 / 45 / 50 / 55 m/s
- height above ground / number of storeys: …
- eaves: open / boarded

Eaves should be boarded in exposed terrains.

laying

- tile: concrete / clay / slate / fibre-cement / metal
- valley gutter: open / concealed
- verge tiles: required / not required

roof underlay

- roof underlay: required / not required

Underlays are strongly recommended in any area, and are mandatory in exposed and coastal terrains, depending on pitch. Not required for metal roof tiles.

SANS 204 states ”all tile roofs in climatic zones 1, 2, 4 and 6 shall have a tile underlay or radiant barrier and the joints shall be sealed to prevent air infiltration and leakage”.

7.3 Profiled sheet roofing/cladding

7.3.1 Metal sheet

Mass of metal sheet roofing is ±11 kg/m^2.

metal

- metal and coating: zinc-coated (galvanized) steel / AZ-coated steel / prepainted zinc coated steel / weathering steel / natural aluminium alloy / prepainted aluminium alloy / stainless steel / copper

Copper, aluminium, stainless steel or weathering steel should be used in environments where atmospheric corrosion is aggressive. Check availability, thickness and finish of these metals with manufacturer/ supplier.

profile

- profile: corrugated / box rib (IBR) / interlocking box rib / rib-trough/standing seam
- sheet length: single lengths per roof slope / standard lengths with overlap / single length standing seam over-ridge (see ridging)

Standard lengths (1,8 – 14 m) – check with manufacturer/ supplier.

Corrugated and IBR sheets in standard lengths with overlap causes less thermal movement stress on exposed fixings than long lengths.

steel

- nominal sheet thickness: 0,5 / 0,6 mm

Check availability of 0,8 mm sheets. 0,6 mm thick sheet costs ±16% more than 0,5 mm.

- coating grade: Z275 / Z600 / AZ150 / AZ200

Z275 and AZ150 for inland regions, Z600 and AZ200 for coastal regions and aggressive atmospheres.

Coiled sheeting with hot dip zinc coating (galvanising) class Z275 has an average zinc coating thickness of about 19µm; Z600 - 42µm. AZ coatings have increased corrosion resistance over zinc coating by 3 or 4. See notes on hot dip galvanising under Section 5 Structural Steel. Get expert advice from HDGASA or ARTF - SCRACE.

aluminium alloy

- aluminium roofing sheet thickness: 0,6 (cladding only) / 0,7 / 0,8 / 0,9 mm

stainless steel

- stainless steel thickness: 0,5 / 0,6 mm

copper

- copper: 0,6 mm thick

prepainted metal

- prepainted metal sheet type: 3 / 4 / 5a / 5b / 6a / 6b

Type 3 (mild to moderate rural, urban, tropical and industrial environments) / 4 (marine and industrial) / 5a (severe marine) / 5b (heavy industrial and industrial marine) / 6a very severe marine) / 6b (very severe industrial).

Coil coated and prepainted products are e.g. Chromadek or Chromadek Plus (Mittal Steel) for marine and industrial environments; there are several others. Paint coating more than doubles the life of sheets with metal coating only.

weathering steel (Cor-ten)

- weathering steel: 0,8 mm

bullnosing

- bullnosing radius: …

Minimum radius about 500 mm (inside radius), depending on material, profile and sheet thickness.

roof ventilators

- roof ventilator type, material, dimensions: …

7.3.2 Fibre-cement sheet

Mass of 5 mm thick fibre-cement sheets is 15 kg/m^2. Purlins must be 50 x 76 mm at 1 200 max spacing on trusses/beams at 1 200 max spacing (SANS 10243). Finish fibre-cement sheets in *coastal areas* with an anti-fungicidal paint – see section 14 Painting.

- bullnosing radius: …

7.3.3 Glass-reinforced polyester sheet

See also SANS 141 GRP laminates.

- type: 1 / 2

1 (with weathering protection both sides) / 2 (ditto one side)

- class: W / WF

W (without fire-retardant properties) / WF (with fire-retardant properties)

SANS 10400-L: “skylights shall have a maximum opening area of 0,6 m² or, if in the form of a translucent roof sheet, an installed width of 700 mm”.

- mass: 1,0 – 1,4 kg/m^2 (domestic) / 1,4 / 1,8 / 2,4 kg/m^2 (industrial)
- opacity: clear / opaque
- colour: …
- profile: see drawings / to match roofing/cladding sheet / corrugated / IBR / …

7.3.4 Polycarbonate sheet

- colour: …
- thickness: 1,0 mm / 1,2 mm

1,0 mm (domestic) / 1,2 mm (industrial)

- profile: see drawings / to match roofing/cladding sheet / corrugated / IBR / …

7.3.5 Fasteners and washers

- corrosion resistance class: 1 / 2 / 3 / 4

1 (general internal / 2 (general internal with significant condensation) / 3 external, mild to moderate industrial or marine) / 4 (external severe marine)
Identification of corrosive characteristics of the environment is essential.
Corrosion resistance class 2, 3 and 4 correspond with class C2, C3 and C4 of ISO 9223.
Some coating information for zinc and tin-zinc coated fasteners (corrosion resistance class, coating type, coating thickness in µm):
1, electroplated zinc (EZ), 4
2, EZ, 12
2, mech. plated zinc (MPZ), 17
3, EZ, 30
3, hot dip galv (HDG), 30
3, MPZ, 40
4, HDG, 50
4, MPZ, 45.
For full list see SANS 1273.

- type and size: hook-bolt / U-bolt / J-bolt / drive screw / self-tapping screw / *according to* roofing material *manufacturer's instruction*
- material: zinc-coated carbon steel / stainless steel.

7.3.6 Installation

exposed fixing

- box rib cladding: with rib against girt / with rib away from girt

lapping

Sealing of laps in sheeted roofs in climate zone 1, 2, 4 and 6 is mandatory (SANS 204)

7.4 Fully-supported metal sheet roofing and cladding

Flat metal sheet with standing seams on continuous solid boarding can follow any shape within limits of the boarding. The specification presented in PW371-A is for copper. Other materials are zinc, lead, aluminium or hot dip galvanized steel. Check material and fixing with specialists.
Boarding must be able to absorb condensation under roof sheet - use of chipboard or other dense boarding material will cause corrosion. Board thickness depends on span.

7.5 Thatch roofing

To be published: SANS 2001- Construction Works Part CR3: Thatch Roofing.
Cost of a thatch roof is 15 – 20 % higher than a conventional roof. Check insurance requirements.
Consider requesting that the work be done by a member of the South African Thatcher's Association.
Avoid penetrations of the roof area – place chimneys preferably at the ridge, ventilation pipes outside the exterior wall faces.
Thatch can be shaped and moulded.

- thatch type: grass / Cape reed (dekriet) / water reed

Local grass will weather better in the same climate from which it originates. Hyparrhenia and Hyparphilia species should last for 35 years. Thamnochortis species (Cape reed/dekriet) could last for 75 years. Also Phragmites Communis reed. 175 mm thick thatch weighs 35 kg/m2, about 40 bundles of grass per m^2.

Roof pitch in general should not be less than 45 degrees, 40 degrees at dormers (SANS 10400-L).

After the maintenance period the roof should be serviced every 10 – 12 years, and a new layer of 70 – 100 mm thatch added after 35 years. The life of thatch will be prolonged by brushing with a thatch spade at 4 – 5 year intervals.

- wire sways: prohibited / allowed

Wire sways should not be used in roof construction in areas where lightning is a problem unless provided with a lightning protection system (See SANS 10400-T).

- ridging: thatch / sand-cement / fibreglass
- fire retardant treatment: none / pre-treatment / during construction / after installation

7.6 Flashings, trim

Flashings to metal roofs should be similar to roof material to ensure same life to first maintenance and avoid electrolytic corrosion.

Counter flashings with an anti-capillary fold avoid electrolytic corrosion.

7.7 Fascias and barge boards

- size: see drawings.

Relevant standards:

SANS 10062: The fixing of concrete roof tiles.

SANS 10237: Roof and side cladding.

SANS 1200 HB-Cladding and sheeting.

SANS10400-L Roofs.

SANS 10400-T Fire protection.

Concrete Roof Tiles – Technical Manual. Concrete Manufacturer's Association.

Guide to good thatching practice. Thatcher's Ass of SA.

8 Waterproofing

To be publshed: SANS 2001-EW Waterproofing.

8.1 Materials

This section covers the conventional system of waterproofing with membranes only. Damp proofing in masonry is covered in SANS 2001-CM1. Consult The Concrete Institute for the waterproofing of concrete with additives.

The Waterproofing Federation of South Africa is the industry representative body.

SANS 10021 is outdated but useful and hopefully to be revised.

Bituminous felt (SANS 92), mastic asphalt (SANS 297/298) and elastomeric membranes like butyl rubber (polyisobuty-lene, SANS 187), chloroprene rubber (SANS 580) and EPDM (Ethylene Propylene Diene Monomer) have been used in the past but have largely been replaced by polymer modified bitumen membranes. No national standard exists for polymer-modified bitumen membranes, but most systems are Agrément certified.

reinforced bitumen membrane (RBM)

- finish: plain / slate granular / metal foil: aluminium or copper

self-adhesive plastic membrane (APM)

- finish: plain / foil / granular / polyester fabric

Self-adhesive membranes are thin (1,5 mm), normally laid as single layer systems to be covered (not UV resistant, except with foil, granular or fabric finishes).

reinforced liquid membrane (RLM)

- in situ reinforced liquid system: acrylic emulsion / bitumen emulsion / cementitious

Acrylic or bitumen emulsion is suitable only for exposed roofs and parapet walls. Cementitious systems can only be applied to cementitious backgrounds and can be tiled directly.

cavity drainage membrane

Studded polypropylene or HDPE cavity drainage membranes allow damp or running water to travel behind the membrane to a controlled drainage system. They are lighter than conventional stone and geotextile, provide continuous drainage and act as slip/separation layer.

slip/protection layers, geomembranes

Check requirements for bituminous felt or HDPE slip/protection layers and thermplastics geomembranes.

outlets

- outlet type: roof / small balcony / shower
- size: >75 mm.

8.2 Preparation

falls

SANS 10400-L: Slope of a (cast in situ) concrete roof should be achieved by casting the concrete to the required fall, eliminating the need for a screed which may be susceptible to cracking and and resultant spreading of leaks.

Falls in flat timber roofs should be created in the rafter/beam design and not by raising purlins.

Show ridges, valleys and falls clearly in drawings.

SANS 10400-L Roofs stipulates a design fall of 1:50, allowing for construction inaccuracies and deflection under dead or imposed loads.

balconies

Ensure balconies are at a sufficiently lower level than door thresholds to allow for the screed or topping to be minimum 50 mm thick, and have sufficient fall to outlet(s).

Balustrades are best fixed to front of upstands.

Balcony door thresholds exposed to rain: waterproofing should be continued up against threshold and finished under door frame

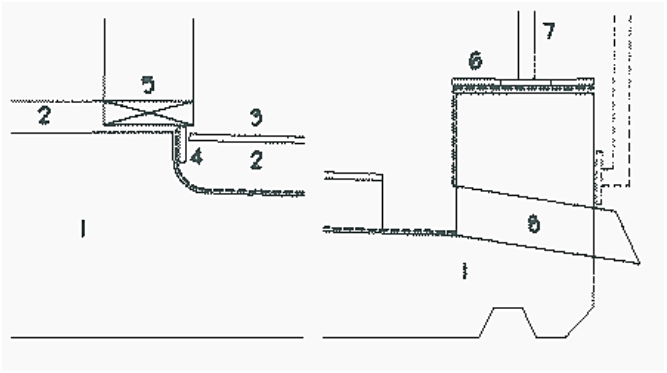


Diagram: Section through a balcony

1 concrete slab; 2 screed (optional); 3 tiles in adhesive on screed or bonded to waterproofing; 4 soft joint/sealant; 5 sliding door frame; 6 tiles bonded to waterproofing; 7 balustrade; 8 outlet.

outlets

Outlets set lower than their surroundings to prevent ponding: SANS 10400-L 4.3.2.4

SANS 10400-L: “attention should be given to the provision of ventilation to allow moist air, which might accumulate below the waterproofing layer, to be vented to the outside air”. Check with manufacturer/ supplier.

8.3 Application

For basement construction see SANS 10021. Basement floors and walls may be tanked, or formed with a cavity construction combined with drainage or pumping, or both, or may be constructed with cavity drainage membranes.

8.3.2 Termination

Bonding waterproofing with DPC’s should be considered in winter rainfall areas. DPC’s should be the same material as the waterproofing and have sufficient overhang to facilitate overlapping and bonding.

Balcony door thresholds exposed to rain are a common cause of leakage. Waterproofing should be taken up against thresholds and finished under the door frame and sealed.

1.5 Waterproofing surface finishes/protection

Protection against UV degradation, traffic and hail prolongs life expectancy of membranes. No protection required to exposed bitumen membranes with slate granular or metal foil finishes.

8.5.1 Exposed non-trafficable areas

□ type finish/protection: see drawings

paint / crushed stone / crushed stone on insulation panels / tiled insulation panels

paint

Acrylic does not adhere well to new bituminous-based systems.

crushed stone

A layer of gravel protects waterproofing and acts as anchor, but makes leaks difficult to trace. Thermal insulation value of gravel layer on its own is slight.

tiled insulation panels

Thermal insulation should be placed over the waterproofing (“inverted roof”), protecting it from high temperature fluctuation, ultraviolet degradation and mechanical damage,while allowing easy visual inspection of the waterproofing when laid loose.

Depending on tile mass, loose-laid tiled insulation panels should be installed only on flat roofs protected against wind by perimeter upstands. Tiles should be fully vitrified to withstand freeze-thaw cycles and should be sturdy enough to withstand handling and maintenance foot traffic. Panel size depends on multiples of tile size. Panels could float during heavy downfalls. Panels are easily removed for inspection and maintenance.

8.5.2 Pedestrian traffic areas

- type finish/protection: see drawings

topping / topping on insulation panels / tiles on screed / tiles on waterproofing / paving slabs on insulation panels / paving slabs on adjustable pads

Paving units are suitable for trafficable roofs, and for roof gardens and planters where waterproofing may be damaged by garden tools.

Paving on adjustable pads can be easily removed for inspection/repair, and the air space provides considerable thermal downward insulation. Paving slabs need to be sturdy, depending on traffic.

thermal insulation panels

- lay finish on thermal insulation panels: required / not required

tiles on waterproofing

- tile type, size: …

See Section 12 Tiling.

paving slabs on adjustable pads

- paving surface levels: see drawings

8.5.3 Vehicular traffic areas

- type finish/protection: see drawings

50 mm premix laid directly onto waterproofing / brick or concrete pavers laid on 25 – 30 mm sand bed (see Section 21 External works) / 75 mm concrete paving on protection/slip layer (see Section 2 Concrete works)

8.5.4 Basement, retaining walls

- before backfilling, protect waterproofing with: softboard / hardboard / cavity drainage membrane / masonry leaf
- drainage system behind wall: …

Omit if not agricultural drain encased in stone as specified.

8.5.5 Planters, roof gardens

- type finish/protection: 100–150 mm layer stone with geocomposite drainage layer with minimum mass of 210 g/m^2 laid on top / cavity drainage membrane laid directly on waterproofing.

Relevant standards:
SANS 10021 Waterproofing of buildings (including damp-proofing and vapour barrier installation).
SANS 10400-L Roofs.
BS.8102:2009 - Protection of Below Ground Structures against Water from the Ground.
GP Koning. *The Waterproofing of Buildings*. PO Box 26153 Hout Bay 76872.

9 Ceilings, linings, partitions, access flooring

To be published: SANS 2001- Construction Works Part EC1: Ceilings, partitions, access flooring.

9.1 Brandered ceilings

9.1.1 Branders, grounds

- type: timber / steel

timber branders/grounds

SANS 2001-CT2 (and SANS 10400-L) covers the fixing of timber brandering to roofing members to support ceilings that comprise gypsum plasterboard, fibre-cement board or similar boards only: “Brandering of size 38 mm × 38 mm required to support gypsum plasterboard, fibre-cement board or similar board shall be securely spiked to the supporting timbers with 75 mm wire nails. Cross brandering shall be cut in between the longitudinal brandering and skew nailed to the same, using 75 mm wire nails at centres that do not exceed 900 mm”.

Grounds for wall linings: depth of 25 mm may be influenced by thickness of required insulation, services.

steel branders

Steel brandering is ideal for bulkhead construction.

- perimeter trim: standard / shadowline.

9.1.2 Fibre cement and gypsum board brandered ceilings

- type: fibre-cement / gypsum

fibre-cement board

Flat fibre-cement boards are made with organic fibres, plain or textured, and are water and fire resistant.

gypsum board

Gypsum board is non-comustible. Standard board should not be exposed to contact with water – do not use in industrial bathrooms or kitchens, or in exterior applications. For high moisture conditions use moisture resistant board. For fire resistance use X-rated board. Use double layers where acoustic insulation is required.

- type: standard / moisture resistant / fire rated
- edge: square / tapered

Use tapered edge board for scrim and plaster joints when full ceiling surface is not to be plastered.

cornices

- material, size: coved gypsum 75 mm wide / ditto 125 mm wide / coved polystyrene cornice / foam moulded / hardwood / softwood, profile …

cover strips

- joint cover strips: H-profile: prepainted galvanized steel, aluzinc or plastic / gypsum board / hardwood: specie …; profile, size: see drawings

Omit if ceiling is plastered.

fixing

- board pattern: see drawings

Omit if not visible or default (symmetrical about room) is acceptable.

- position of movement/control joints: see drawings

movement/control joints should be a clean break of 15 mm through the complete ceiling structure and finish.

finish

- finish to plaster board ceiling: plain with cover strips / plain with plastered joints / entire ceiling plastered

9.1.3 Wood board brandered ceilings, linings

- type of board: tongue and groove / strip / plywood / perforated plywood

tongue and groove board (SANS 1039)

- species: softwood / hardwood / species …
- grade: clear / select / knotty
- profile: see drawings

See SANS 1039 for various profiles.

- face width: 50 / 65 / 75 / 102 / 140 mm
- thickness: ceiling board: 12 / 16; panelling 12 / 16 / 22 mm

wood strip, trim

- strip spacing: see drawings

plywood

- exposure class: 1 / 2 / 3 / 4

1 (exterior); 2 (semi-exterior); 3 (humid interior); 4 (dry interior).

- veneer species: …
- cut: rotary / sliced
- grade: S / A / B

S (select, for decorative applications), A (furniture, for joinery where it may be reworked), B (standard, to be covered, coated or painted).

- perforations: size, spacing: …

For effect and/or acoustic control.

fixing

- position of ceiling: see drawings

above / in beteen / below roof beams

- strip spacing: …
- cornice, trim size and profile: …

9.1.4 Hatches

- position of ceiling hatches: see drawings

See note on geyser position under Section 18.

- trap door: hinged / laid loose

9.2 Suspended ceilings

Consult SABISA (South African Building Interior Systems Association, part of the AAAMSA group).

- type: board / fabric / louvre / grid / bulkhead
- material: mineral fibre / metal / …

performance

- required fire resistance in minutes: see drawings

20 / 30 / 60 / 90 / 120 / 180 / 240
See also note under 9.3.

- required airborne sound insulation grading dB: see drawings

30 / 35 / 40 / 45 / 50
For noise measurement and rating consult SANS 10103.
See also note under 9.3.

board

- type: plain / perforated / smoke-tight / impact-proof (e.g. ball) / removable / fold-down / drop-and-slide
- material: mineral fibre / gypsum / fibre cement / metal / vinyl clad / grid / flush plaster
- mineral fibre edge: square / revealed square / bevelled concealed / concealed

- size: see drawings
- colour: …
- texture: plain / fissured / perforated
- finish: …
- ceiling panels: removable and replaceable from below / fixed / as required for maintenance

suspension fittings

- suspension system: patent / rational design

installation

- grid pattern: see drawings

access

- access: see drawings

Access depends on hold-down system, panel removability, access requirements to above-ceiling services, weight of ceiling panels. Discuss with manufacturer/supplier.

9.3 Partitions, linings

- type: see drawings

drywall / light weight internal wall / demountable / cubicle / operable

performance

- required fire resistance in minutes: see drawings

20 / 30 / 60 / 90 / 120 / 180 / 240
Fire resistance*:* SANS 10400 Part T classifies the performance of materials in respect of fire resistance in categories of 20, 30, 60, 90, 120, 180 and 240 minutes. Architect/*Competent Person* to specify. Fire resistance is achieved by increasing layers of board. Deflection requirements are achieved by multiple studs reinforced with layers of board. Check with SABISA.

- required sound insulation grading dB: see drawings

30 / 35 / 40 / 45 / 50
30 (normal speech audible, but unintelligible), 35 (loud speech understood), 40 (loud speech audible, but unintelligible), 45 (loud speech barely audible), 50 (shouting barely audible)
Comparable constructions: 26 (solid wood door without seals), 32 (6 mm laminated glass), 42 (100 mm brick wall), 48 (230 mm hollow concrete wall).
For noise measurement consult SANS 10103.

9.3.1 Materials

gypsum plasterboard

- type: wallboard / moisture resistant wallboard / high-temperature wallboard

Moisture resistant board for use in all wet areas such as bathroom showers as well as locations with high humidity levels.

- thickness: 12 / 15 mm
- type of edge: square / tapered / bevelled / rounded
- covering: paper backed vinyl of weight in g/m^2 : …

fibre cement board

- type: MD / HD

flat unpressed (MD), flat pressed (HD).

- thickness: 9 mm

studs and tracks

- material: metal / wood

aluminium extrusions

- abrasion resistance: required / not required
- colour: natural / anodized

anodising

- anodising grade SANS 1407: AG10 / AG15 / AG20 / AG25

grade AG10 (0,1 mm thick), for interior use only; AG15 and 20 for mild atmospheric conditions; AG25 where little or no deterioration is permitted. According to ASFA (Aluminium Surface Finishers Association), SANS 1407 is suitable for internal use only.

- abrasion resistance when relevant: required / not required
- colour: …

powder coating

- SANS 1274 type: 1 / 2

1 (heavy duty interior), 2 (interior and non-corrosive conditions).

- colour: …
- finish: matt / satin / high gloss / hammertone / textured

glass

- type: see drawings

float glass / wired / patterned / safety
See GLAZING

- thickness: see drawings

9.3.2 Drywall partitions, light weight internal walls

- framing: timber / steel
- cladding: gypsum board / fibre cement board
- gypsum board cladding finish: vinyl / paint / tile

For cladding finish of appropriate type to suit expected traffic in designated areas, refer to manufacturer for recommendations.

- door/window frame finish: anodising / powder coating
- glazing: clear / opaque / patterned / safety

9.3.3 Demountable partitions

- framing: steel / aluminium
- exposed frame finish: anodized aluminium / powder coating
- cladding: gypsum plasterboard / melamine-faced board / …
- cladding finish: vinyl / paint
- glazing: clear / opaque / patterned / safety

9.3.4 Cubicle partitions

- mounting: flush floor / raised on stainless steel stiles
- panels: vitreous enamel / melamine faced
- hinge type: normal butt / rising butt
- accessories: indicator bolt / coat hook / …

9.3.5 Operable partitions

- operation: individual panels / hinged paired panels
- accessories: pass doors / work surfaces (chalkboard, dry marker board, tackboard) / pocket doors (to hide stacked panels).

9.4 Raised access flooring

Annex B and C of SANS 1549 gives information on quality verification of components; electrical properties; fire protection and safety; special panels; surface of completed installation; moving and placing of safes and other heavy equipment.

NOTE: this standard has been withdrawn but is regarded by industry as superior to the new (European) standard (SANS 52825). Check with supplier.

- required fire resistance in minutes: see drawings

20 / 30 / 60 / 90 / 120 / 180 / 240

See note under Section 9.3.

- required sound insulation grading in dB: see drawings

30 / 35 / 40 / 45 / 50

See note under Section 9.3.

- class: A / B / C

Class: A, B or C depending on static or dynamic loads. Check with manufacturer.

- floor panel covering: heavy duty high pressure laminate on particle board P6 / textile / …
- degree of corrosion resistance if other than default : …
- clear height to underside of floor: see drawings
- required life of covering: …
- details of special floor panels: see drawings
- whether floor assembly forms part of a plenum system: …
- lifting devices: required / not required.

Relevant standards: SANS 10400-L Roofs.

SANS 10218 Acoustical properties of buildings.

SANS 10103 The measurement and rating of environmental noise with respect to annoyance and to speech communication.

SANS 52825 / EN 12825 Raised access floors.

10 Windows, doors, curtain walls, skylights, solar control

10.1 Performance

mechanical performance

- site category: 1 / 2 / 3 / 4

Design wind pressure must be specified in terms of SANS 10160. It is derived from the site category and height above ground. Site categories are: 1: open sea, lake shores, flat treeless plains; 2: airfields, parklands, farmlands, outskirts of towns and suburbs; 3 and 4: built-up areas or city centres.

- height above ground: …
- plastic, shrinkage and creep deflection of floor slabs: …

Omit if not relevant. If relevant (curtain walling/ window walling), deflection of floor slabs MUST be specified by a structural engineer.

thermal performance

- fenestration unit conductance: see drawings
- fenestration unit SHGC: see drawings

Actual Conductance and SHGF-value test results for fenestration units may be obtained from the South African Fenestration and Insulation Energy Rating Association (SAFIERA), representative of the National Fenestration Rating Council (NFRC) in the USA.

fire resistance

- fire resistance: …

sound insulation

- sound insulation: … .

General requirements

- type: see drawings

residential / industrial / stock / purpose made

- type opening section: see drawings

casement / sliding / sash / tilt-and-turn / pivot

- handing, whether viewed from inside or outside, including proportion of vertically pivoted casements that opens outwards: see drawings
- frame material: see drawings

hot-rolled steel / cold-rolled steel / pressed steel / aluminium / wood / polymer / polymer concrete / composite

Aluminium is durable with low maintenance but highly heat conductive – frames with thermal breaks are acceptable. Wood has good insulating values and strength, but needs regular maintenance. Polymer frames are maintenance free with good insulation value.

- glazing from inside: see drawings

For windows not accessible from outside.

- shape and size: see drawings
- glazing bars: see drawings
- burglar bars: …

to all opening sections / to complete window

Ensure extent to which openable sections can open is acceptable.

- pattern: see drawings

- insect screens: see drawings
- glazing: see drawings

See Section 17.

- sealants and seals: …

see Section 6.

- hardware and fixings: see drawings

Hinges (ordinary or projecting), handles, stays, catches, bolts etc.: see also Section 16.

- additional security devices: …

building in

Best way to fit single aluminium frame units is to build in steel or timber subframes, finish all wet trades, and fit window or door at last possible stage. If built in early, protection of frames against damage is required. Another good method is to build and finish openings and make and fit frames to measure – thus also making it possible to fit at last possible moment. Screw fitting of frames can only be done before glazing. Discuss with supplier/installer.

10.3 Steel frame units

- factory finish: primed / hot dip galvanized

See notes on zinc coating under Structural Steelwork.

10.3.1 Hot-rolled steel framed units (SANS 727)

Hot-rolled steel frames are not thermal performance rated and will not meet air leakage requirements as specified in SANS 10400 XA or SANS 613 without weather seals. See also cold-rolled steel framed units.

10.3.2 Cell windows

Manganese steel obtainable only from the contractor who has been awarded the State Tender Board contract for the provision of such steel for the financial year in question and whose name and address is available from The Chief Director, Procurement Administration, Private Bag X49, Pretoria 0001

10.3.3 Pressed steel clisco type window frames (SANS 1311)

- type: A / B

A (single rebate surround) / B (double rebate surround)

10.3.4 Pressed steel door frames (SANS 1129)

- type: see drawings

single leaf door without fanlight / ditto with fanlight / double door without fanlight / ditto with fanlight / door and frame combination

- material of lock strike plate: chromium/cadmium plated steel / brass
- hinges: steel / brass
- handing: see drawings
- size: see drawings
- type of profile: see drawings

single rebate / double rebate / half wall width / full wall width

- fanlight: see drawings

fixed, with glazing beads / opening hinged bottom / opening hinged top

- type of lock/latch: see drawings

additional clauses

Frames for power floated floors need to be shorter, and temporary bracing has to be removed after fixing.

10.4 Cold-rolled steel frame units

Cold rolled steel frames may meet air leakage requirements as specified in SANS 10400 XA or SANS 613. Check with manufacturer/supplier.

10.5 Aluminium frame units

- performance class: A1 / A2 / A3

A1 (residential and light commercial); A2 (commercial); A3 (monumental).

Aluminium framed windows, doors and shopfronts manufactured according to the minimum requirements of the Association of Architectural Aluminium Manufacturers of South Africa (AAAMSA) are mark-bearing with the mark and number of the test certificate issued by AAAMSA. Consult AAAMSA General Specification for Glazed Architectural Products (Including Energy Efficiency Design for Fenestration).

- frame surface finish: anodised / powder coated / liquid organic coated

Anodising is a harder and more abrasion-resistant finish than powder coating, but has a limited choice of six colours (natural through four shades of metallic bronze to black). Colours are light fast but never identical and virtually impossible to match with older or other finishes. Anodising is susceptible to mortar and lime attack during construction. Consult AAAMSA or the Aluminium Surface Finishers Association (ASFA) for the selection of anodized and powder coating thicknesses.

- anodising grade: AA15 / AA25

Grade: AA15 (0,015 mm thick, for mild atmospheric conditions in rural environments), AA25 (0,025 mm thick, for polluted atmosphere, sites within 5 km from chemical plants, coastal regions within 25 km from the sea, marine conditions, windy areas where sand causes abrasion). See AAAMSA Surface Finishes.

- powder coating colour: … ; gloss category/finish: mat / satin / high gloss / hammertone / textured.

10.5.1 Windows and glazed doors

- colour of gaskets and weatherstrips: black
- weatherstrips: renewable.

10.5.2 Skylights

No national standard on skylights exists. The Skylight Association of Southern Africa (SASA, part of the AAAMSA group) is the industry representative body. Consider heat transmission, glare, UV radiation and ventilation carefully. Provide *drawings* at time of tender, if available.

- type, shape: see drawings

sloped / pitched / arched / domed / single / composite / openable

- size: see drawings

SANS 10400-L: “skylights shall have a maximum opening area of 0,6 m² or, if in the form of a translucent roof sheet, an installed width of 700 mm”.

- slope: see drawings

To ensure proper condensation and water infiltration control, and to minimize the accumulation of dirt, inclination of glazing materials should be 15° minimum. Sloping glazing to have sufficient overhang to shed rainwater from significant vertical surfaces.

- frame: powder-coated steel / natural aluminium / anodized aluminium / powder-coated aluminium / painted wood / varnished wood
- glazing: glass / polycarbonate / acrylic
- mounting: flush / curb / integral
- fixed or operable: …

10.5.3 Curtain walling

- curtain walling type: …

site assembled continuous mullions with discontinuous transoms with infill glazing and panels / prefabricated units of framework, glazing and panels / rational design / submit proposals

□ curtain walling panel construction: …

external finish / internal finish / core insulation / combustability / surface fire spread.

10.6 Adjustable glass louvre windows

□ operation: manual / remote control.

10.7 Wood frame units

No national standard exists on wood frame doors and windows, but check compliance with SANS 613.

Wood frames should be protected from rain by adequate roof overhangs or extended lintels with drips.

□ wood species: …

□ profile and dimensions: see drawings

10.8 PVC-U frame units (SANS 1553)

□ profile and dimensions: see drawings

□ surface finish: matt / glossy.

10.9 Polymer concrete frame units

□ profile and dimensions: see drawings

□ surface finish: …

□ sub- and opening frame material: aluminium / cold rolled steel.

10.10 Wood doors (SANS 545)

□ type of door: see drawings

balanced / batten / flush / casement / prehung / security-view / louvre / patterned / screen / sliding / special / stable / cupboard / X-ray / single / paired single swing / paired double swing

□ dimensions: see drawings

610 / 762 / 813 / 864 mm x 457 / 2032 x 40/44 mm

457 mm high doors for cupboards. Entry doors for disabled persons in wheelchairs must be at least 813 mm wide.

□ handing: see drawings

Hand refers to position of hinge when door opens towards viewer. Show first opening leaf of paired doors when important.

□ exposure class: see drawings

2 / 3 / 4

2 (semi-exterior, partly or wholly exposed at infrequent intervals to unprotected open air conditions); 3 (humid interior); 4 (dry interior). Note there is no exposure class 1. Hardwood framed and braced batten doors are heavy duty doors, suitable for exposure class 2.

flush panel doors

□ performance class: see drawings

LD / MD / HD

LD (light duty, hollow core) / MD (medium duty, semi-solid core / HD (heavy duty, solid core)

Solid core flush panel doors are heavy duty doors suitable for dry interior use only – specify for frequent use and abuse, e.g. schools, public places, hospitals.

Semi-solid flush panel doors are medium duty doors suitable for dry interior use only - specify for general use in office blocks, dwellings, barracks and single quarters, including cupboard doors.

Hollow core flush panel doors are light duty doors suitable for dry interior use only – specify for dwellings or cupboard doors in dwellings only.

- any special properties: …
- finish, and wood species when relevant: see drawings

fibre board / sapele mahogany veneer / plywood / coating

Do not specify veneer when door is to be painted. Other commercial veneer species: maple, cherrywood, beech – check with suppliers.

10.11 Fire doors and fire shutters (SANS 1253)

- class (fire resistance in minutes) : see drawings

A / B / C / D / E / F

A (60 min) / B or C or D (120 min) / E or F (30 min)

- type door: see drawings

single / double / swing / sliding

Manually operated sliding fire doors are normally parked in open position, closing only in event of a fire by means of a fusible link or electric magnet.

- type of closing device: see drawings

fusible link / electric magnet

Electrical operation is recommended for larger doors that are frequently used.

- handing: see drawings

Doors forming part of fire escape routes must open in direction of route.

- size: see drawings

Maximum 4 x 4 m.

- finish: see drawings

hardboard / galvanized steel cladding

Galvanized steel for heavy duty and external doors or corrosive conditions.

10.12 Garage doors

- type: up-and-over / sectional overhead / sliding / swing
- size: single / double
- framework material: steel / wood
- cladding/boarding material: hardwood / aluminium / prepainted galvanised steel / primed steel
- operation: manual / electric / chain drive / hand crank
- finish: varnish/sealer / paint / powder coated / anodised / epoxy coated
- locking devices: chrome plated centre lock with spring loaded side catches, interior/exterior padlock bolt and keep / automated (no locking device required)

sectional overhead doors

- panels: aluminium / aluminium/zinc / galvanised mild steel / prepainted galvanised mild steel / hardwood / glass
- specialised applications for solid doors: fire-doors SANS 1253 class … / with fusible link, permanently open / gas leak proof / tornado wind resistant / high-frequency / petrol bomb resistant / acoustic control.

10.13 Roller shutter doors

Roller shutter doors are *suitable* for from counter closures to aircraft hangars, and may be used for security, fire, smoke, gas, wind and bomb control.

Push-up operation is limited to 7,5 m²; chain 8 – 30 m²; crank to 25 m²; electrical to any size.

- size: see drawings
- operation: push-up / chain / crank / electric

- slats: steel / aluminium / solid / see-through/ventilated / double wall / grille / with end-locks
- grill pattern: …
- finish: mill / hot dip galvanised / wet spray / anodised / powder coated
- canopy enclosing rolling mechanism: required / not required
- bottom bar in case of sloping floor: sloping / with flexible weatherstrip
- locking devices: side bolt at waste height / external pad bolt / centre lift lock with external key and internal knob operation / floor level four point slide bolts
- wicket door 685 x 1830 mm: opening in / opening out
- additional features required: card readers / inductive loop circuits / automation
- specialised applications for solid doors: not required / fire-door SANS 1253 class … / with fusible link, permanently open / gas leak proof / tornado wind resistant / high-frequency / petrol bomb resistant / floor shutter / acoustic control .

10.14 Strongroom/record room doors, ventilators

- type: see drawings

strongroom / vault / record room

strongroom and vault doors (SANS 949)

- category strongroom doors: 1 / 2 / 2 ADM

Category: 1 (fire resistance 30 minutes, entry resistance 15 minutes), 2 (30 minutes, 1 h), 2 ADM (anti-disc cutter material)

- category vault doors: 1 / 2 / 2 ADM / 3 / 4 / 5

Category 3, 4 and 5 resist increasing levels of attack.

- dimensions: see drawings
- fittings: see drawings
- handing: see drawings
- type and number of locks if other than specified: …
- factory finish: primer only / baked enamel / hammertone

fire-resisting record room doors (SANS 1015)

- type of lock if other than specified: …
- finish: baked enamel / hammertone.

10.15 Solar control

- type: internal / external / fixed / retractable / awning / canopy / blind / louvre
- material: fabric / metal / concrete / glass
- fabric: UV-resistant, washable, rot-proof
  - visible transmission: …
  - solar transmission: …
- metal: aluminium / prepainted hot dip galvanized steel
- louvre: fixed / adjustable
- operation when relevant: manual / automated / from inside.

Relevant standards: SANS 10400-O Lighting and Ventilation. SANS 204 Energy efficiency in buildings

11 Plaster, screeds, toppings, terrazzo

11.1 Plaster

- type: see drawings

cement plaster / gypsum plaster / lime plaster / insulating plaster / barite plaster / waterproof plaster.

11.1.1 Cement plaster (SANS 2001 EM1)

SANS 2001- Construction Works Part EM1: Cement Plaster Admixtures are not permitted in cement plasters to improve workability or improve the properties of the finished plaster.

Specification data:

- application: single coat / multicoat
- finish to cement plaster: smooth / textured / roughcast / bagged / skimmed

Show in drawings: V-joints through full plaster thickness at dpc level and where different materials meet; metal lath strips over roof anchors on single leaf masonry walls, or across joints between different materials – see SANS 2001-EM1.

11.1.2 Gypsum plaster

Do not mix gypsum-based plaster with plaster made with common cement – the sulphate compound in gypsum attacks common cement paste.

11.1.4 Insulating plaster

- low density aggregate density range: 60 – 160 / 120 – 240 / 450 – 720 kg/m³

60 – 160 (exfoliated vermiculite); 120 – 240 (perlite); 450 – 720 (foamed slag).

Omit if default (800 – 960 kg/m³ (clinker) covered in SANS 2001-EM1) is acceptable.

Barite plaster for use in X-ray rooms. Thickness for general diagnostic X-ray work normally between 15 and 30 mm. Check mix and thickness with requirements.

11.1.6 Accessories

- expanded metal, type: sheet/plate / angle bead / base bead / corner mesh / plaster lath / plaster stop / rib lath / strip mesh
- angle rounded corner protection: 1 500 x 1,0 x 35 mm girth strip, position: see drawings.

11.2 Screeds, toppings, terrazzo

To be published: SANS 2001-EM2 Screeds and toppings.

Screed is a layer of a well-compacted mixture of cement and fine aggregate applied to a concrete base, *suitable* for receiving a floor finish.

Topping is a layer of high-strength concrete designed to provide a dense, abrasion-resistant surface on a concrete base.

Terrazzo is a hard-wearing decorative concrete finish in which crushed or uncrushed aggregate like marble and pigments is used, and of which the surface is generally ground and polished.

Specify screed or topping only where a direct-finished one-course concrete floor is impracticable.

11.2.1 Materials

proprietary surface treatments

Treatments to harden or seal the surface of toppings are not normally required, provided a sufficiently high grade of properly finished concrete is used. They may however be useful in dust sensitive areas or where oil spills or mildly acidic solutions may occur. Expert advice should be sought from the manufacturer/supplier.

- form: dry shake / coating / screed
- to improve: abrasion resistance / chemical impact resistance / slip resistance / density / UV resistance
- colour/finish: …

mesh reinforcement

- mesh reinforcement: …

Mesh reinforcement may be required to restrain differential shrinkage stresses and control cracking on precast concrete elements – not normally required.

water

- water: SANS 51008

Omit if default (drinking water) is acceptable.

11.2.2 Mix

topping

- concrete grade: see drawings

20 / 30 / 40 / 50

Topping: 1 part cement to 1½ parts sand to 1½ parts stone would produce a concrete strength of 25 – 30 MPa. Use concrete of at least grade 20 where abrasion resistance is not a consideration; grade 30 for floors for light duty industrial and commercial purposes; 40 for ditto medium duty; 50 for heavy duty industrial, workshops, special commercial; very heavy duty engineering workshops would require a proprietary topping. Consult The Concrete Institute for advice.

11.2.4 Laying

Method of laying as described here is known as "separate bonded construction", where the topping or screed is laid on and bonded to a hardened base. For other methods, for example monolithic construction, and separate unbonded construction, consult SANS 10109 part 2.

Compaction of the mix is most important. Stiff semi-dry mixes not well compacted are a common cause of bond failure. Compact stiff mixes with power-operated equipment such as vibrating screed boards.

Joints in screeds should be minimal. Screeds laid in large areas may crack, but this is more acceptable than curling at edges of small panels.

- screed thickness: see drawings

25 – 50 mm

- topping thickness: see drawings

25 – 40 mm

- edge/feature/dividing strips: see drawings.

11.2.5 Finishing

- type of finish: ordinary / hard / colour pigmented / dry shake / surface ground and polished

Ordinary finish is *suitable* for surfaces that are to be covered by flooring. Hard finish is *suitable* for surfaces that are not to be covered with flooring and for toppings that require high resistance to wear (grade 30 and higher).

Hardwearing surfaces like toppings and terrazzo may be ground and polished – not recommended for sand:cement screeds. Grinding tends to create lower slip resistance. Grinding will affect appearance and will remove surface treatments such as dry shakes.

- surface smoothness: smooth / non-slip

pigmentation

- type: integral (mix with dry cement) / add to freshly laid surface as a dry shake / not required.

11.2.6 Joints

- type: isolation joint / intermediate sawn contraction joint / patent movement joint
- pattern: see drawings
- seal joints: required / not required
- patent movement joint system with flexible inserts: aluminium / stainless steel / PVC

Material depends on nature and intensity of traffic. Joints should be sealed when floor is subjected to liquids, hygiene.

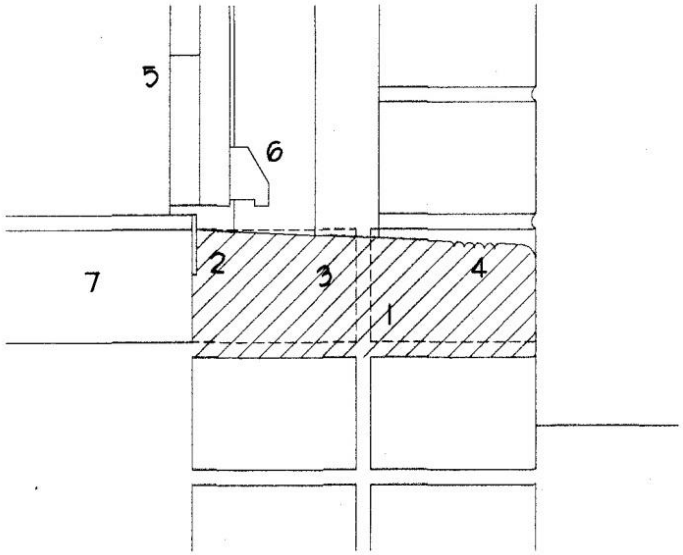
11.2.7 Surface regularity

- degree of surface regularity: I (3 mm) / III (10 mm over 3 m in any direction)

Omit if default (II) is acceptable. Check with SANS 10155. In small rooms deviation should be less.

11.2.8 External thresholds

Placing the door in line with the inside wall face allows the join
under the door and adds a measure of rain protection to the d



1 break out bricks
2 metal edge strip
3 in situ or precast concrete threshold with slight fall
4 reeding
5 external door
6 weather bar
7 concrete surface bed

11.2.13 Surface sealing

- seal floor surface with: one coat non-slip wax polish / epoxy / not required.

Relevant standards:
SANS 10109 Part 2 Finishes to Concrete Floors.
Concrete Basics for Building. 2004. Cement and Concrete Institute.

12 Tiling

12.1 Materials

□ type of tile: see drawings

ceramic / stone / concrete / terrazzo / mosaic

ceramic wall and floor tiles (SANS 1449/13006)

□ group: A1 / A2 / A3 / A4 / B1 / B2 / B3 / B4 / C

Group A (extruded split /quarry tiles) and B (dust pressed tiles) are classified according to their water absorption properties. C=other. Group A1 and B1 have the lowest water absorption (≤3%). Fully vitrified porcelain tiles, covered by SANS 13006 only, are frost resistant and suitable for cold rooms etc.. Not all manufacturers produce to SANS 13006.

□ surface: glazed / unglazed

□ shape, pattern, colour: …

□ nominal dimensions: see drawings

200 x 200 / 300 x 300 / 400 x 400 / 500 x 500 mm

□ grade: first grade / second grade

Second grade tiles have minor blemishes.

□ glazed tile abrasion resistance class: 1 / 2 / 3 / 4 / 5 / not required

Abrasion resistance class to SANS 13006: 1 for interior soft domestic footwear such as bathrooms and bedrooms; 2 for interior light domestic traffic such as living rooms; 3 for interior and exterior areas such as domestic kitchens, halls and terraces, and low-traffic commercial areas; 4 for frequent traffic such as public entrances, shops, hospitals, hotel kitchens and exhibition rooms; 5 for severe pedestrian traffic such as shopping malls, airport concourses, sports stadia and factories.

□ slip resistance value (coefficient of friction) : dry …, wet … / on stairs and ramps only

For slip resistance, contact manufacturer. Slip resistance is important in public places and on ramps and a requirement for disabled people (SANS 10400-S). Several test methods exist. The Pendulum Test Value (PTV) to BS 7932 is acceptable. PTV 0–24 is high, 25–35 moderate, 36+ low slip potential. A calibrated tester is available in SA. Slipperiness is also affected by use, water, spills and floor care.

□ acid and alkali resistance of glazed tiles: type of chemical … / not required

stone tiles

No local standard exists on natural stone tiles. Consult supplier/installer.

□ type: natural stone / cast stone

□ natural stone: slate / quartzite / marble / granite

□ slip resistance value (coefficient of friction) : dry …, wet … / on stairs and ramps only / not required

For slip resistance contact manufacturer.

□ nominal dimensions: see drawings

300 x 300 / 450 x 450 / 600 x 600 x 50 / 65 mm

□ shape: …; colour: …

concrete tiles

□ type: concrete / terrazzo

□ nominal size: see drawings

300 / 450 / 600 x 300 / 450/300 / 600/450 x 50 / 65 mm

mosaic

□ material: ceramic / glass / stone

- appearance: glazed / unglazed
- colour: …
- size of tesserae: …

grout

- proprietary grout: cement-based / organic-based / reaction resin (epoxy)

Epoxy grout e.g. in food storage and preparation and processing areas, abattoirs, breweries, dairies, bottling plants, restaurants, industrial kitchens, hospitals and clinics.

profiled and decorative tiles

- profiled and decorative tiles: see drawings

skirting / dado / bullnose

accessories

- edging, trim, stair nosing and movement joint strip material: PVC / aluminium / brass / stainless steel

see also Section 16.

- profile, size, colour: …

12.2 Tiling

To be published: SANS 2001-ET Tiling.

bedding

- external angles: see drawings

mitred / lapped / strip edged / bullnose tile

- internal sills in bathrooms: see drawings / level / sloping

Sloping sill to prevent internal sills being used as a shelf.

External sills should be tucked in under all window frames - fixed in front of window frame will lead to moisture damage in exposed conditions. See also SANS 2001-CM1.

- field, border, pattern: see drawings.

12.3 Jointing

Floor tiling joint width may be subject to manufacturer's recommendations, irregularities in the tiles, modular discipline or decorative effect.

Extruded tiles require a wider joint to cater for distortions.

In internal work, laser cut natural or cast stone of precise dimensions may be butt jointed with little or no grout.

- joint width: …

Omit if default widths are acceptable.

12.4 Movement joints

- type: formed in situ / preformed strip / isolation joint / intermediate joint / structural joint

preformed compression joint strip

- material, colour: PVC / aluminium / brass / stainless steel / …

Preformed joint strip: PVC is suitable for light traffic, stainless steel for heavy traffic. Check whether chemical resistance is required.

isolation (perimeter) joints

Isolation joint design depends on the wall finish, skirting, hygiene requirements and floor cleaning method, e.g. if regularly washed.

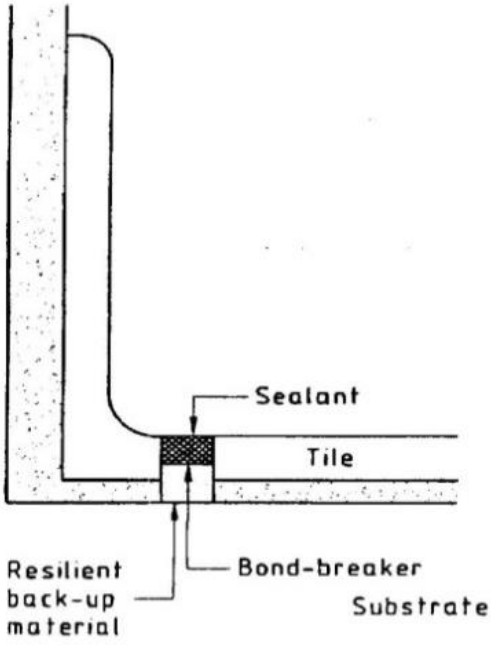


Diagram: Isolation joint where hygiene is important (SANS 10107).

structural joints

In practice structural substrate joints are often not true. Ignoring this fact will result in a tiling joint not uniformly coinciding with the base joint, leading to cracks. Possible solutions are:

a) if the joint is out of line but straight, consider continuing the joint through the tiling (the joint will not be aligned to the tile joints, but will at least be straight), or

b) if the joint is irregular within a narrow straight band, consider installing a prefabricated flexible metal joint capable of spanning the irregularity, or

c) if the joint is out of line and irregular, consider leaving out the row(s) of tiles in which the troublesome joint occurs, and lay the row of tiles over an underlay or in a permanently flexible adhesive, or lay a different flooring material over the joint which is able to accommodate the expected movement, e.g. carpet, thermoplastic, wood or laminate. Reinforce the edges or, in the case of rigid materials, seal both sides of the strip covering the structural movement joint.

Relevant standard: SANS 10107 Design and Installation of Ceramic Tiling.

13 Floor coverings, wall linings

 type: see drawings

thermoplastic / wood / textile / epoxy.

13.3 Thermoplastic and similar flexible floor covering

To be published: SANS 2001-EF3 Resilient thermoplastic and similar flexible floor covering.
Consider slip-resistant and tactile floor finishes for disabled persons. See SANS 784 for guidance.

13.3.1 Materials

 type: see drawings

vinyl / linoleum / rubber

semi-flexible vinyl floor tiles

 tile thickness: 2,0 / 2,5 / 3,2 mm

SANS 581: type of semi-flexible vinyl flooring: 120, 130, 160, 200 (domestic), 250 (heavy traffic), 320 (extra heavy traffic).

 pattern: none / marbled / mottled
 chemical resistance: … ; type of chemical …

flexible vinyl flooring

 tile thickness: 2,0 / 2,5 / 3,0 mm

SANS 786: type of flexible vinyl flooring: 125 (1,25 mm, domestic light), 160 (domestic), 200 (commercial, domestic heavy), 250 (industrial light, commercial heavy), 300 (industrial), 320, 360 (industrial heavy).

 form: sheet / tile
 pattern: none / marbled / mottled
 chemical resistance: … ; type of chemical …

linoleum sheeting or tiles

Linoleum is manufactured by mixing linseed oil with wood or cork powder, resins, ground limestone and mineral pigments, rolled out onto a jute backing and cured.

 thickness: 2,0 / 2,5 / 3,2 / 4,0 mm
 form: tile / sheet
 shape, size, of tile: …
 colour: …
 finish: unfinished / coated

rubber sheeting or tiles

Recycled and natural rubbers are “green”. Recycled rubber lasts longer. Rubber floors are suitable for sport and industries. Interlocking tiles are interchangeable.

 form: tile / interlocking tile / sheet
 shape, size of tile: 300 x 300 to 500 x 500 mm
 texture: plain / studded / diamond
 colour: plain / patterned / speckled
 installation method: glued / interlock floating

accessories

 skirtings: extruded PVC , height: …
 trim, movement joints: extruded PVC / aluminium / brass / stainless steel

- nosings: extruded PVC / rubber / extruded aluminium with non-metallic slip-resistant inlays / solid wood

13.3.2 Laying

- pattern: see drawings / straight joints in both directions

finishing

- polymer floor dressing type: 1 / 2

Floor dressing type 1 produces hard coating; type 2 produces soft coating.

13.4 Wood flooring, solid and laminate, on solid substrates

To be published: SANS 2001- EF1 Wood and Laminate Floor Covering.

For the installation of timber suspended floors see Section 4 Structural timber (flooring).

Solid wood floors may be sanded several times during their life span.

Wood and laminate flooring is laid directly on solid cementitious substrates. Solid wood floors are glued or nailed to battens. Laminate floors are floating floors assembled by using a patent click lock system. Wood and laminate floors expand and contract – do not use in wet areas.

SAWLFA South African Wood and Laminate Flooring Association is the industry representative body.

- traffic class: 21 / 22 / 23 / 31 / 32 / 33

See SANS 10043 table 1 for a traffic classification according to EN 13329: 21 (domestic moderate, e.g. bedrooms), 22 (domestic general, e.g. living rooms), 23 (domestic heavy); 31 (commercial moderate, e.g. conference rooms, offices), 32 (commercial general, e.g. offices, hotels, classrooms, 33 (commercial heavy, e.g. corridors, stores, schools, halls, open plan offices).

See SANS 10043 table 6 for traffic, hardness, density and shrinkage classification of flooring timbers in common use.

13.4.1 Materials

Solid wood floors may be sanded several times during their life span.

- flooring type: see drawings

solid wood strip/block / solid wood parquet/mosaic / plywood / faced plywood or fibreboard / melamine laminates

solid wood strip, block, parquet, mosaic

SANS 281 *Hardwood block and strip flooring* and SANS 978 *Wood mosaic flooring* were withdrawn in May 2009 and not replaced.

- species: …
- grade: clear / figured
- preservative treatment: …

Note that some woods are naturally durable.

- second-hand blocks: allowed / prohibited
- prefinishing: required / not required

faced plywood or fibreboard

- facing: natural hardwood / cork / bamboo
- species: …
- prefinishing: required / not required

decorative melamine laminate

- pattern, colour: …
- built-in underlay: required / not required
- prefinishing: required / not required

underlays

- required insulating underlay function: acoustic / thermal / noise control / impact (sports)
- polyethylene elastic-adhesive underlay:

This is an imported underlay with several advantages, not requiring gluing, nailing or clipping of the floor boards. Check with supplier.

- density: 30 / 50 kg/m³
- thickness: 2 / 3 / 5 / 10 / 15 mm
- adhesive type: permanent / re-usable.

13.4.2 Installation

installation in general

- installation method: nail down / glue down / floating / stick down on elastic-adhesive underlay / sprung / as recommended by manufacturer

Underfloor heating has important repercussions for wood and laminate flooring. Check with supplier, SAWLFA.

- pattern: see drawings

nail down

Nail down is *suitable* for solid and engineered wood strip on new concrete floors or stairs, on existing rigid floors that are reasonably level, where a dpm is required, and where the total floor covering thickness of about 40 mm can be accommodated. Not to be installed over underfloor heating unless space between battens is filled with a cement:sand mix. Can be installed on walls as panelling.

Nail down floors can reduce impact noise transmission.

13.5 Textile flooring

To be published: SANS 2001- EF2 Textile flooring.

13.5.1 Materials

textile flooring

- type: pile construction / needle punched construction
- colour and design: …
- fire index class: 1 / 2 / 3 / 4 / 5

Fire index: material to be used for floor covering (including underlays) or wall finish is tested in a standard manner and is classified on a scale of 1 to 5. These classifications are based on a "fire index" which in turn represents the effect of rate of burning and the amount of heat and smoke generated. Most good quality floor coverings have a fire index of 1 or 2. See SANS 10400-T table 9 and 10 for required classes for different occupancies.

- location grade: U1 / U2 / U3 / U4 / U5

Location grade: U1 (light domestic); U2 (medium domestic); U3 (heavy domestic, light commercial); U4 (medium commercial); U5 (heavy commercial).

carpet underlays

- type: fibrous / foam / contractor's choice

Underlays: needled fibre, foam rubber, latex bonded fibre or composites. A carpet should be fire tested with its underfelt, since no fire classification for underfelt is currently available. Underfelt makes an important contribution to impact sound insulation, and to airborne sound absorption provided the carpet has a porous backing.

13.5.2 Installation

Seams should run parallel to length of area (so that traffic moves along rather than across the seam) and so that light from windows does not strike across the seam. Pile should face away from incident light and downwards on stairs.

13.6 Epoxy flooring

Epoxy floors are hard-wearing and have excellent resistance to chemicals, oils etc.

- aggregate colour, size: …

application

- position of edge/dividing/feature strips: see drawings
- thickness: 1 – 6 mm
- finish: smooth / exposed aggregate finish.

Relevant standards:
SANS 10043 The installation of wood and laminate flooring
SANS 10070 The laying of thermoplastic and similar types of flooring.
SANS 10170 The cleaning and maintenance of floors.
SANS 10177 Fire testing of materials, components and elements used in buildings.
SANS 10186 The installation of textile floor coverings.
SANS 10245: The maintenance of textile floor coverings.
SANS 2424 Textile floor coverings – vocabulary.
SANS 10400-J Floors.
SANS 13746 Textile floor coverings – guidelines for installation and use on stairs.

14 Painting, paperhanging

To be published: SANS 2001-EP Painting.

14.1 Materials

primers

Standards for red lead or red lead/red oxide primers, zinc chromate primers, calcium plumbate primers, metallic lead primers have been withdrawn due to toxic lead content.

undercoats

Universal undercoats are *suitable* for interior and exterior use for subsequent application of solvent-borne finishes, especially gloss finishes.

☐ universal undercoat grade: 1 / 2 / as required

1 (high hiding), 2 (utility grade).

finishing paints

alkyd

Alkyd paint, also known as enamel paint, is solvent-borne.

☐ alkyd high gloss finishing paint (SANS 630) grade: 1 / 2 / as required

1 (high hiding), 2 (regular hiding).

☐ decorative paint for interior use (SANS 515) type: semi-gloss / flat

emulsion

☐ emulsion paint (SANS 1586)

☐ grade: 1 / 2 / 3 / 4

Grade: 1 (high hiding, scrub resistant), 2 (high hiding, washable), 3 (general purpose, washable), 4 (utility, interior only)

Emulsion paint is water-borne and suitable for application over plaster and masonry substrates. Grade 1, 2 and 3 is suitable for interior and exterior use, grade 4 for interior use only.

☐ gloss designation: matt / semi-matt / semi-gloss

☐ textured emulsion wall coating (SANS 1227)

☐ type: 1 / 2 / 3 / 4

1 (smooth aggregate-free), 2 (low-relief, sand-textured finish), 3 (high-relief, coarse-textured)

☐ fungus resistance: required / not required

Aluminium paint is typically an alkyd resin binder pigmented with flake aluminium.

Micaceous iron oxide paint is typically solvent-borne. Masonry paint may be solvent-borne or emulsion type.

varnishes, varnish stains, stains, sealers

Varnishes are transparent or semi-transparent.

Stains have no protective or preservative properties and are *suitable* for interior work only.

☐ varnish or varnish stains for interior use (SANS 887)

☐ type: 1 / 2

1 (general purpose), type 2 (heat and chemical resistant)

☐ gloss designation: glossy / eggshell

bituminous and tar-based coatings

Bitumen-based coatings for interior and exterior use on primed metal, masonry, fibre cement, wood, roofing felt, creosoted timber, hard bituminous surfaces.

specialized coatings

Epoxy and polyurethane coatings have superior resistance to abrasion and chemicals. One-pack materials usually do not have the same resistance as the two-pack types. They require a high standard of surface preparation.

14.2 Preparation of surfaces

- hardware etc.: remove, mark, store and refix / mask.

14.3 Colours

Specify colours on schedules. There is a marked difference in price for various colours, especially bright colours.

- identification colour marking (pipes etc.): required / not required.

14.8 Paint systems for on-site application

- paint system: see drawings

alkyd / emulsion / textured emulsion / masonry / cement / lime / varnish / aluminium / heat-resistant / sealer / intumescent

- colour: see drawings.

14.8.1 Cement-based surfaces, brick and stone

alkyd paint

Alkyd-based coatings are sensitive to alkali. Alkali-resistant sealers are required on cement plaster and off-shutter concrete.

14.8.3 Wood

transparent finish systems for wood (interior)

In transparent finishes the darker colours are more durable because they absorb ultraviolet light more effectively, but increase solar heat gain so that the moisture content of the wood decreases more rapidly.

Varnish is not recommended on exterior wood.

14.8.5 Plastics

paint on unplasticized polyvinyl chloride (PVC-U)

A two-pack wash primer is no guarantee for proper adhesion of conventional paint systems

No general specification can be made with regard to the painting of plastic coatings. Seek expert advice.

14.8.6 Intumescent paint

- surfaces requiring intumescent paint: …

Intumescent paint enhances fire resistance by limiting spread of flame. Check compliance with fire regulations.

14.9 Paperhanging

wallpaper

- type, pattern, colour: …

Relevant standards:
SANS 10064: Preparation of steel surfaces for coating.
SANS 10305: Painting of buildings:
Part 1: Paint and paint selection.
Part 2: Paint application and defects.
Part 3: Paint types.
Part 4: Painting of walls, ceilings and cladding.
Part 5: Painting of roofs and steel structures.
Part 6: Painting of wood.

15 Furniture, equipment, stairs, architectural metalwork

15.1 Joinery

For wood doors and windows see Section 10.

15.1.1 Solid wood

wood

- type: hardwood / softwood / laminated wood

hardwood

- species: …

SANS 1099 includes requirements for preservative treament. Annex C gives properties of 29 hardwood species, local or exotic.

softwood

- species: …

laminated timber

- exposure class: 1 / 2 / 3 / 4

1 (exterior); 2 (semi-exterior); 3 (humid interior); 4 (dry interior).

- type of wood: hardwood / softwood
- species: …

15.1.2 Wood board

- type: plywood / composite board / decorative melamine-faced boards (MFB) / fibreboard / particle board / oriented strand board (OSB)

plywood and composite board (SANS 929)

- exposure class: 1 / 2 / 3 / 4 / as required

1 (exterior); 2 (semi-exterior); 3 (humid interior); 4 (dry interior).

- type board: ply / composite
- type plywood: commercial / marine / structural
- type composite board: batten board / blockboard / laminated board / high-pressure decorative board / veneered particle board / veneered fibre board
- thickness plywood: 3 / 6 / 9 / 12 / 15 / 18 / 22 mm
- number of plies or laminae: 3 / 5 / 7

Number of plies are always odd.

- veneer: species…, rotary cut / sliced
- plywood grade: S / A / B

S (select, for decorative applications), A (furniture, for joinery where it may be reworked), B (standard, to be covered, coated or painted).

decorative melamine-faced boards (MFB) (SANS 1763)

MFB is low pressure melamine on particle board or MDF, suitable for medium duty vertical and light duty horizontal surfaces e.g. shelving – not for kitchen and office desktops.

- core: particle board / MDF
- thickness: 9 / 12 / 16 / 18 / 22 / 32 mm

Board size 3,6 x 1,8 m.

- shelving edge: sapele-print / melamine
- surface finish: smooth matt / textured / embossed wood grain
- moisture resistant board: required / not required

fibreboard (SANS 540)

- type: insulation board / medium density fibreboard (MDF) / tempered hardboard

MDF has a fine structure allowing for traditional wood-working techniques like moulding, embossing, routing and edge profiling.

- thickness of tempered hardboard: 3,2 / 4,8 / 6,4 mm / as required

Hardboard can be bent by cold-dry, cold-moist and hot-moist bending techniques. Consult manufacturer. For full range of thicknesses see SANS 540.

- moisture content range: …

particle board (SANS 50312)

- type: P2 / P3 / P4 / P5 / P6 / P7 / as required

P2 (general purpose, dry conditions); P3 (interior fitments, dry conditions); P4 (load-bearing, dry conditions); P5 (load-bearing, humid conditions); P6 (heavy-duty, dry conditions); P7 (heavy-duty, humid conditions).

- thickness: 12 / 16 / 18 / 22 / 25 / 28 mm / as required

oriented strand board (OSB) (SANS 472)

- type: OSB/1 / OSB/2 / OSB/3 / OSB/4 / as required

OSB/1 general purpose dry interior; OSB/2 load-bearing dry conditions; OSB/3 load bearing humid conditions; OSB/4 heavy-duty load-bearing humid conditions, e.g. walls, floors, roofing, I-beams.

- thickness: 6 / 9 / 12 / 15 / 18 mm / as required

15.1.3 Polymer laminate and solid surfaces

high pressure decorative laminates (HPL) (SANS 4586)

HPLs consist of layers of phenol formaldehyde impregnated sheets of Kraft paper with melamine formaldehyde (MF) impregnated décor and overlay paper, pressed together. Normally glued to suitable board with a backer laminate for balance, but can be self-supportive (solid core).

- material type: S / F / P / as required

S (standard) / F (flame-retardant) / P (postformable).

- grade/duty class (wear, impact and scratch resistance) : 1 / 2 / 3 / 4 / / as required

1 (light duty, post-forming), 2 (vertical surface), 3 (general purpose), 4 (heavy duty)

General Purpose grade, thickness1,2 / 1,5 / 2,0 / 2,5 / 3,0 / 3,5 / 4,5 mm: for work surfaces on counters, vanities, desks and tables, and for vertical surfaces like wall panels and front panels of work stations in hospitals, airports and restaurants.

Vertical Surface grade: for cabinet walls, door and drawer panels, desks, restaurant booths, architectural cladding.

Light duty/post forming grade, thickness 0,35 / 0,6 / 0,8 / 1,0 mm: for rounded edges.

Heavy duty, thickness 6,0 mm

- thickness: light duty and post forming: 0,35 / 0,6 / 0,8 / 1,0; general purpose: 1,2 / 1,5 / 2,0 / 2,5 / 3,0 / 3,5 / 4,5 mm; heavy duty: 6,0 / as required

Omit if default (1,2 mm for grade 3 (general purpose) and 1,0 mm for grade 1 and 2 (vertical surfaces and post forming) is acceptable.

- surface finish, colour, texture: smooth matt / textured / embossed wood grain / writing
- solid core grade: interior grade / exterior grade
- thickness interior grade: 3 / 6 / 8 / 10 / 20 mm

□ thickness exterior grade: 20 mm

Solid core for horizontal and vertical work surfaces; exterior grade for vertical surfaces only, e.g. cladding, balustrading and signage.

Check thickness and usage with manufacturer.

continuous pressed laminates (CPL)

CPLs are supplied in 100 –150m rolls.

□ grade/duty class, thickness: HGP / VGP / VLP / as required

HGP (horizontal, general purpose, postformable), thickness 0,6 mm, wear index number 3, impact index number 2, scratch index number 2; VGP (vertical, general purpose, postformable), 0,6 mm, 2, 2, 2; VLP (vertical, light duty, postformable), 0,35/0,5 mm, none, 2, 2.

□ colour, pattern: …

polymer solid surfacing material

□ colour: …

□ inlays: …

□ form: …

15.1.4 Stone surfaces

stone surfacing material

□ type: …

□ thickness: …

□ edge: …

□ form: …

15.1.5 Steel tubes for furniture

steel tubes for furniture SANS 657-4

□ material and grade: mild steel 230 / 250 / stainless steel class A type 1 or 2, grade 304

□ size, profile: see drawings

Size, profile: 16, 20, 25, 32, 38, 40, 50, 60, 70 mm ø (round steel); 16, 20, 25, 32, 50 mm (round stainless steel); 30 x 16 mm (oval steel); 20 x 20, 25 x 25, 32 x 32, 40 x 40, 50 x 50, 65 x 65 mm (square steel); 25 x 25, 32 x 32 mm (square stainless steel); 50 x 20, 50 x 25 mm (rectangular steel and stainless steel)

□ wall thickness: see drawings

0,9 / 1,2 / 1,6 / 1,8 / 2,0 mm, depending on material.

□ stainless steel finish: mill / matt / polished / mirror.

15.1.6 Joinery

general

Climate zones: inland / coastal. Inland zones represent over 90% of South Africa's climate, made up of an average 8% moisture content, including air-conditioned indoor areas.

□ wood sizes: see drawings

Wood sizes: show finished sizes of timber members on drawings to avoid arguments about tolerance: 25 mm nominal size reduces to 22 mm after planing, 38 to 32, 50 to 44, 76 to 68, 114 to 105, 150 to 140, 228 to 118 mm.

Check available board sizes to ensure optimum yield and to avoid unnecessary waste.

Marine ply is a superior choice to moisture resistant particle board in wet areas.

□ exposed edges of veneered composite board: solid wood edging to match veneer and to full thickness of board

grain, pattern

- direction of grain or pattern: see drawings

Omit if default (vertical on vertical surfaces, parallel to walls on horizontal surfaces) is acceptable.

backs

- backs to fittings: 4,8 mm hardboard / 16 mm ply/composite board / contractor's choice / not required

drawers

- drawer construction: see drawings

Omit if default construction is acceptable.

shop painting

- delivery of joinery on site: knot and prime / knot and prime hidden faces only / brush apply one coat clear finish as specified under Section 14 / reaction lacquer spray paint

Omit if fully painted (default) is acceptable.

15.1.7 Fixing

Consider tables, counters and shelves at a variety of heights to accommodate standing, sitting and a range of different tasks for disabled persons.

wood cornices, skirtings, quarter rounds, rails

- material: solid hardwood / medium density fibreboard / …
- size and profile: see drawings.

15.2 Commercial kitchen cupboards (SANS 1385)

SANS 1385 covers 8 types of kitchen unit cupboards of steel sheet, composite wood board or solid timber.

Kitchen Specialist Association (KSA) is the national trade association of kitchen fitting manufacturers. Consider specifying that the manufacturer/installer is a registered member.

- type of unit: see drawings

base / sink / was trough / wall / combination / corner / special / floor mounted tall cupboard

- colour: …
- type of stainless steel for sinks, wash troughs, worktops: AISI-304 / AISI-430
- finish on mild steel fittings, handles, fasteners: electrodeposited nickel-chrome / zinc and cadmium
- type of wood: solid / laminated / hardboard / plywood / particle board / low pressure decorative board / laminated veneer board / as required
- material of work tops: composition board / stainless steel / ceramic / mosaic
- edging of worktops: hardwood / plastic moulding / extruded aluminium / self-edging (same material as top) / aminoplastic / high-pressure decorative laminate
- number and position of bowls: see drawings
- material of casings: sheet steel / solid timber / composite (particle board with laminates)
- material and construction of doors: steel butts / sliding / wood / composite board / glass panel
- locks: cylinder / lever
- region: inland / coastal region
- wood finish: raw linseed oil / lacquer varnish / bees wax and turpentine / epoxy resin
- dimensions: see drawings

Floor units: 300, 400, 450, 500, 600, 900, 1000, 1200, 1500, 1800, 2100 x 525, 600 x 900 mm; wall units: ditto length x 300 x 300, 600; tall units: 500, 900 x 525, 600; wash trough units: 450, 900, 1050, x 525, 600 x 900 mm / for non-modular dimensions, consult manufacturers.

- type door, arrangement of drawers, shelves: see drawings

additional items

- plinths or any other part of wood cupboards in contact with the floor or wet areas, e.g. sinks, food preparation: solid hardwood / marine plywood / moisture resistant particle board / moisture resistant medium density fibreboard.

Composite wood and softwood swells or rots in contact with moisture from floor cleaning operations.

15.3 Commercial steel furniture (SANS 757)

- type of unit: see drawings

stationary cupboard / linen cupboard / pigeon-hole cupboard / locker / wardrobe / filing cabinet / card-index cabinet

- class, colour and texture of paint finishes: enamel or powder class 1 / 2

enamel or powder class 1 (minimum 0,06 mm thick) / 2 (minimum 0,03 mm thick)

- metal finishes: chromium / zinc / cadmium
- powder coated finishes SANS 1274: type 1 / 2 / high gloss / satin / matt
- number of drawers, adjustable shelves: …
- type hinges: …
- type of locking system: cylinder / latch rod / latch plate
- type of adjusting strip: …
- mirrors in wardrobes: see drawings
- fire resistance rating of vertical plan filing cabinets: …

15.4 Metal counters, balustrades, cladding, signs, street furniture

- material: see drawings

stainless steel / aluminium / prefinished metal

stainless steel

Stainless steel is low carbon steel containing >11% chromium (Cr), providing the steel with a corrosion resisting passive film.

Stainless steel classes are austenitic (300 series) and ferritic (400 series). Each class has several grades. Austenitic stainless steel grade 304 (European Norm1.4301) is normally used for street furniture, shop fronts, doorways, counters, balustrades, cladding, signs, roofing and street furniture. Use grade 316 in corrosive regions. Ferritic stainless steel is used only in interior applications of a non-aggressive nature.

Locally produced stainless steel is available in flat products, forgings and castings. Hot-rolled flat sheet is 3 – 50 mm thick, cold-rolled 0,4 – 3 mm thick. Sections like angles, channels, welded pipe and tubes are cold-rolled from flat sheet. Other grades and products are imported.

Stainless steel mill finishes can be annealed, pickled or polished. Processed finishes are achieved by grinding, polishing or buffing. Stainless steel can be coloured, acid-etched, mirrored, electro-polished, perforated, expanded, meshed or screened.

Choose the correct grade with consideration of the building's location, prevailing environment and climate.

Design stainless steel elements to avoid receiving run-off water from other metals, or concentrated flows of rainwater over parts of the element. Designs must cater for the facilitation of regular cleaning.

Consult the Southern African Stainless Steel Association (SASSDA).

- austenitic stainless steel grade: 304 or 304L / grade 316 in the coastal region 3 – 4km from the coast

- finish: annealed and pickled mill finish / polished / coloured / etched / mirrored / electro-polished
- form: see drawings

sheet / section / perforated / expanded / meshed / screened

aluminium

- finish: mill / anodising / liquid organic coating / powder coating
- colour: …
- finish: matt / satin / high gloss / hammertone / textured

prefinished sheet metal products

Organic film coating on steel, aluminium, stainless steel for interior and exterior use.

- type: 1 / 2a / 2b / 3 / 4 / 5a / 5b / 6a / 6b / as required

1 (interior, requiring further application after fabrication); 2a (dry areas); 2b (wet corrosive areas); 3 (mild to moderate rural, urban, tropical and industrial environments); 4 (marine and industrial); 5a (severe marine); 5b (heavy industrial and industrial marine); 6a (very severe marine); 6b (very severe industrial)

- colour: …
- finish: flat / semi-gloss / gloss
- dry film thickness: …
- type of substrate: hot dip galvanized steel / aluminium / stainless steel

15.5 Stairs and ramps

- type: see drawings

straight / spiral / dogleg / combination / helical / security/fire / enclosed
The rule in SANS 10400 – M of a minimum going of 250 mm and a maximum rise of 200 mm often leads to a disregard for another rule, i.e, "*any stairway … shall have dimensions appropriate to its use*" (NBR part M Stairways). The full range of a more comfortable and safer proportion within the rule that "*the sum of the going and twice the riser is not less than 570 mm and not more than 650 mm*" would be: 180/280 mm; 170/280 – 310 mm; 150/280 – 350 mm and should be used in most public buildings.
Public ramps must have a safe gradient and frequent landings for disabled persons. Check with *SANS* 10400-S.

- structure: see drawings

painted mild steel / stainless steel / wood, species

- treads: see drawings

wood, species … / stainless steel / steel / glass

- balustrade / handrail: see drawings

stainless steel / wood / glass / polymer concrete.

Relevant standards:
SANS 10400-M Stairways.
SANS 10400-S Facilities for Persons with disabilities.
SANS 10104 Handrailing and balustrading (safety aspects).

16 Hardware

Hardware information should appear on door, window or finishes schedules.

16.1 General

- type: see drawings

lock / latch / handle / plate / closer / hook and eye / bracket / hinge / bolt / door stop / door knob / door knocker / sanitary / furniture / curtain rail / edge or feature strip / sunken door mat / signage / drawer runner

- fire door hardware type: see drawings

escape hardware / panic bars / locksets with thumb turns / fire bolts

- material: see drawings

steel / stainless steel / aluminium / brass / nylon / ceramics / porcelain / wood

finish

For finishes on metal see SANS 1171 Annex C.

- finish: see drawings

natural / brass plated / copper plated / chrome plated / zinc plated / nickel plated / sherardised / cadmium plated / phosphated / passivated / antiqued / epoxy coated / powder coated / anodised

- sherardising coating thickness class: 15 / 30 / 45

15 μm normal indoor/outdoor / 30 μm severe outdoor / 45 μm highly severe outdoor/industrial/ marine.

- electroplating service condtion: 1 / 2 / 3

1 (mild), 2 (moderate), 3 (severe)

Commercially plated fasteners are mostly sold with minimum corrosion protection, suitable only for dry interior conditions (corrosion resistance class C1). Thicker plating implies a special order (contact SAMFA – SA Metal Finishers Association – for details).

Rather specify solid brass, stainless steel or sherardized steel (30/45) for exterior or wet interior conditions, or ensure that plated products are protected by an appropriate paint system.

- appearance: bright / dull / satin.

16.2 Fasteners

- fastener type: bolt / screw / nut / washer / pin / rivet
- metal screws for wood, type: countersunk-head / round-head / raised countersunk-head / slotted or cross recess drive / hexagon-head / scant shank
- material and size: steel / brass / silicon-bronze / aluminium / stainless steel
- mild steel nails: type…; finish…

See SANS 1700 for full list of fastener types.

For roof/cladding fasteners see Section 7.

16.3 Locks, latches, catches, bolts

- type lock: see drawings

mortise / rim / cylinder / cupboard / drawer

- type handle: see drawings

lever / knob

- type latch: see drawings

mortise / cupboard / finger

- type catch: see drawings

magnetic / ball / roller

- type of bolt, size: see drawings

barrel / flush / tower / stable / extension / size

SANS 10400-S stipulates that door handles should be 450 mm away from any wall.

Consider handles, levers and controls that are easy to operate by disabled persons. SANS 10400-S: The manual operation of handles, taps, levers, switches, locks, control mechanisms and keys is in part affected by their design. The selection of controls requiring a 'twist-action' of the wrist and hand, and fine-finger movements should be avoided.

- hardware on fire doors: see drawings

padlocks

- type: see drawings

keyed / combination / masterkeyed

- duty: medium / heavy
- material: see drawings

brass / iron / chrome plated brass / aluminium / stainless steel

- size: see drawings

40 / 50 / … mm

keys

- master and grand master keys: see drawings.

16.4 Hinges

hinges for lightweight doors

- type: see drawings

piano / pivot / flush / european (adjustable) / strap

hinges for medium to heavy doors

- material: see drawings

steel / stainless steel / brass / bronze

- number of hinges for fire doors: see drawings.

16.5 Door closers

- type: see drawings

surface-mounted / concealed in frame / concealed in floor / concealed in door / overhead / floor / manual / automatic

Consult AAAMSA Technical Publication: Hardware, Door Controls etc.

Ensure surface mounted overhead closers do not hit the wall when opening.

All fire doors are required to be fitted with closers (NBR), usually overhead. Do not fit a mechanical hold open arm to a fire door. Use concealed mechanisms in hygienic areas.

For concealed floor types, ensure floor spring box depth of up to 75 mm can be accommodated.

Specifiy a higher strength closer for exposed, windy or draughty conditions. Specify a lower strength for narrow doors.

Double doors with rebated meeting stiles must be fitted with a door selector to ensure the inactive leaf closes first.

- floor springs, consisting of a floor spring unit set into the floor, bottom and top door strap of size and finish: see drawings

Size depends on door size and weight – see manufacturer's literature.

16.6 Pelmets, curtain rails, rods, blinds

pelmets

- type, size and profile: see drawings / wood / metal / fabric

rails with rollers or glides

- track: single / double
- duty class: light / heavy
- finish: …
- cord: with / without weighted cord pulleys

rods with rings

- rod, rings, end caps: wood / aluminium / steel

tie backs

- tie backs: …

indoor venetian blinds

- slat width: 50 / 35 / 25 mm
- headbox: steel / aluminium
- type of ladder web: reinforced plastic / woven cotton / knitted cords

16.7 Edge, feature, dividing strips

- strip material: solid brass / aluminium / hot dip galvanized steel / PVC
- colour of plastic: …

16.8 Sunken door matting

- material: natural coconut fibre with PVC backing / rubber / interlocking aluminium channels with plastic inserts / light or heavy-duty loop matting.

16.9 Number/name plates, safety signs

Type, letter size, position, message etc. should be given in schedule form.

Signs may be grouped: general information signs; hospital signs; safety signs; signs for disabled persons; statutory signs, e.g. fire safety.

- type: changeable plate system / variable room identification system / changeable letter system / illuminated signs / in-house signage / statutory signage

Changeable plate system: fixed plate holders to which may be attached or inserted removable interchangeable sign plates; variable room identification system: fixed room numbers and removable name strips; changeable letter system: holders into which can be inserted removable individual letters, numbers, etc.; illuminated signs: cabinet enclosing a light source illuminating a translucent face panel bearing the specified signage; in-house signage: project specific signs

- materials: aluminium / plastic / stainless steel
- colour: …

symbolic safety signs

- type: PV / MV / WW / FB / GA

PV (prohibitory – circular, red), MV (mandatory – circular, blue), WW (warning – triangular, yellow), FB (informative, fire-fighting – square, red), GA (informative, general – square, green)

- reflectivity, luminousity: standard (non-reflective) / self-luminous (radio luminescent) / internally illuminated / retro-reflective or photo luminescent / decal / embossed

- size: 100 x 100 (WW7 only) / 150 x 150 / 190 x 190 / 290 x 290 / 440 x 440 / 880 x 880 mm)

See SANS 1186 Annex C for positioning, fixing, illumination and maintenance of signs.

16.10 Drawer runners/slides

- type commercial ball-bearing runner: normal / self-closing / soft-closing / push-locking
- load capacity: 30 kg static / 45/90 – 160 kg (heavy duty)
- extension: full / three-quarter.

Relevant standards:
SANS 10140 Identification colour marking.

17 Glazing

SAGGA – South African Glass and Glazing Association – is the trade association and AAAMSA member.

17.1 Materials

glass

Clear and tinted float glass is made in South Africa by one manufacturer in Springs.

- type of glass: see drawings

float / safety / security / pattern / tinted / insulated / polymer

- float glass thickness: see drawings

Local float glass thickness: 3, 4, 5, 6 and 10 mm.

- laminated safety glass interlayer strength class: NS / HPR / HI

NS (normal strength), HPR (high penetration resistance), HI (high impact).

- bullet-resistant glass: class and level of attack: GA / GC / RA / RB / SB

Safety and security glass is made by several local manufacturers. Laminated safety glass is made with a poly-vinyl butyral interlayer (0,38 mm for Normal Strength (NS); 0,76 mm High Penetration Resistant (HPR); 1,14mm High Impact (HI)); or a cast in place polyester resin interlayer, available in one thickness only (0,5 mm Normal Strength). SANS 1263 provides for three applications, i.e. human contact, burglary and firearms. See SANS 1263 for bullet-resistant glass classes and level of attack.

- pattern glass thickness: 4 / 6 mm; colour: clear / amber / bronze; pattern: …

All patterns cost the same.

- tinted glass: heat-absorbing / heat-reflecting / glare-reducing
- insulated glass units (SIGU's) : 6/12/6, low-e surface #2, dehydrated air filled gap / …

6/12/6 denotes glass-space-glass. Common insulated glass thickness range (glass-space-glass) in South Africa is 20–28 mm. Life expectancy of double glazing in South Africa has not been recorded. Northern hemisphere experience indicates 7–12 years, 20 years being exceptional.

- coloured glass: …
- work on glass: cutting / obscuring / acid embossing / silvering / gilding / staining or painting / bending

polymer glazing

- polymer glazing type: PC / PMMA / PVC clear / GRP / PS / PET / single wall / multi-wall

Available polymer glazing materials are polycarbonate (PC), polymethyl methacrylate (PMMA or 'acrylic'), polyvinyl chloride (PC), glass-fibre reinforced polyester (GRP), polystyrene (PS), polyethylene teraphthalate (PET). PC and PMMA is available in sheet sizes 1 250, 1 500 or 2 050 wide by up to 6 m long by 1,5 – 6 mm thick. They can be cold bent to minimum radii of 300 x thickness for acrylic, or 100 x thickness for polycarbonate.

Outstanding properties of polymer glazing are impact strength (polycarbonate 250x glass), light transmission, light weight, weather resistance, thermal insulation in multi-wall construction (40% better than glass). Typical applications: rooflights, industrial roofs, commercial greenhouses, shopping centres.Polycarbonate is self-extinguishing, acrylic burns like hardwood. No toxic fumes are claimed. Make generous allowance for thermal movement.

17.2 Glazing

17.2.2 Structural glazing

- design: by *competent person* (glazing) / submit proposals

Structural glazing depends on stringent quality tests and checks, for example the pretreatment of aluminium, surface finishing, sealants, and factory and site care. Check with AAAMSA.

A butt joint in structural glazing is assumed to have no structural strength.

Check underwater glazing, glazing for fire protection, for control of reflections in shop windows, for solar control, for one-way vision, unframed glazing, suspended glazing, glass floors, glazing with channel profiles, glazing with plastics and patent glazing, with manufacturers, specialists and SANS 10137.

17.2.3 Protection and cleaning

Anti-sun glass can be permanently damaged by mortar or plaster splashes. Specify precautions if risk is high.

17.3 Mirrors

 type: silvered clear glass / silvered coloured glass / stainless steel / privacy

silvered mirror backs are easily damaged. Silvered obscure glass also available. Stainless steel for vandal proof areas.

 size and position: see drawings

Consider full length mirrors in public places for children and disabled persons.

 coloured glass: pink / gold / bronze / black

Relevant standards:

SANS 10137 The installation of glazing materials in buildings.

SANS 1263 Safety and security glazing materials for buildings.

SANS 10400-N Glazing.

SANS 2001-CG1 Installation of glazing.

Relevant sources:

Selection Guide for architectural Aluminium Products. AAMSA.

Skylight Association of Southern Africa.

18 Drainage, sewerage, water and gas supply, fire equipment, sanitary plumbing

18.1 Roof eaves drainage

18.1.2 Gutters and downpipes

□ gutter type: see drawings

eaves / valley / box / parapet/chimney

□ material: Z275 / Z450 / Z600 / AZ150 / AZ200 hot dip galvanised steel sheet / uncoated steel painted on-site / aluminium / copper / U-PVC / fibre cement / prepainted

Galvanized sheet: Z275 or AZ150 for inland use; Z450/ Z600 or AZ200 for the *coastal region*, prepainted for corrosive industrial use. Commercial standard rainwater goods are made of 0,4 or 0,5 mm thick sheet.

□ profile: see drawings

half round / square / rectangular

□ size: see drawings

100 x 75 mm, or 100 / 125 / 150 mm half round (domestic); 125 x 100 (institutional); 150 x 100 / 200 x 150 / >225 x 225 (industrial). Sheet metal gutter standard lengths: 1,8; 3,0; 3,6; 4,8; 5,4; 6,0 m. Gutter and downpipe sizes are determined by roof area and rainfall region in accordance with the requirements of SANS 10400-R: summer rainfall area:140 mm²/m² roof area served; year-round rainfall area:115 mm²; winter rainfall area: 80 mm². Downpipe internal size: 100 mm²/m² roof area served or 4400 mm² (75 mm diameter). For more information on gutter design, e.g. risk, rainfall intensity, hail and outlet protection, launders, drop boxes etc. see The Red Book – Southern African Steel Design Handbook, Section 11.

accessories

□ outlet drop boxes: funnel shaped

Drop boxes for box gutter outlets improve flow and reduce stoppage by debris.

□ overflow weirs in box gutters: required

□ hail guards: see drawings

removable / pedestrian trafficable Hail guards over gutters act as protection against hail, as maintenance walkways, as outlet protection and as protection against leaves and wind-blown debris. Trafficable hail guards should be made of suitable gauge expanded mesh – provide clear working *drawings*. Hail guards should be removable for maintenance.

□ launders: see drawings

Launders are horizontal downpipes draining intermediate box gutter outlets to the exterior of large industrial buildings.

gutter brackets

□ type: purlin / fascia / purpose-designed for industrial/box gutters / as supplied by gutter manufacturer

downpipes

□ material: galvanised steel sheet / PVC

Do not use PVC downpipes if offsets are required.

□ size: see drawings

75 / 100 / 120 / 150 mm square / diameter Best solution for outlet protection is to use oversize downpipes ≥200 mm diameter.

□ sheet metal downpipe bends: crimped / solder mitred / sealed and pop riveted

18.2 Flat concrete roof, balcony and floor drainage

18.2.1 Rainwater outlets

- type: see drawings

patent with grating / pipe without grating

- patent type: see drawings

vertical / 45° / 90° / two-way / car-park / pedestrian

- outlet size: see drawings

50 / 80 / 100 / 150 mm diameter

Outlets without gratings should be used for small roof areas in accessible position only, e.g. for balconies, and be not less than 75 mm in diameter due to the waterproof dressing restricting the pipe bore, unless pipe can be flanged.

18.2.2 Floor outlets

- material: ductile iron with baked epoxy coating / stainless steel

18.2.3 Outlet downpipes

- material: PVC / galvanized steel
- size: see drawings

75 / 110 / 160 mm (PVC); 80 / 100 / 125 / 150 mm (steel)

18.3 Stormwater drainage

18.3.1 Earthworks (SANS 2001-DP1)

SANS 2001-DP1 covers earthworks for trenches for all types and sizes of buried pipelines, ducts, cables and prefabricated culverts, including excavation, preparation of trench bottoms, bedding, backfilling and reinstatement of surfaces.

Specification data:

- pipes that are to be encased in concrete: see drawings

18.3.2 Storm water drainage (SANS 2001-DP5)

SANS 2001-DP5 covers the construction of stormwater drainage systems including pipelines, manholes, culverts, catchpits, inlet and outlet structures.

Specification data:

pipes

- material of pipe, associated fittings: see drawings

concrete / fibre cement / PVC-U / GRP / PP / PE

- diameter: see drawings

concrete pipes: 100, 150, 225, 300, 375, 450, 525, 600, 675, 750, 825, 900, 1050, 1200, 1350, 1500, 1800 mm. Check diameters of other material pipes.

culverts

- precast concrete culverts
  - class: 75S / 100S / 125S / 150S / 175S / 200S
  - dimensions (internal) : see drawings

span: 450, 600, 750, 900, 1200, 1500, 1800, 2400, 3000 mm

height: 300, 450, 600, 900, 1200, 1500, 1800, 2400, 3000 mm

tests

- tests: required / not required

18.3.3 In situ concrete stormwater channels

- overall width: see drawings

380 / 450 / … mm 380 mm width: 230 mm x 75 mm deep channel; 450 mm width: 300 mm x 100 mm deep channel.

- fall: see drawings

1:250 min.

- spill basin shape, size and finish: see drawings.

18.4 Sewerage

18.4.1 Earthworks (SANS 2001-DP1)

Specification data:

- pipes that are to be encased in concrete: see drawings

18.4.2 Sewers (>160 mm) (SANS 2001-DP4)

SANS 2001-DP4, *Sewers,* covers the construction of sewer systems within servitudes, road reserves and interconnected complexes and is suitable for the construction of below ground sewers having a diameter greater than 160mm. Excludes sewer rising mains, pump stations, treatment works, and ancillary works.

Specification data:

- type of pipe, associated fittings: ductile iron / fibre cement / PVC-U / structured wall PVC-U / PP / GRP / pitch impregnated fibre / vitrified clay / reinforced concrete

Unplasticised polyvinyl chloride (PVC-U); polypropylene (PP); glass-reinforced plastics (GRP)

- diameter: see drawings

200 / 250 / 315 / 355 / 400 / 450 / 500 / 560 / 630 / 750 / 800 / 900 / 1 000 mm diameter (PVC-U). Check diameters of other material pipes.

- gradient: see drawings
- step irons in manholes: required / not required
- masonry manholes: plastered internally / plastered internally and externally to prevent infiltration
- tests on completed pipelines: required / not required.

18.4.3 Sewers for buildings (SANS 2001-DP7)

SANS 2001-DP7 covers surface mounted sewers having a nominal diameter of 200 mm or less; and below ground sewers having a nominal diameter of 160 mm or less including manholes and the like which discharge into a connecting sewer, conservancy tank, French drain or septic tank. This standard is *suitable* for constructing sewers designed in accordance with the design rules provided in SANS 10400-P, Drainage. Construction of manholes is referred to SANS 2001-DP4.

Specification data:

- type of pipe, associated fittings: cast iron / ductile iron / fibre cement / PVC-U / structured wall PVC-U / PP / GRP / pitch impregnated fibre / vitrified clay / reinforced concrete
- nominal diameter: see drawings

40 / 50 / 75 / 110 / 160 mm

- gradient: see drawings

SANS 10400-P requires that sewer gradient be not flatter than 1:120 for 100 mm diameter pipes and 1:200 for 150 mm pipes. The hydraulic load determines the minimum grade of the pipe.

18.4.4 Surface boxes, manhole covers, gulley gratings, frames

For vehicular and pedestrian areas only (does not apply to gullies and manholes in buildings).

- type: see drawings

surface box / valve chamber / manhole/inspection cover / gulley grating

- material: polymer concrete / cast iron or steel

polymer concrete

- polymer concrete covers
  - size: see drawings
  - duty class: see drawings

heavy (trucks) / medium (domestic vehicles / light (no wheeled vehicles)

cast iron/steel and concrete

- cast iron, cast steel, rolled steel combined with concrete covers
  - size: see drawings
  - duty class: see drawings

A15 / B125 / C250 / D400 / E600 / F900

Class A15 pedestrian and pedal cyclists; B125 car parks; C250 road kerbside channels; D400 roads, hard shoulders, parking for all types of road vehicles; E600 docks, aircraft pavements; F900 particularly high wheel loads.

- gulley gratings: laid loose / bedded in bitumen.

18.4.5 Grease interceptors

- material: stainless steel / reinforced fibreglass
- type, capacity and size: see drawings / to approval of the local authority

Several models are available on the market.

18.4.6 Pit latrines

- type: see drawings

VIP / masonry / patent / to approval of local authority

- construction: masonry / patent precast concrete / patent polymer
- pit size: see drawings

Pit size depends on capacity/ number of persons using. Omit if default (750 x 1 500 x 2 000 mm minimum deep) is acceptable. Maximum pit size: 1 000 x 2 500 x 2000 mm.

18.4.7 Conservancy tanks, septic tanks and french drains

- type: see drawings

conservancy tank / septic tank / french drain

- construction: masonry / patent precast concrete / patent polymer
- tank capacity: see drawings / as prescribed by local authority

Conservancy tank capacity is typically 6 000 L. See SANS 10400-P for sizing of septic tank. Patent septic tank capacity 1 250 litres (2-4 persons); 1 500 (2-6); 1 750 (4-6); 2 000 (4-7); 2 500 (4-9). Consult SANS 10252 for design guidelines.

- french drain length: see drawings

See SANS 10400-P for length formula, positioning, soil type, etc.

18.5 Water supply

18.5.1 Earthworks (SANS 2001-DP1)

SANS 2001-DP1 covers earthworks for trenches for all types and sizes of buried pipelines, ducts, cables and prefabricated culverts, including excavation, preparation of trench bottoms, bedding, backfilling and reinstatement of surfaces.

Specification data:

- pipes that are to be encased in concrete: see drawings.

18.5.2 Below ground medium pressure pipelines (SANS 2001-DP2)

SANS 2001-DP2 covers the supply and installation of pipelines of diameter greater than 160 mm and up to 1 000 mm, complete with ancillary works (valves, strainers, hydrants, manholes, surface boxes, chambers) for transporting water and sewage under working pressures up to 2,5 MPa.

Erf or connections to buildings from mains are covered in SANS 2001-DP6.

Specification data:

- type of pipe: steel / ductile iron / concrete / fibre-cement / GRP / PE / PP / contractor's choice)

glass-reinforced plastics (GRP); polyethylene (PE); polypropylene (PP)

- nominal pipe sizes: see *drawings*.

225 / 300 / 375 / 450 / 525, 600 / 675 / 750 / 825 / 900 mm

18.5.3 Below ground water installation for buildings (SANS 2001-DP6)

SANS 2001-DP6 covers the construction of water pipelines having a nominal diameter of up to 160 mm from a water reticulation main to the boundaries of individual erven or other specified points on erven. It covers the installation of pipework and associated specials which provide water, meters and fire hydrants

SANS 2001-DP6 is suitable for construction of fire installations designed in accordance with the design rules provided in SANS 10400 W, Fire installations.

Specification data:

- type of pipe and associated fittings: galvanised mild steel / fibre cement / GRP / PE / PP / PVC / PVC-U / PVC-M / PVC-O / copper / contractor's choice

Glass-fibre reinforced plastics (GRP) / polyethylene (PE) / polypropylene (PP) / polyvinyl chloride (PVC) / unplasticised polyvinyl chloride (PVC-U) / modified polyvinyl chloride (PVC-M) / oriented polyvinyl chloride (PVC-O).

- nominal pipe size: see drawings

40 / 50 / 75 / 110 / 160 mm

- meter type and size: …

18.5.4 Above ground water installation

- pipe material: galvanised mild steel / PP / copper / contractor's choice
- nominal pipe size: see drawings

8 / 10 / 12 / 15 / 18 / 22 / 28 / 35 / 42 / 54 / 67 / 76 / 108 mm (copper, check other pipe types)

- fixing of pipes <20 mm: chased / surface fixed

Surface mounting may be a requirement from a maintenance point of view.

Chasing is prohibited in wall faces that are to receive roof flashing. Roof flashing is inserted in grooves sawn by a separate trade with disc cutters after pipes are installed, leading to unnecessary and costly pipe repair work when pipes are damaged.

18.5.5 Water storage tanks

- ☐ tank material: tumbled polymer / pressed steel sections bolted and sealed together / corrugated steel
- ☐ capacity or size: see drawings / …L
- ☐ stand for external tanks: …

18.6 Electric geysers and solar water heaters

18.6.1 Electric geysers

- ☐ geyser type: open outlet / cistern type / closed (unvented) / floor or wall mounting / horizontal or vertical

geysers should be placed near kitchen sinks that are regularly used throughout the day. Show geyser positions in drawings.

- ☐ nominal capacity: see drawings

open outlet and cistern type ≤15 / 25 / 50 / 75 / 100 / 125 / 150 / 175 / 200 / 250 L; closed type 15 / 25 / 50 / 75 / 100 / 125 / 150 / 175 / 200 / 250 / 300 / 400 / 600 L

- ☐ design: standard / solar / dual purpose.

18.6.2 Solar water heaters

- ☐ type: domestic / commercial / industrial
- ☐ capacity in litres (integral units only): …
- ☐ collector/storage combination: integral / close-coupled / split
- ☐ heat transfer method: direct / indirect
- ☐ circulation method: thermo-siphon / pumped
- ☐ cover: with cover / without cover
- ☐ supplementary energy source required: mains electricity / gas / …
- ☐ working pressure: 0 / 100 / 200 / 300 / 400 kPa
- ☐ freezing, hail resistance: required / not required.

18.8 Fire equipment

fire hose reels

- ☐ height from floor to spindle if not 2 100 mm: …
- ☐ enclose reel in security box with clear acrylic cover and suitable closer: required / not required

portable fire extinguishers

- ☐ portable non-refillable general purpose extinguishers (SANS 1322):

Suitable for all classes of fire other than class D

  - ☐ class: I / II

class I (temp <110°C); II (temp <65°C)

  - ☐ capacity: 1,5 / 2,5 kg
  - ☐ extinguishing medium: lp gas / dry powder

- ☐ water, foam or dry powder rechargeable extinguishers (SANS 1910):
  - ☐ type: water / foam / dry powder
  - ☐ class of fire: A / B / C

A (ordinary combustibles); B (flammible liquids); C (live electric power), or combinations, e.g. ABC

- ☐ CO_2 type extinguisher (SANS 1567):

- capacity: <9kg
- class of fire: A / B / C

- BCF type extinguisher (SANS 1151) capacity: 1 – 12 kg

Suitable for class of fire AC / BC / ABC

- enclose extinguisher in security box with clear acrylic cover and suitable closer: required / not required.

18.9 Sanitary plumbing

18.9.1 Sanitary appliances

appliances

- appliance type: see drawings

wash-hand basin / bath / water closet / urinal / bidet / sink / flushing cistern

- material: see drawings

glazed ceramic / stainless steel / plastic / stone / concrete

- stainless steel grade: 430 / 304 / 316; finish: satin / bright

Omit if default (430) is acceptable. Stainless steel grades are listed by the American Iron and Steel Institute (AISI). Grade 430 is *suitable* for domestic purposes, kitchen sinks, wash troughs and hand wash basins. Grade 304 is *suitable* where mild corrosive conditions exist, e.g. in *coastal areas*. Grade 316 is *suitable* for laboratories, photographic workrooms and seagoing vessels where corrosive conditions are severe.

- anti-theft waste plug: required / not required
- flow restrictors: required / not required

baths

- type, shape: see drawings

built-in / freestanding / spa / rectangular / oval / corner

- handles: required / not required

basins

- type, shape: see drawings

counter-top / wall hung / drop-in / pedestal / round / oval / corner

wash troughs

- type: see drawings

single trough / double trough / with drainboard

water closets

- type: see drawings

wall-hung / floor mounted / close-couple / squat

flushing cisterns

- type: see drawings

high level / low level / near level / close coupled / wall-hung / concealed

- flush capacity: low-flush (4½ or 6 L) / regular flush (6 or 9 L)
- flush valve flushing operation: single flush / dual flush / interruptible flush

urinals

- urinal type: see drawings

bowl / trough / stall

bidets

- bidet type: see drawings

wall-hung / floor mounted

sinks

- sink type: see drawings

domestic / laboratory / scullery / scrub sink / cleaner's / drop-in / wall-hung / pot / freestanding / with drainboard / with backsplash and tiling key / single, double or triple compartment

- bowl position: see drawings

left / right / centre

shower enclosures

SASEMA (South African Shower Enclosure Manufacturer's Association). SANS 549 "domestic" includes use in hotels, student accommodation, hospitals.

- shower enclosure type: purpose made / prefabricated / domestic to SANS 549 / medical / industrial / cabinet / curtain / roofed (steam shower)
- drained floor type: tiled / tray / bath
- glazed wall/door/roof construction: framed / frameless

Frameless construction requires toughened safety glass. Holes for hinges etc. must be prepared before toughening.

- safety glass: toughened safety glass / laminated safety glass / plastic
- door type: pivoting / folding- sliding
- metal finish: anodising, grade … / powder coating, type 4

Metal coating grade/thickness will depend on location: anodising grade AG15 or AG20 will suffice for mild atmospheric conditions, while grade AG25 will be required for coastal applications. For powder coating, type 4 or 5 should suffice. Check with manufacturer.

18.9.2 Taps, valves, showerheads

- tap, valve type: see drawings

bath / basin / shower / sink / garden / bib / pillar / mixer / divert mixer / swivel / stop / flush / gate / hose / washing machine / draincock / float

- showerhead type: see drawings

fixed rose, diameter … / adjustable rose / swivel / rail / vandalproof / handshower and holder

- material: chromium plated brass / stainless steel / plastic
- flush valve type: WCHP / WCLP / urinal

WCHP (Water closet high pressure; WCLP (water closet low pressure).

18.9.3 Traps

- type: see drawings

bottle trap / P-trap / P-trap resealing / pop-up

- material: plastic / rubber / chromium plated brass
- depth of seal: 40 / 75 mm.

18.9.4 Miscellaneous

holders

- holder type: see drawings

paper / soap / tumbler / tooth brush / toilet brush / towel rail/ring/hook

- material: chromium plated brass / glazed ceramic / aluminium / wood

shelves

- material: safety glass with polished edges on nickel-chromed / wood / metal / plastic brackets

cabinets

- type: wall / vanity / with mirror
- material: wood / plastic / metal.

Relevant standards:
SANS 10105 The classification, use and maintenance of portable fire extinguishers.
SANS 10112 The installation of polyethylene and PVC-U pipes.
SANS 10102 Selection of pipes for buried pipelines.
SANS 10252-1 part 1: Water supply and drainage for buildings; part 2: Drainage installation for buildings.
SANS 10254: The installation of fixed electric storage water heating systems.
SANS 10400-P Drainage.
SANS 10400-Q Non-water-borne means of sanitary disposal.
SANS 10400-R Stormwater disposal.
Relevant sources:
Concrete Pipe Handbook published by the Concrete Society of Southern Africa.

19 Electrical works

19.1 Earthworks (SANS 2001-DP1)

SANS 2001-DP1 covers earthworks for trenches for all types and sizes of buried pipelines, ducts, cables and prefabricated culverts, including excavation, preparation of trench bottoms, bedding, backfilling and reinstatement of surfaces.

Specification data:

- areas where pipes are to be encased in concrete: see drawings

19.2 Cable ducts (underground) (SANS 2001-DP3)

SANS 2001-DP3 covers the supply, and the laying and bedding in trenches, of pipes of diameter not exceeding 160 mm as ducts for the protection of telephone and electric power cables.

Specification data:

- type of pipe, associated fittings: pitch impregnated fibre / PVC-U / fibre cement / vitrified clay

Unplasticised polyvinyl chloride (PVC-U).

- draw pits: see drawings.

19.3 Materials and installation

19.3.1 Wiring

conduits

Chasing is prohibited in wall faces that are to receive roof flashing. Roof flashing is inserted in grooves sawn with disc cutters after conduits are installed, leading to unnecessary and costly repair work.

conductors

See SANS 10198 The selection, handling and installation of electric power cables of rating not exceeding 33 kV.

distribution board, meter cabinets

- position of DB's and meter cabinets: see drawings.

19.3.2 Fittings

luminaires

- type: see drawings

surface mount / recessed / accent / downlighter / step / theatre / outdoor (pole, step, bollard)

stove, hob, oven, cooker hood

- stoves, hobs, ovens, cooker hoods model, type: … / see drawings.

Relevant standards:
SANS 10114 Interior lighting.
SANS 10389 Exterior lighting.
SANS 10142 The wiring of premises.
SANS 10222 Electrical security installations.
SANS 10313: The protection of structures against lightning.
SANS 61024 Lightning protection of structures.

20 Mechanical works

20.1 Installation

- routing and/or concealment of cables, ducts, trays, pipes etc. : see drawings.

20.3 Location and access

- catwalks, cat ladders, access panels: see drawings.

Catwalks and cat ladders should be detailed and coordinated with other services in order to keep to a minimum.

21 External works

21.1 Paving

21.1.1 Materials

units

- paving unit type: see drawings

precast concrete blocks / burnt clay pavers / in-situ concrete / precast concrete slabs

precast concrete segmental paving blocks

- type: S-A (interlock) / S-B (semi-interlock) / S-C (rectangular)
- class: 25 / 35

Class 25 (MPa) concrete blocks should be specified for most uses.

- nominal thickness: 50 / 60 / 80 / 100 / 120 mm

Thickness of blocks depends on site conditions, design requirements and cost.

- top edges: chamfered / not chamfered
- colour: …

burnt clay paving units

- class: PB / PA

PB (uniform), PA (highly uniform in shape and size).

- colour and work size: …

precast concrete paving slabs

- size: 295 / 445 / 595 x 295 / 445/295 / 595/455 x 50/65 mm

sand for bedding and jointing of flexible paving

The use of mine sand for jointing is generally accepted.

21.1.2 Preparation

subgrade

- subgrade levels and falls: see drawings

Check soil and traffic conditions with a Competent Person. The sub-base thickness is a function of both the type and amount of traffic to be carried and the strength of the subgrade. See also SANS 1200 ME, MF, ML.

concrete sub-base for rigid paving

- thickness, reinforcement: see Section 2

weed killer

- treat area to be paved with *suitable* weed killer: required / not required

levels, falls, pattern

- levels and falls: see drawings

A fall of 1:60 is regarded as an optimum fall. Gradients of 1:100 are less forgiving (workmanship, settlement).

- pattern: see drawings / herringbone / basket weave / stretcher / waving

Edge restraints along the perimeter of the paving is necessary to prevent lateral spread of the units and to retain the bedding course sand. See concrete culverts, kerbs etc. below.

21.1.3 Laying

See SANS 784 for guidance on tactile indicators for access and mobility.

□ type of paving: see drawings / flexible block/brick / flexible slab / rigid block/brick / in situ concrete

flexible block/brick paving

Flexible paving is paving laid on sand, with joints filled with sand. The surfaces of flexible paving usually bed down ±5 mm after trafficking.

Consider mixing filling sand with 10 – 15% cement depending on traffic, type of paver, and control of weed growth. Spray paving thus filled with a fine spray of water immediately after filling to clean off all cement.

□ concrete anchor beams across road on grades exceeding 8%: …

Horizontal forces of motor traffic increase considerably on grades exceeding 8%, causing creep. This is avoided by casting concrete anchor beams across the road. On steeper grades the paving should preferably be rigid. See CMA technical note 6.2 1994.

flexible slab

□ joints: filled with mortar / to be left open

rigid block/brick paving

Rigid paving is paving units bedded in mortar on a concrete base. External paving is exposed to wide temperature and moisture fluctuation which can only be provided for by movement joints.

accuracy

Accuracy depends on experience of contractor and/or labourers, and importance of the contract.

21.2 Concrete culverts, kerbs, channels

□ type: see drawings

culvert / kerb / channel

21.2.1 Materials

□ precast concrete culvert class: 75S / 100S / 125S / 150S / 175S / 200S

Class depends on foundation conditions and fill.

□ dimensions (internal) : see drawings

span: 450 / 600 / 750, 90 / 120 / 150 / 180 / 240 / 3 000 mm; height: 300 / 450 / 600 / 900 / 1 200 / 1 500 / 1 800 / 2 400 / 3 000 mm

□ kerb type: see drawings

rectangular / half-battered / battered / mountable

□ edging type: see drawings

rectangular / half-round

□ channel type: see drawings

rectangular / tapered.

21.2.2 Laying

□ movement joints: leave open / fill with polysulphide.

21.3 Concrete retaining blocks

Concrete retaining blocks are an economical, versatile and environmentally compatible method of retaining earth and be used for planting, steps, seats, pavilions, and for erosion and scour control.

blocks

- shape, size and colour: …

preparation

- depth, level and type of foundation: see drawings

Foundations: also on sloping or gravel foundation. *Drawings* should show this. Compacted earth foundation is usually sufficient for structures not higher than 1,2m. Higher walls should be thicker, inclined towards the retained earth, anchored with a geogrid mesh, or by modifying the properties of the backfill. Consult the supplier of the blocks and/or Competent Person. Ensure building regulations are complied with.

- width of foundation: see drawings

Show width of foundation if of concrete.

- drain pipes, aggregate drain, geofabric drain behind retaining wall: required / not required

placing

- stacking pattern: see drawings
- geofabric reinforcement: required / not required.

SANS 207 gives recommendations for the application of reinforcement techniques to soils and other fills.

21.4 Gabions

materials

- cage dimension: 4 x 1 x 1 / 6 x 2 x 0,5 m
- mesh wire to be PVC-coated: required / not required.

21.5 Fencing

- type: see drawings

line wire on steel posts, stays, droppers and standards / wire chain-link mesh on strain wire on steel posts, stays, droppers and standards / welded mesh / barbed tape / palisade / electric / private swimming pool

21.5.1 Line wire and chain-link mesh fencing

- type wire: …

line / barbed

- type chain link wire: 1 / 2

1 (zinc coated) / 2 (zinc coated and PVC coated).

- colour of PVC coating when relevant: dark green / white
- nominal size mesh of chain-link wire: 40 / 50 / 60 / 75 / 100 mm

posts, stays, standards, droppers

- type: steel / concrete / wood

erection

- fence height: see drawings

900 / 1 200 / 1 800 / 2 000 / 2 400 / 3 000 / 3 600 mm

fencing gates

- size, shape: see drawings.

21.5.2 Weld mesh fencing

- material: mild steel / high tensile steel / very high tensile steel

High tensile steel (>950 MPa); very high tensile steel (>1 250 MPa).

- mesh size: 25 x 25 / 50 x 25 / 50 x 50 / 100 x 50 / 100 x 100 mm
- finish: hot dip galvanized / black / hot dip galvanized and powder-coated
- fence height: see drawings

1 200 / 1 800 / 2 400 mm

21.5.3 Barbed tape fencing

- type: A (concertina) / B (flatwrap) / C (barbed tape unclipped) / D barbed razor tape
- material: zinc-coated steel strip / stainless steel
- zinc coating grade: light / medium / heavy

21.5.4 Palisade fencing

- type: steel / concrete
- finish on steel: paint / hot dip galvanized

steel

- type: security purpose / general purpose
- steel fence height: see drawings

1 800 / 2 400 / 3 000 / 3 600 mm

- concrete fence height: see drawings

1 800 / 2 400 mm.

21.5.5 Electric fencing

- type: wall top / from ground up / electrified palisade / freestanding
- number of lines for wall-top type: 6 / …
- powered by: mains / battery / solar.

21.5.6 Gate automation

- theft-resistant cages with padlock: required / not required.

21.5.7 Private swimming pool fencing

- fence height: see drawings

1,6 m* / 1,2 m

- type of protective wire coating: powder / zinc / paint / dual (paint over zinc).

21.6 Precast concrete plank walling

- type panel: plain / decorative
- colour: natural / …
- height of wall: see drawings

900 / 1 200 / 1 500 / 1 800 / 2 200 mm

- width of panel: 300 / 600 mm.

21.7 Swimming pools

- swimming pool size, shape and finish: see drawings

21.8 Timber decking

SANS 10043 covers general principles on the installation of timber decking.

21.8.1 Materials

poles

- wood: softwood / hardwood

Softwood: Pinus; hardwood: Eucalyptus.

- top diameter (thin end): see drawings

50-79 (red) / 80-99 (yellow) / 100-119 (blue) / 120-139 (white) / 140-159 (orange) / 160-179 (green) / 180-199 (black) mm; ditto posts: 145-174 / 175-199 / 200-230 mm.

structural laminated timber

- wood: softwood / hardwood

Softwood: Pinus; hardwood: Eucalyptus.

- appearance and finish: P

Rough-sawn (R), fine-sawn (F), planed (P), sanded (S), smoothed (G), coated (C), special (X).

Preservative treatment: The Forestry Act 1968 (Act 72 of 1968) provides for the legal requirement of pressure treatment of structural softwood timber to combat any fungus or bacterial disease, insects or parasites affecting the timber. The present legislation applies to the so-called *the coastal region* only.

- fire retardant treatment: required / not required
- size: …

deck boarding

- wood: softwood (Pinus) / hardwood
- softwood:
  - grade: clear / semi-clear
  - dimensions: 22 / 33 mm x >50 mm wide
- hardwood:
  - specie: …
  - grade: clear / figured
  - dimensions: 20 mm x 35 – 90 mm wide

fixings

- screws: solid brass / silicon bronze / aluminium / stainless steel

balustrades

- material: wood / metal / glass / …
- construction: …

Balustrades to conform to SANS 10400-M.

21.8.2 Installation

- pole to ground contact: see drawings / planted in concrete / on metal brackets on concrete footings
- plug screw holes with matching wood: required / not required
- protect end grain with metal caps: required / not required / see drawings.

21.9 Landscaping

21.9.9 Garden furniture

- garden furniture type: see drawings

table / bench / seat / canopy / litter bin / playground equipment

- material: see drawings

precast concrete / wood / metal

- finish: …

21.9.10 River pebbles

- size, colour, mix: …

Relevant standards:
SANS 1200 MJ Segmental paving.
Precast concrete paving blocks – laying manual. The Concrete Masonry Association.
Technical guide: Clay Pavers & Paving – selection and construction guidelines. Corobrik.
SANS 10244 Zinc and zinc-alloy coatings on steel wire.
SANS 10104 Handrailing and balustrading (safety aspects).
SANS 14001 Environmental management systems.