


Project: KZN DOH CLINICS

Electrical Specification

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## 1 SECTION 1 – GENERAL

### 1.1 Intent of Document

The specification is intended to cover the complete supply, delivery, off-loading, installation, commissioning, testing and handover documentation of the Electrical and Electronic services at the Small Clinic and Residences The Clinic is set on a greenfield site therefore the solution includes an installation and supply of new main incomer boards and metering as well as sub distribution boards, lighting installation and plug circuits installation, and all associated cabling from the loads that require power to the main/sub distribution board as per design drawings and BOM. The Small Clinic is not a 24 hour operation clinic.

The minimum equipment requirements are outlined in the relevant sections of this document. The details and construction of the equipment is not covered in this document due to this being the sole responsibility of the Contractor.

In all cases where a device or part of the equipment is referred to in the singular, it is intended that such reference shall apply to as many devices as are required to complete the installation.

### 1.2 Standards and Codes

- a) All work and equipment shall be in accordance with the requirements of the latest SANS Standards, regulations and local municipality codes and shall comply with the Occupational Health and Safety Act, No 85 of 1993 and current regulations of all other codes applicable to this work.
- b) Refer to Section 2 for the relevant standards and codes as a guideline.
- c) All equipment shall be compliant with the latest relevant standards and codes.
- d) Refer to Department of Health Ideal Clinic (Prototype) Standard (Volume 1-6)

### 1.3 Regulations

The following documents contain provisions that, whether referenced in the text or not, constitute requirements of these guidelines.

- a) SANS 10142-1: The Wiring of Premises Part 1: Low-voltage installations, as amended
- b) The Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended,
- c) National Building Regulations and Building Standards Act, Act 103 of 1977, as amended
- d) National Building Regulations, GNR 2378 of 12 October 1990, as amended
- e) Electrical Installation Regulations, 2009 as amended (Promulgated in terms of the Occupational Health and Safety Act by GNR 242 of 6 March 2009)

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- f) National Guidelines: NRS 098: Guidelines for the Installation and Safe Use of Portable Generators on Utilities' Networks
- g) Applicable City By-Laws and Guidelines Electricity Supply.
- h) The Local Government Ordinance 1939 (Ordinance 17 of 1939) as amended and the municipal by-laws and any special requirements of the local supply authority,
- i) The Electricity Act 1984 (Act 41 of 1984) as amended

#### **1.4 Electrical Contractor**

- a) Electrical contractors must be registered by the Department of Labour in compliance with Regulation 6(1) of the Electrical Installation Regulations.
- b) Electrical contractors must produce the registration certificate issued by the Department of Labour on request of an Installation Inspector, Law Enforcement Officer or any other authorized ESD official

#### **1.5 Design Rationale**

##### **1.5.1 Power Supply**

The Power will be supplied by the local Supply Utility (Eskom) via a 200kVA 3 phase transformer as the load is calculated to be 180KVA, for both the Small Clinic and the Residences. The design also includes a renewable power supply source which is solar and a final backup of a diesel generator should there be a prolonged outage. There will be no batteries supplied other than in the Residences which is to accommodate the night time outages up to 4 hours.

##### **1.5.2 Renewable Energy**

Due to the location of the Small Clinic, only solar plant was considered. The Contractor shall be responsible for the design including PVsys, Helioscope or equivalent study showing the yield of the plant. The plant shall be sized to supply:

- 150KW for the Small Clinic
- 5kW each for the Residence, sized in groups of one or two. A total of 6 Residences comprising of 3 buildings of 2 units each. The equipment will be stored in the patio in a fire proof enclosure.
- All inverters will be of hybrid type
- Batteries supplied for the Residence will be Lithium Iron Batteries rated for at least 4 hours.
- All measuring and monitoring equipment
- The power produced must be guaranteed for a period of 10 years.

##### **1.5.3 Clinic**

The design of the clinic areas was guided by the Ideal Clinic standard/Prototype. As lux levels were not explicitly stated in the document, the designer used SANS10114 Interior lighting & Exterior lighting as a guide. All LED lights were used and no localised batteries were added to the light fittings due to the inclusion of both solar plant and a diesel generator. All lights are non-dimmable. Ceiling panels lights were used in offices and consulting rooms, giving an average of 500lux. Specialised lighting is allowed for in procedure rooms.

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Power outlets are classified into normal, dedicated and UPS supply. As the facility is supplied by solar, generator and mains, all the power outlets will have power after a very short switching period. The IT server and other electronic equipment will be supplied by a 5kVA UPS to provide safe shutdown of equipment and supply for 2 hours, via socket outlets fed from the localised UPS. Dedicated circuits are provided for medical equipment and fire detection equipment.

The following equipment has been provided in the clinic as part of this supply:

- Access control in administration and dedicated patient care areas.
- Access control doors to be fitted with fire escape door release mechanism.
- CCTV at entrances and passage ways
- Nurse call in emergency room areas
- PA system
- Earthing and Lightning Protection

#### **1.5.4 Residence**

The Residence electrical network has been designed with a solar and mains source to supply LED indoor and outdoor lights, power outlets for kitchen and household appliances. Each unit will have its own distribution board. A stove isolator and geyser supply is included. Earthing rods for local DB's and surge protection is included. Lightning protection is included.

No heating or cooling loads have been accommodated for.

#### **1.6 Scope of Work**

- a) This specification covers the supply, delivery, installation and commissioning of the low voltage distribution system. This includes the complete installation and commissioning of cables, compliance of entire installation of all power distribution board, lighting and plug circuits as per the following:
- (1) Power cabling from main incomer kiosk to all DB's
  - (2) Lighting cabling to all light fittings
  - (3) Lightning Protection and Earthing of installation
  - (4) Conduits and cable trays for power
  - (5) Cable trays and conduits for lighting
  - (6) Cable trays and conduits for IT, Access control, Speaker, CCTV And Audio distribution separated from power routes by at least 300mm edge to edge from single phase circuits.
  - (7) Cabling from the main distribution board to ATS,
  - (8) Cabling from generator to the ATS including communications cabling,
  - (9) Cabling from the ATS to the main kiosk, and
  - (10) Cabling from the distribution board to the relevant the lighting and plug circuits
  - (11) All plaster boxes as per BOM
- b) The main distribution board is fed from a three phase supply from the Utility with associated metering. All associated permits and application as per legislation would be necessary for power is part of this scope. The main electricity kiosk is to be housed at the back of the property with a diesel generator, away from patient areas.
- c) The Contractor shall also apply for a fibre cable supply to the site and cable from the intake point into the building main Data Board. The IT portions of the work will include:

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- 1) Network distribution to all server cabinets
  - 2) Installation of all network cabling
  - 3) Installation and termination of IT, Access control PA & Speakers, CCTV, Nurse Call and other electronic equipment as per BOQ.
  - 4) Conduits and cable trays for IT, Speakers wiring, CCTV and Audio distribution separated from power routes by at least 300mm edge to edge from single phase circuits.
  - 5) All plaster boxes as per BOQ
  - 6) Supply and install of IT cables (CAT6/6A)
  - 7) Commissioning of all IT, Audio and Video
- 
- d) Conduit to Switches plaster mounting boxes 4 x 2 and 4x4 plaster boxes supplied and installed
  - e) Earthing as per design including earthmats/rods at Distribution Boards, Generator and pumps. 16mm<sup>2</sup> earth cable as needed and per BOM
  - f) The supply and install of lights, plugs and isolators at the residences.
  - g) Supply and install of all solar panels, DC cabling, inverters & batteries as per the bill for residences and clinic as two sperate system.
  - h) Electrical compliance (3 phase certification) of the installation as per legislation for lighting, and power DB included.
  - i) Supply and install including Termination of speaker cables as per BOM.
  - j) Conduits sizes as per BOM and design
  - k) Supply, install and terminate all power distribution single and 3 phase as well as all power required by all third party devices such as pumps.
  - l) Labelling of cables as per design
  - m) Testing continuity of all cables prior to termination
  - n) Hold points for inspection by Engineer and authorities will be detailed in the Quality plans and 1 week notice would be required or as per Inspection Test plans

#### **1.7 Limits of Scope of Work**

The complete backup power solution includes the integration of the scope of work to be completed by both the Electrical Contractor and the Utility Contractor. The limits of the scope of work for the contractor will be the terminals of the Utility supplied transformer or Kiosk and the Fibre Optic supplier Kiosk terminals.

### **1.8 Environmental Conditions**

The electrical installation shall be capable of withstanding any combination of the following environmental conditions in which it must operate and without any electrical or mechanical damage or degradation of the operating characteristics:

- a) Altitude : up to 1300m height above sea level
- b) Ambient Temperature : -10 to 47 degrees
- c) Relative Humidity : up to 90%

### **1.9 Co-ordination**

- a) Due to the nature of the installation, a fixed sequence of operation is required to properly install the complete solution. The Contractor shall perform the installation of all electrical and electronic works and shall co-ordinate his program to ensure that the works is completed and ready for commissioning of the end users of power.
- b) The work shall be closely scheduled in order not to delay the entire project, and proper planning to ensure that the works is carried out with minimum interruptions.
- a) Delays due to lack of co-ordination between the Contractor shall not form a basis for claims by the Contractor of this Contract.

### **1.10 Test Certificates and Inspections**

The following tests are to be carried out:

- (a) After completion of the works and before first delivery is taken, a full test will be carried out on the installation for a period of sufficient duration to determine the satisfactory working thereof. During this period the installation will be inspected and the Contractor shall make good, to the satisfaction of the Representative/Agent, any defects which may arise.
- (b) The Contractor shall provide all instruments and equipment required for testing and commissioning of the installation at completion.
- (c) The Contractor shall ensure that he is a qualified electrician and completes the testing and commissioning of the complete installation. The electrician shall provide a valid Certificate of Compliance (CoC) for the completed installation. The CoC must be accompanied by a test report in the format stipulated in SANS 10142.
- (d) Due to possible load changes at the main existing metering board, the Contractor shall ensure that the application for extra power as calculated by new load requirements is included and any necessary upgrades are performed accordingly and the necessary applications for such upgrades as well as obtaining the local permits.
- (e) Test reports and CoC as specified above are to be submitted to the Department.

### **1.11 Guarantee, Warranty and Maintenance**

- a) The Contractor shall guarantee the complete plant for a period of 24 months for any defects on equipment and installation.



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- b) If during this period the plant is not in working order, or not working satisfactorily owing to faulty material, design or workmanship, the Contractor will be notified and immediate steps shall be taken by him to rectify the defects and/or replace the affected parts or installation on site at his own expense.
- c) The Contractor shall offer technical support where required during normal working hours i.e. phone, email support.

**1.12 Materials and Workmanship**

- (a) The work throughout shall be executed to the highest standards and to the entire satisfaction of the Representative/Agent who shall interpret the meaning of the Contract Document and shall have the authority to reject any work and materials, which, in his judgement, are not in full accordance therewith. All condemned material and workmanship shall be replaced or rectified as directed and approved by the Engineer.
- (b) All work shall be executed in a first-class manner by qualified tradesman.
- (c) The Contractor shall warrant that the materials and workmanship shall be of the highest grade, that the equipment shall be installed in a practical and first-class manner in accordance with the best practices and ready and complete for full operation. It is specifically intended that all material or labour which is usually provided as part of such equipment as is called for and which is necessary for its proper completion and operation shall be provided without additional cost whether or not shown or described in the Contract Document.
- (d) The Contractor shall thoroughly acquaint himself with the work involved and shall verify on site all measurements necessary for proper installation work. The Contractor shall also be prepared to promptly furnish any information relating to his own work as may be necessary for the proper installation work and shall co-operate with and co-ordinate the work of others as may be applicable.
- (e) All components and their respective adjustment, which do not form part of the equipment installation work, but influence the optimum and safe operation of the equipment shall be considered to form part of, and shall be included in the Contractor's scope of works.
- (f) The Contractor shall make sure that all safety regulations and measures are applied and enforced during the installation.
- (g) The Contractor is to include for all scaffolding required to complete the work required.

**1.13 Schedule of Fitting**

In all instances where schedule of light, socket outlet and power points are attached to or included on the drawings, these schedules are to be regarded as forming part of the specification.

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**1.14 Quality of Materials**

- (a) All materials procured for the installation shall be in compliance with the requirements of SANS 10142.
- (b) Only materials of first class quality shall be used and all materials shall comply with the relevant South African Bureau of Standards, specifications, or to IEC Standard Specifications, where no SABS Specifications exist.
- (c) Materials wherever possible, must be of South African manufacture.

**1.15 Workmanship and Staff**

- (a) The workmanship shall be of the highest grade and to the satisfaction of the owner.
- (b) All inferior work shall, on indication by the Engineers inspecting officers, immediately be removed and rectified by and at the expense of the Contractor.

**1.16 Certificate of Compliance**

- (a) On completion of the service, a certificate of compliance must be issued to the Department's Representative/Agent in terms of the Occupational Health and Safety Act, 1993 (Act 85 of 1993).
- (b) The certificate of compliance shall be for the complete installation including the power side of the IT Boards as well as to free issue distribution boards if applicable.
- (c) A test report shall be accompanied with the certificate of compliance.

**1.17 Submittals**

The following information must accompany the tender documents

No	List of Technical Tender Returnable	Compliant	
		Yes	No
1	Certification of Master Electrician		
2	Certification of Electrician		
3	Wireman's License		
6	Low voltage distribution board type test		
7	OSHACT Compliance		
8	Previous Experience (Projects similar size and nature of this project for last 3 years)		
10	Price Schedules		
11	Deviations from specification		
11	High level schedule		

## **2 SECTION 2 LOW VOLTAGE DISTRIBUTION**

### **A. EQUIPMENT REQUIREMENTS**

#### **2.1 Quality, Standards & Regulations**

All material and equipment supplied for this contract shall be new and the best of their respective kind. All new materials and equipment supplied, shall comply fully with the requirements laid down in the specification. The whole of the works shall be executed in accordance with best practice and to approval of the engineer. The equipment shall comply with the latest issues of the following standard specifications:

##### **2.1.1 Standards**

The low voltage system must be designed and produced in compliance with the following standards but not limited to:

- SANS 10142-1 Wiring Code of Practice.
- SANS 1765 Distribution Boards
- SANS 1507 PVC Cables
- SANS 950 PVC Conduit
- SANS 156 Circuits Breakers
- SANS 60947-2 Circuit Breakers
- SANS 556-1 Circuit Breakers
- SANS1239 Socket outlets
- SANS 1433-1 Terminals
- SANS 61008-1 Earth Leakage Devices
- SABS 150 Insulated wire
- SANS 1213 Cable Glands

##### **2.1.2 Regulations and Rights of Engineer**

Apart from any other authority, which the engineer may have in terms of the contract, he shall have the right to set the standard and to accept or reject part of the specified equipment depending on the quality of material and workmanship offered.

The Contractor shall be notified if the quality of such materials and/or workmanship is not acceptable. In such an event, the contractor shall replace the specific part or repair it to the satisfaction of the engineer, all at the cost of the contractor. Such an instruction shall not exempt the contractor from any of his obligations in terms of the contract.

The installation shall be erected and carried out in accordance with:

- a) The Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended.
- b) The local Municipality by-laws and Regulations as well as the regulations of the local Supply Authority.
- c) The local Fire regulations.

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- d) The Standard Regulations of any Government Department or public service company where applicable.

In addition the Contractor shall at his cost issue all notices in respect of the installation to the local authorities, and shall exempt the client from all losses, costs or expenditures which may arise as a result of the Contractor's failure to comply with the requirements of the regulations enumerated above.

It shall be assumed that the Contractor is conversant with the above-mentioned requirements. Should any requirements, by-law or regulation, which contradicts the requirements of this document, apply or become applicable during erection of the installation, the Contractor shall immediately inform the engineer of such a contradiction. Under no circumstances shall the Contractor carry out variations to the installation in terms of such contradictions without obtaining the written permission to do so from the engineer.

## **2.2 Low Voltage Equipment**

### **2.2.1 General**

The installation shall be in accordance with SANS 10142 and at handover the Contractor shall give the end user a Certificate of Compliance in accordance with the Occupational Health and Safety Act.

(A readable copy of the Certificate of Compliance is to be submitted to the project manager)

The low voltage connection shall consist of:

1. All cabling for the generator, ATS and main and sub distribution board and all loads.
2. Main and sub distribution boards.
3. All solar plant
4. All protection and metering plant
5. Circuit wiring from the distribution board to sub distribution board to loads:
  - a) Switched socket outlets;
  - b) Electronic boards such as data & telephones
  - c) External lighting to sub distribution board

### **2.2.2 Earthing and Bonding**

#### **Main earthing**

- a) Where the supply authority does not provide an earth terminal or conductor, an earth electrode system that complies with the requirements of SANS 10142 shall be supplied.
- b) At least one earth electrode shall be installed for the main distribution board or ready board irrespective of whether the supply authority provides an earth terminal (or conductor) or not: the earth electrode shall comply with SANS 10142. The earth wire shall be protected by a steel pipe.
- c) Where the supply authority provides an earth terminal, it shall be connected to the consumer's earth terminal.
- d) Installations shall be effectively earthed in accordance with the "Wiring Code" and

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to the requirements of the supply authority. All earth conductors shall be stranded copper with or without green PVC installation with suitable thickness.

- e) Earthmat for the generator as per design

#### **Sub-distribution boards**

- a) A separate earth connection shall be supplied between the earth busbar in each sub-distribution board and the earth busbar in the Main Switchboard. These connections shall consist of a bare or insulated stranded copper conductors installed along the same routes as the supply cables or in the same conduit as the supply conductors. Alternatively armoured cables with earth continuity conductors included in the armouring may be utilised where specified or approved.

#### **Sub-circuits**

- a) The earth conductors of all sub-circuits shall be connected to the earth busbar in the supply board in accordance with SABS 0142.

#### **Connection**

- a) Under no circumstances shall any connection points, bolts, screws, etc., used for earthing be utilised for any other purpose. It will be the responsibility of the Contractor to supply and fit earth terminals or clamps on equipment and materials that must be earthed where these are not provided. Unless earth conductors are connected to proper terminals, the end shall be tinned and lugged.

#### **Bonding**

- a) Bonding shall be in accordance with the requirements of SANS 10142.

### **2.2.3 Earth Continuity**

- a) Earth continuity conductors and resistances shall be installed in accordance with SANS 10142.

### **2.2.4 Distribution Boards**

- a) Distribution Boards and equipment used within the board shall comply with relevant SANS Standards.
- b) Each distribution board shall comprise of a main circuit breaker, busbar, plug and light circuit breakers, earth leakage unit, neutral and earth bar, etc.
- c) Each distribution board shall be controlled by main circuit breaker mounted in the board.
- d) Each distribution board shall have appropriate labelling (main switch, loads, generator supply, etc.) and danger notices as per SANS Standards.
- e) Each distribution board shall include adequately rated cabling for jumpers as per SANS.
- f) The distribution board shall be suitable for the environment conditions in which it operates and the boards shall be protected against corrosion.
- g) The distribution board shall be mounted at a suitable height above the existing floor level in order to obtain access during normal operation.
- h) The position of the distribution board shall allow safe operation and maintenance.
- i) Each unoccupied opening of the distribution board shall be fitted with a blanking plate.

- j) All circuit breakers shall be adequately rated for the prospective short circuit current.
- k) All Coastal rating materials (3CR12) to be used.

### **2.2.5 Wall Switches and Accessories**

The IT supplier and install provide all switches and coverplates necessary for installation.

- a) All switches are suitable for mounting in standard wall outlet boxes.
- b) NOTE – Exterior switches shall be mounted in positions protected from rain or water ingress.
- c) Cover plates for wall outlet boxes shall be supplied and installed by the specialist.

### **2.2.6 Switched Socket Outlets**

- a) This section covers switched socket outlets for use in general installations under normal conditions.
- b) Switched socket outlets shall be surface mounted and comply with SABS 163, SABS 164, and SABS 1085 and be rated 16A, 22 V/250 V and shall have 2 switched 3-pin sockets.
- c) Switch socket outlet covers shall be white. There will be a combination of 2 x 4, 4x4 and 6 and 8 way boxes depending on application
- d) The sockets shall be level and mounted equally distance and as per design heights.
- e) The contractor shall be asked to remove the plaster boxes and redo should the design heights and distances not be correct.



### **2.2.7 Lighting**

- a) All lights shall be provided as per the bill and drawings.
- b) Where lights are indicated on panel ceilings, these should be 1200x600mm panel fittings.
- c) Where lights are on plaster ceilings, fittings will be flush surface mounted type.
- d) All outdoor lighting shall be IP65 or better.
- e) All light fittings shall be rated for coastal conditions including screws.

### **2.2.8 Surface Wiring and Accessories**

- a) This section covers the requirements for wiring and accessories for general installations under normal conditions.
- b) All surface wiring shall comply with SABS 1574 and SABS 1507.
- c) The installation shall comply with SANS 10142.
- d) Surface wiring shall enter wall boxes and luminaires using the correct size compression glands. Wiring for lighting circuits is to be carried out with 2 x 1.5mm<sup>2</sup> conductors and earth conductor. For socket outlet circuits the wiring shall comprise 2 x 2.5mm<sup>2</sup> conductors and earth conductor.
- e) Surface wiring shall be connected and interconnected in draw and junction boxes with push wire type connectors. No terminations shall be made in conduit junction boxes. These should only be used for draw wires. All terminations are to be done in DB's, Equipment, Switch boxes and or sockets.
- f) Only for power circuits can the single stands be used but colored as per the phase color and enclosed in suitable trays as per SANS requirement.
- g) Lighting circuits shall be as per item d and no single stands will be permitted.

### **2.2.9 PVC Conduit and Conduit Accessories**

This section covers the requirements for conduit and conduit accessories for general installations under normal environmental conditions.

- a) All PVC conduit shall comply with SABS 950 and be fitted and glued with the correct size coupler and lock nut where the conduit terminates in any box.
- b) PVC accessories shall be suitable for the PVC conduit.
- c) The installation of conduit and accessories shall be symmetrical, vertical and parallel to the respective walls and floors and saddled and screwed down where surface mounted.

### **2.2.10 Diesel Generator**

The generator will be as follows:

- a) Maximum 200kVA standby power at 230/400v @ 50Hz 1500rpm High quality and reliable six-cylinder Scania/ Volvo turbodiesel engine, Silent canopy which can stand outside with lockable doors. Fuel tank to be built into the unit base to include enough of fuel for 72hours operation and a minimum of 600l.
- b) Automatic changeover (ATS) to include mains/solar/diesel generator inputs.
- c) Maintenance free batteries and trickle charger included.
- d) Four-way protection system included, H-specification insulation, brushless alternator with AVR provides stable output, digital controller with auto and manual start options,
- e) All sets must undergo a comprehensive testing/pre delivery inspection, prior to delivery and include one year/1000 hour warranty. Including first fuel fill, oil filters, fuel filters and all other consumables necessary for operation.
- f) Must be positioned away from patient areas

## **2.3 ELECTRONIC EQUIPMENT**

### **2.3.1 Server Cabinets and room**

- a) Server cabinets and equipment used within the server cabinets shall comply with relevant Standards.
- b) Each distribution board shall comprise of network switch, patch panel, patch leads, brushes, all network equipment and UPS.
- c) The Contractor to design the server rooms and plan the termination points for all network points. The network must be planned and installed that best suits the layout of server rooms
- d) Each server room to have raised flooring for cable routes.
- e) Each server room shall include adequately rated cabling for jumpers as per SANS.
- f) The server cabinet shall be suitable for the environment conditions in which it operates and must be protected against corrosion.
- g) The position of the server cabinet shall allow safe operation and maintenance.

### **2.3.2 PA System**

Compete PA sound system has been designed for audio distributed throughout the Clinic by using ceiling, Wall mount and Horn speaker. The main front end Mic is to be in the Admin building at the reception desk as indicated on the drawings.

The Contractor must provide as listed

1. The Position all speaker has been marked on the design layout drawing. Speaker points must be moved on site to the most suitable position.
2. The Contractor to run all speaker cable from the server room to the speaker point. Contractor must install and terminate all speakers.
3. The Contractor must install all amplifiers in server cabinet and programme the complete system as per the specification below and comply with the standards below.
4. The Contractor must test the installation that audio is distributed thought out the Clinic. The Contractor shall install additional speakers were required.

### **2.3.3 IT Network - Data – coms**

The IT network has been designed with the infrastructure to house all IT equipment and provide WIFI and LAN through the Clinic as per guideline provided.

Bulk infrastructure service sleeves in trenches/cable routes for main cables and routes to interconnect or enter buildings as been designed thought out the project site.

Adequate cable trays (for IT and Electrical) has been allowed to accommodate all the electronic/Electrical cabling.

Listed is the typical allowance in the Sever cabinets includes as listed

- 1 x 42-20 U 800x800mm cabinet depending on space required
- 1 x 24 port network POE switch
- 1 x 24 port patch panel
- 1 x Surge protection PDU
- 1 x Fibre Panel to link server rooms
- 48 x panel leads



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- 1 x 6 KVA Rack mounted UPS

Additional space has been allowed in each cabinet to house all ICT equipment from all systems. There is also additional space for future expansion.

Each server room will be fitted with as listed:

- Air-con split units for cooling
- Environment monitoring kits for alarm

#### **2.4 CCTV Camera Network**

The CCTV Network will cover all areas as listed for security. This to provide security to all staff and visitors using the clinic. The main front end screens will be house in designated control room in the security building for monitoring. The system can be linked to the principle PC for remote monitoring.

Typical camera system function is listed below:

- All cameras with IP protocol type
- All with day and night vision
- Each camera is fully programable
- Infrared cameras will be used
- All camera is outdoor ready IP 66. Low maintenance
- The complete system is linked to main control room for monitoring
- This link can also be on principle PC and remote access

### **B. INSTALLATION DETAILS**

#### **2.5 Cable Sleeve Pipes**

Where cables cross under roadways, paved areas, other services and where cables enter buildings, the cables shall be installed in asbestos-cement pipes, earthenware or high-density polyethylene pipes.

The ends of all sleeves shall be sealed with a non-hardening watertight compound after the installation of cables. All sleeves intended for future use shall likewise be sealed.

#### **2.6 Notices**

If required, the Contractor shall issue all notices and make the necessary arrangements with Supply Authorities and other authorities as may be required with respect to the installation.

#### **2.7 Electrical Equipment**

All equipment and fittings supplied must be in accordance with the relevant SANS Standards and suitable for the relevant supply voltage, and frequency.

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**2.8 Drawings**

The drawings generally show the scope and extent of the proposed work and shall not be held as showing every minute detail of the work to be executed.

The position of power points, switches and light points that may be influenced by built-in furniture must be established on site, prior to these items being built in.

Drawings that form part of this Specification are included in Section 3:

**2.9 Balancing of Load**

- a) The Contractor is required to balance the load as nearly as is practicable, over the multiphase supply. The Single line diagram will be provided and this shall be used to balance the load. Updates are to be made on the drawing should changes be required
- b) In cases where the single phase loads for the new distribution board causes an imbalance of currents, the Contractor is required to reallocated some of the loads on the existing main distribution board in order to balance all loads as nearly as is practicable, over all three phases.

**2.10 Service Conditions**

All plant shall be designed for the climatic conditions as pertaining to the service.

**2.11 Switches and Socket Outlets**

The installation of switches and socket outlets must conform SANS Standards and Section 2 of this specification.

**2.12 Earthing and Bonding**

The Contractor will be responsible for all earthing and bonding of the building and installation. The earthing and bonding is to be carried out strictly as described Section 2 of this specification and the SANS Standards.

**2.13 Maintenance of Electrical Supply**

All interruptions of the electrical supply that may be necessary for the execution of the work, will be subject to prior arrangement between the Contractor and the Department's representative.

**2.14 Extent of Work**

The work covered by this contract comprises the complete electrical installation, in working order, as shown on the drawings and as per this specification, including the

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supply and installation of all fittings and also the installation of such equipment supplied by the Department.

#### **2.15 Bulk Supply and Connection**

The supply will be applied for to the local electricity utility (Eskom).

#### **2.16 Diesel Generator**

- a) The 200kVA diesel generator complete with automatic changeover control panel will be supplied, installed and commissioned. It shall be noted that supply of cabling from the generator to the ATS will be provided by the generator Contractor. Installation of the cabling shall be included as part of this scope of work.
- b) The Contractor will be responsible for the supply and installation of all other cabling in order to provide a complete solution. The cabling includes connection between the main DB and the ATS, the ATS and new sub DB, generator and ATS, all plug and lighting circuits.
- c) The supply cables are listed in the Schedule of Cables and measured in the Bill of Quantities.
- d) The Diesel Generator must be positioned away from patient areas but as close as possible to the main incomer

#### **2.17 Power Points**

- a) Allow for the installation of power points as listed in the schedule and indicated on the drawings.
- b) All plaster boxes that are 6 or 8 way shall be galvanized
- c) The boxes shall be installed level and maximum 12mm from plaster edge
- d) The power sockets are Legrand modular therefore contractor shall allow for multiple wiring with sockets in one box.
- e) All terminations shall be in boxes or DB and never in ceilings

#### **2.18 Lighting Circuits**

- a) All lighting circuits must not exceed the breaker rating of 80% of rated load amperage for continuous current i.e. 8A for 10A breaker and 12A for 15A breaker.
- b) All terminations shall be in boxes or DB and never in ceilings

#### **2.19 Switches**

- a) All switch boxes shall be mounted 4 x 2 (vertically mounted ) unless specified otherwise.

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- b) The switch boxes shall be supplied and installed by contractor and shall be standard PVC 4 x2 or 4x 4 if specified
- c) Supply, install and termination of bus is done by others unless otherwise specified
- d) All terminations shall be in boxes or DB and never in ceilings

#### **2.20 Cables trays**

The Contractor shall supply and completely install all distribution cables as per BOM. If single strands used for power then these have to be enclosed in galvanized trays

The cables trays for IT shall be 300mm apart from power cables and shall be open

#### **2.21 Cables**

The Contractor shall supply and completely install all distribution cables as indicated on the drawings, and listed in the Schedule of Cables. All power cables shall comply with the relevant SANS standards.

The storage, transportation, handling and laying of the cables shall be according to first class practice, and the Contractor shall have adequate and suitable equipment and labour to ensure that no damage is done to cables during such operations.

The Contractor to assess sites conditions for the installation of the main cable from generator ATS to the main/sub distribution board. The preference is to consider running the cabling on the surface. All cabling shall be inserted metal conduit to protect cabling from mechanical damage and exposure. The installation shall be done in accordance with SANS 10142.

All lighting cables shall be 2 wire and earth surflex 1.5mm<sup>2</sup> and not single strands

Single strands for power is permitted however colour codes shall be in line with phase it connected too.

All cables shall be labelled with suitable permit markers with 4 digit number as per design

Outdoor power cables shall be armoured and installed as per SANS requirements, No joints are permitted on outdoor cables.

#### **2.22 Conduits**

The Contractor shall supply and completely install all conduits, junction boxes as per BOM.

The sizing of conduits are as per BOM

All conduits that are installed but are not for power and lighting shall include a draw wire for others to install cables

All conduits for Cameras shall end with a round junction box plastered in the wall

#### **2.23 Lights and Fittings**

The Contractor shall install

- a) All lighting to be installed as per the manufacturers instructions.
- b) Install all light fittings are to free issued by Owner as applicable
- c) All light fittings are to be handled with care and in a professional manner
- d) All screws for outside mounting should be of a quality to minimize rusting

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e) All outdoor fitting should be correctly installed to avoid any water ingress

**2.24 Distribution Boards**

The Contractor shall install the distribution board as indicated on the drawings and listed in the distribution Board Schedule below and must contain the circuit breakers and isolators as per this list. The loads have been optimized from the Ideal Clinic Prototype by considering smaller supplies for security scanners, making provision only for hand dryers and using LED lights only. The design loading has increased as a result of the inclusion of fire fighting pumps and water pumps, air conditioning load, ventilation fans and geysers all of which were not included in the Ideal Clinic Design.

<b>Main LV kiosk</b>				
<b>CIRCUIT</b>	<b>EQUIPMENT</b>	<b>WATTAGE(W)</b>	<b>QUANTITY</b>	<b>ACTUAL CB</b>
DBM-P-001	Main supply		1	400A-4P
DBM-P-002	Generator	200000	1	400A-4P
DBM-L-001	Carport Lights	50	6	20A- 1PH
DBM-L-002	Streetlights	50	6	20A- 1PH
DBM-P-001	DB A	50	6	20A- 1PH
DBM-P-002	DB B	50	6	20A- 1PH
DBM-P-003	DB CD	50	6	20A- 1PH
DBM-P-004	DB E	50	6	20A- 1PH
DBM-P-005	DB MECH	50	6	20A- 1PH
DBM-P-006	DB RESIDENTS	50	6	20A- 1PH
DBM-P-007	DB RESIDENTS	50	6	20A- 1PH
DBM-P-008	DB RESIDENTS	50	6	20A- 1PH
DBM-P-009	DB RESIDENTS	50	6	20A- 1PH
DBM-P-010	DB RESIDENTS	50	6	20A- 1PH
DBM-P-011	DB RESIDENTS	50	6	20A- 1PH

<b>Block A</b>	<b>Guard house/Public Services</b>	<b>DB-A</b>		
<b>CIRCUIT</b>	<b>EQUIPMENT</b>	<b>WATTAGE(W)</b>	<b>QUANTITY</b>	<b>ACTUAL CB</b>
	<b>Main incomer</b>			<b>60A 3PH</b>
	<b>Surge Arrestor</b>			
DBA-L-001	Lights	50	6	20A- 1PH
DBA-L-002	Lights	50	6	20A- 1PH
DBA-L-003	Lights	18	7	20A- 1PH
DBA-L-004	Lights	18	7	20A- 1PH
DBA-P-001	Plugs	300	5	20A- 1PH
DBA-P-002	Plugs	300	5	20A- 1PH
DBA-P-003	Plugs	300	5	20A- 1PH

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DBA-P-004	Plugs	300	5	20A- 1PH
DBA-P-005	Plugs - Dedicated	300	5	20A- 1PH
DBA-P-006	Security Scanner	400	2	40A-4P
DBA-P-007	Airconditioning	2000	2	20A-2P
DBA-P-008	Airconditioning	2000	2	20A-2P
DBA-P-009	Hand dryer	5888	1	32A-2P
DBA-P-010	Fans	200	1	20A- 1PH
DBA-P-011	Geyser	1500	1	20A- 1PH
<b>Block B</b>	<b>Main Central Area &amp; Admin</b>	<b>DB - B</b>		
<b>CIRCUIT</b>	<b>EQUIPMENT</b>	<b>WATTAGE(W)</b>	<b>QUANTITY</b>	<b>ACTUAL CB</b>
	<b>Main incomer</b>			<b>60A 3PH</b>
	<b>Surge Arrestor</b>			
DBB-L-001	Lights	50	11	20A- 1PH
DBB-L-002	Lights	50	11	20A- 1PH
DBB-L-003	Lights	50	11	20A- 1PH
DBB-L-004	Lights	50	11	20A- 1PH
DBB-L-005	Lights	18	2	20A- 1PH
DBB-L-006	Lights	18	7	20A- 1PH
DBB-L-007	Lights	18	7	20A- 1PH
DBB-P-001	Plugs	300	5	20A- 1PH
DBB-P-002	Plugs	300	5	20A- 1PH
DBB-P-003	Plugs	300	5	20A- 1PH
DBB-P-004	Plugs	300	5	20A- 1PH
DBB-P-005	Plugs	300	5	20A- 1PH
DBB-P-006	Plugs	300	5	20A- 1PH
DBB-P-007	Plugs	300	5	20A- 1PH
DBB-P-008	Plugs	300	5	20A- 1PH
DBB-P-009	Plugs - Dedicated	300	5	20A- 1PH
DBB-P-010	Airconditioning	2000	2	20A-2P
DBB-P-011	Airconditioning	2000	2	20A-2P
DBB-P-012	Airconditioning	2000	2	20A-2P
DBB-P-013	Hand dryer	5888	1	32A-2P
DBB-P-014	Fans	200	1	20A- 1PH
DBB-P-015	Geyser (1.5 &2KW)	2000	2	20A- 1PH
<b>Block C</b>	<b>Services and Stores</b>	<b>DB C-D</b>		
<b>CIRCUIT</b>	<b>EQUIPMENT</b>	<b>WATTAGE(W)</b>	<b>QUANTITY</b>	<b>ACTUAL CB</b>
	<b>Main incomer</b>			<b>60A 3PH</b>

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	<b>Surge Arrestor</b>			
DBC-L-001	Lights	50	5	20A- 1PH
DBC-L-002	Lights	18	14	20A- 1PH
DBC-P-001	Plugs	300	5	20A- 1PH
DBC-P-002	Fans	200	1	20A- 1PH
DBC-P-003	Geyser	2000	1	20A- 1PH
<b>Block D</b>	<b>Emergency and Support Services</b>	<b>DB C-D</b>		
<b>CIRCUIT</b>	<b>EQUIPMENT</b>	<b>WATTAGE(W)</b>	<b>QUANTITY</b>	<b>ACTUAL CB</b>
	<b>Main incomer</b>			<b>60A 3PH</b>
	<b>Surge Arrestor</b>			
DBD-L-001	Lights	50	11	20A- 1PH
DBD-L-002	Lights	50	11	20A- 1PH
DBD-L-003	Lights	50	11	20A- 1PH
DBD-L-004	Lights	50	11	20A- 1PH
DBD-L-005	Lights	18	2	20A- 1PH
DBD-L-006	Lights	18	14	20A- 1PH
DBD-P-001	Plugs	300	5	20A- 1PH
DBD-P-002	Plugs	300	5	20A- 1PH
DBD-P-003	Plugs	300	5	20A- 1PH
DBD-P-004	Plugs	300	5	20A- 1PH
DBD-P-005	Plugs	300	5	20A- 1PH
DBD-P-006	Plugs	300	5	20A- 1PH
DBD-P-007	Plugs - Dedicated	300	5	20A- 1PH
DBD-P-008	Plugs - Dedicated	300	5	20A- 1PH
DBD-P-009	Airconditioning	2000	2	20A-2P
DBD-P-010	Airconditioning	2000	2	20A-2P
DBD-P-011	Airconditioning	2000	2	20A-2P
DBD-P-012	Hand dryer	5888	1	32A-2P
DBD-P-013	Fans	200	1	20A- 1PH
DBD-P-014	Geyser	2000	3	20A- 1PH
<b>Block E</b>	<b>Acute Care</b>			
<b>CIRCUIT</b>	<b>EQUIPMENT</b>	<b>WATTAGE(W)</b>	<b>QUANTITY</b>	<b>ACTUAL CB</b>
	<b>Fed from DB-B</b>			<b>60A 3PH</b>
DBE-L-001	Lights	50	10	20A- 1PH
DBE-L-002	Lights	50	14	20A- 1PH
DBE-L-003	Lights	50	10	20A- 1PH
DBE-L-004	Lights	18	12	20A- 1PH

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DBE-P-001	Plugs	300	5	20A- 1PH
DBE-P-002	Plugs	300	5	20A- 1PH
DBE-P-003	Plugs	300	5	20A- 1PH
DBE-P-004	Plugs - Dedicated	300	5	20A- 1PH
DBE-P-005	Airconditioning	2000	2	20A-2P
DBE-P-006	Airconditioning	2000	2	20A-2P
DBE-P-007	Hand dryer	5888	1	32A-2P
DBE-P-008	Fans	200	1	20A- 1PH
DBE-P-009	Geyser	2000	4	20A- 1PH
<b>Block G &amp; F (One DB) Chronic Care</b>				
<b>CIRCUIT</b>	<b>EQUIPMENT</b>	<b>WATTAGE(W)</b>	<b>QUANTITY</b>	<b>ACTUAL CB</b>
	<b>Fed from DB-B</b>			<b>60A 3PH</b>
DBG-L-001	Lights	50	10	20A- 1PH
DBG-L-002	Lights	50	14	20A- 1PH
DBG-L-003	Lights	50	10	20A- 1PH
DBG-P-001	Lights	18	12	20A- 1PH
DBG-P-002	Plugs	300	5	20A- 1PH
DBG-P-003	Plugs	300	5	20A- 1PH
DBG-P-004	Plugs	300	5	20A- 1PH
DBG-P-005	Plugs - Dedicated	300	5	20A- 1PH
DBG-P-006	Airconditioning	2000	2	20A-2P
DBG-P-007	Airconditioning	2000	2	20A-2P
DBG-P-008	Hand dryer	5888	1	32A-2P
DBG-P-009	Fans	200	1	20A- 1PH
DBG-P-010	Geyser	2000	1	20A- 1PH
<b>Block F &amp; G (one DB) Preventative &amp; Promotive Care</b>				
<b>CIRCUIT</b>	<b>EQUIPMENT</b>	<b>WATTAGE(W)</b>	<b>QUANTITY</b>	<b>ACTUAL CB</b>
	<b>Fed from DB-B</b>			<b>60A 3PH</b>
DBD-L-001	Lights	50	10	20A- 1PH
DBD-L-002	Lights	50	14	20A- 1PH
DBD-L-003	Lights	50	10	20A- 1PH
DBD-L-004	Lights	18	12	20A- 1PH
DBD-P-001	Plugs	300	5	20A- 1PH
DBD-P-002	Plugs	300	5	20A- 1PH
DBD-P-003	Plugs	300	5	20A- 1PH
DBD-P-004	Plugs	300	5	20A- 1PH
DBD-P-005	Plugs - Dedicated	300	5	20A- 1PH
DBD-P-006	Airconditioning	2000	2	20A-2P
DBD-P-007	Airconditioning	2000	2	20A-2P



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DBD-P-008	Hand dryer	5888	1	32A-2P
DBD-P-009	Fans	200	1	20A- 1PH
<b>Block H</b>	<b>Youth and Outreach Centre</b>	<b>DB-H</b>		
<b>CIRCUIT</b>	<b>EQUIPMENT</b>	<b>WATTAGE(W)</b>	<b>QUANTITY</b>	<b>ACTUAL CB</b>
	<b>Main incomer</b>			<b>60A 3PH</b>
	<b>Surge Arrestor</b>			
DBD-L-001	Lights	50	10	20A- 1PH
DBD-L-002	Lights	50	14	20A- 1PH
DBD-L-003	Lights	50	10	20A- 1PH
DBD-L-004	Lights	18	12	20A- 1PH
DBD-P-001	Plugs	300	5	20A- 1PH
DBD-P-002	Plugs	300	5	20A- 1PH
DBD-P-003	Plugs	300	5	20A- 1PH
DBD-P-004	Plugs	300	5	20A- 1PH
DBD-P-005	Plugs	300	5	20A- 1PH
DBD-P-006	Plugs - Dedicated	300	5	20A- 1PH
DBD-P-007	Airconditioning	2000	2	20A-2P
DBD-P-008	Airconditioning	2000	2	20A-2P
DBD-P-009	Hand dryer	5888	1	32A-2P
DBD-P-010	Fans	200	1	20A- 1PH
DBD-P-011	Geyser	2000	2	20A- 1PH

<b>External</b>	<b>Mechanical Services</b>	<b>DB-MECH</b>		
<b>CIRCUIT</b>	<b>EQUIPMENT</b>	<b>WATTAGE(W)</b>	<b>QUANTITY</b>	<b>ACTUAL CB</b>
	<b>Main incomer</b>			<b>60A 3PH</b>
	<b>Surge Arrestor</b>			
DBM-P-001	Fire Pump	22000	1	40A- 3PH
DBM-P-002	Jockey Pump	1500	1	20A- 1PH
DBM-P-003	Potable Pump	11000	1	40A- 1PH
DBM-P-004	Ablution Pump	3000	1	20A- 1PH

<b>Residences</b>	<b>Unit 1-6</b>	<b>DB-R (1-6)</b>	<b>REQUIRED IN EACH OF THE 6 DB's</b>
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CIRCUIT	EQUIPMENT	WATTAGE(W)	QUANTITY	ACTUAL CB
	Main incomer			60A 1PH
	Surge Arrestor			
DBR1-L-001	Lights	18	8	20A- 1PH
DBR1-L-002	Lights	18	8	20A- 1PH
DBR1-L-003	Lights	18	5	20A- 1PH
DBR1-P-001	Plugs	500	5	20A- 1PH
DBR1-P-002	Plugs	500	4	20A- 1PH
DBR1-P-003	Stove Isolator	2000	1	40A- 1PH
DBR1-P-004	Geyser	1200	1	20A- 1PH

**C. SCHEDULES OF TECHNICAL INFORMATION**

**2.25 LOAD SCHEDULE**

**2.25.1 SCHEDULE OF POWER POINTS**

Supply and install switch socket outlets at various points indicated in the layout drawing. Note all items are re-measurable as per the bill of materials.

**2.25.2 SCHEDULE OF CABLES, CONDUIT AND WIRING**

Supply, install and connect the following cable, conduit and wiring. Note all items are re-measurable as per the bill of materials.

**2.25.3 SCHEDULE OF DISTRIBUTION BOARD**

The indicated fault current rating (kA) is the minimum value that the switchgear must comply with for connecting to the busbars (10kA) of the respective panels-distribution boards. Selective Circuits will be fed from Generator ATS during mains power failure.

**2.26 PRICE SCHEDULES**

**2.26.1 GENERAL**

- 1.1 The descriptions in this Price Schedule shall be read in conjunction with the specification.
- 1.2 The unit rate for each item in the Price Schedules shall include for all materials, labour, profit, transport, etc., everything necessary for the execution and complete installation of the work in accordance with the description.

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- 1.3 The Price Schedules shall not be used for ordering purposes. The Contractor shall check the lengths of cables and overhead conductors on site before ordering any of the cables. Any allowance for off-cuts shall be made in the unit rates.
- 1.4 The rates shall exclude Value Added Tax
- 1.5 All material covered by this **Specification** shall, wherever possible, be of South African manufacture.

**SECTION 3 DRAWINGS**

Refer to attachments.

**3 Drawing List**

No	Description	Drawing Number
1.	Power Reticulation Layout of Site Plan Small Clinics - Revision 1	TE-KDOH-BSC-001
2.	Single Line Diagram Layout of Site Plan Small Clinics - Revision 1	TE-KDOH-BSC-002
3.	Lighting Layout of Site Plan Small Clinics - Revision 1	TE-KDOH-BSC-003
4.	Power Layout of Site Plan Small Clinics -Revision 1	TE-KDOH-BSC-004
5.	Cable Tray-Wireway Layout of Site Plan Small Clinics - Revision 1	TE-KDOH-BSC-005
6.	Lightning Protection Layout of Site Plan Small Clinics - Revision 1	TE-KDOH-BSC-006
7.	Access & Security System Layout of Site Plan Small Clinics - Revision 1	TE-KDOH-BSC-007
8.	Nurse Call Layout of Site Plan Small Clinics - Revision 1	TE-KDOH-BSC-008
9.	Residences Electrical Layout	TE-KDOH-BSC-009

PREPARED FOR:



**health**

Department:  
Health  
PROVINCE OF KWAZULU-NATAL

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**KZN SMALL CLINIC  
BLAUBOSCH**

**MECHANICAL, WET SERVICES & FIRE  
TENDER SPECIFICATION**

**REPORT NO. KZN-BC-TS REV 0**

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PREPARED BY:



Name:	Date:	Signature:
Mr S R Bechoo Pr Tech Eng Mechanical, Wet Services & Fire	28/06/2023	

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## **1 INTRODUCTION**

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This Mechanical, Wet Services and Fire Tender Specification is for the development of a new Typical Small Clinic for the Department of Health in Blaaubosch, KZN.

The design drawings form part of the project specification and shall be read in conjunction with this document.

Conflicts, errors or discrepancies found in this specification or drawings shall be brought to the Engineer's attention for resolution immediately.

Any deviations from the specifications, drawings and / or equipment specified shall be listed together with the alternatives offered and shall be submitted as part of the tender (for consideration).

If no deviations are listed, it will be assumed that the Tenderer complies with all the requirements of this specification.

Any installations shall be complete in all respects and the appointed contractor/sub-contractor (Mechanical, Wet Services, Fire) shall allow for the completion and successful operation of the complete installation, irrespective of whether every separate item is specified or not.

## **2 SCOPE OF WORK**

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Mechanical, Wet and Fire Services installation scope of work will include the following:

### **2.1 FIRE SERVICES**

- Fire Installation – Hydrants, Hose reels, and Extinguishers
- Fire Water Reticulation - Storage Water Tanks and Pump Sets
- Fire Signage – Photoluminescent Signs
- Fire Separation Elements – Fire Doors, Fire Rated Compartments, and Fire Stopping
- Fire Detection – Fire Detectors, Sounder Beacons, Manual Call Points (Break Glass), and Fire Control Panel

### **2.2 MECHANICAL SERVICES**

- Mechanical Installation – Heating, Ventilation, and Airconditioning
- SANS 10400 XA Compliance – Energy use in buildings

### **2.3 WET SERVICES**

- Rainwater Harvesting
- Potable Water Reticulation
- Hot Water Generation
- Sewage

### 3 REGULATIONS AND STANDARDS

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The installation shall be carried out in accordance with the following standard specifications and regulations:

#### 3.1 DEPARTMENT OF HEALTH NORMS AND STANDARDS

- Infrastructure Unit Support Systems (IUSS)

#### 3.2 GENERAL REGULATIONS

- National Building Regulations: SANS 10400:2011
- Occupational Health and Safety Act No. 85 of 1993
- The Local Municipal by-laws and any special requirements of the supply authorities of the area or district
- Local Authority Fire Regulations

#### 3.3 FIRE SERVICES

- SANS 10400 – National building regulations, Part T:2020 – Fire Protection
- SANS 10400 – National building regulations, Part W:2011 – Fire Installation
- SANS 10400 – National building regulations, Part S:2011 – Facilities for persons with disabilities
- SANS 10139:2012 – Fire detection and alarm systems for buildings — System design, installation and servicing
- SANS 1186 – Safety Signs
- SANS 1253 – Fire doors and fire shutters
- SABS 543 – Fire hose reels
- SABS 810 – Portable rechargeable fire extinguishers

#### 3.4 MECHANICAL INSTALLATIONS

- SANS 10400:2011 – National building regulations, particularly Part O – Lighting and Ventilation
- SANS 10400 Part XA – Energy efficiency in buildings
- SANS 204 – Energy efficiency in buildings

#### 3.5 WET SERVICES – PLUMBING AND DRAINAGE

- SANS 10400:2011 – National building regulations, Part P – Drainage
- SANS 10252-2:1993 – Drainage installations for buildings
- SANS 10252-1:2018 – Water supply installations for buildings
- SANS 10400 Part XA – Energy efficiency in buildings

The appointed contractor/sub-contractor shall work strictly according to this specification and shall ensure that the installation is handed over as a complete working system.

Where trade names and references to catalogues are found in the specification, the intention is to set a particular standard of equipment. Where "or equivalent" equipment is specified, the Tenderer shall obtain written approval from the Engineer before he may deviate from the specified equipment. This approval must be obtained at the tender stage.

#### **4 GENERAL SITE / PROJECT REQUIREMENTS**

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The site is situated in Blaaubosch, Kwa-Zulu Natal. Tenderers are advised to visit the site and acquaint themselves with the nature of the work involved prior to submitting their tenders.

##### **4.1 PROGRAMME**

The appointed contractor/sub-contractor will be required to generate a programme (for submission to the Client for acceptance), and to complete the mechanical installation with the approved schedule to the main contract.

The appointed contractor/sub-contractor shall submit a programme to the Engineer (MS Projects):

The following items shall be programmed in consultation with the Engineer:

- a. Workshop Drawings
- b. Approval of Workshop Drawings
- c. Equipment Detail Submission for Approval
- d. Ordering of Material
- e. Ducting Installation
- f. Piping Installation
- g. Approval of First Fix
- h. Plant Equipment & Tanks Installation
- i. Second Fix
- j. Electrical Installation
- k. Commissioning and Testing
- l. Final Inspection
- m. Handover of the Systems
- n. Scheduled Maintenance

##### **4.2 QUALITY OF MATERIALS AND WORKMANSHIP**

All materials shall be new, undamaged, and free from rust or other defects. Only material of good quality, which has been approved by the Engineer, shall be used.

Where applicable, all material shall be in accordance with the relevant standard specifications of the South African Bureau of Standards and the British Standard Specifications. The installation shall be carried out according to the latest modern engineering practices.



The Engineer reserves the right to reject any work or part thereof that, according to his judgement, does not meet the highest standards of material and workmanship.

#### 4.3 SCAFFOLDING AND PLANT

All plant required for the execution of the contract shall be supplied by the appointed contractor/sub-contractor under this contract.

The appointed contractor/sub-contractor shall provide his own scaffolding. For installation purposes the appointed contractor/sub-contractor shall allow for his own lifting equipment, cranes etc. which may be necessary to complete the installation.

#### 4.4 FINISHING AND TIDYING

In view of the intense concentration of construction activities likely to be experienced during the contract period, progressive and systematic finishing and tidying will form an essential part of this contract.

Finishing and tidying must be done daily and not be left to the end of the contract. All finishing and tidying shall be carried out to the best advantage of the project as a whole.

#### 4.5 RATING OF EQUIPMENT

The appointed contractor/sub-contractor shall issue the sizes and rating of all the equipment offered to the Engineer for approval prior to purchasing or ordering such equipment.

All equipment offered shall operate well within the manufacturer's ratings, and equipment to be operated beyond these limits will not be considered.

#### 4.6 SPACE REQUIREMENTS AND ACCESS

The appointed contractor/sub-contractor shall ensure that the equipment offered by them can be installed in the available space as shown on the drawings.

The equipment shall be installed in such a manner that complete access is provided for operating and maintenance purposes.

The appointed contractor/sub-contractor shall also ensure that the equipment offered by them will pass through available building openings. Large equipment shall be made up in sections and each section shall be small enough for access through doors and other building openings.

### **5 MECHANICAL, WET SERVICES AND FIRE REQUIREMENTS**

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#### 5.1 HVAC REQUIREMENTS

The air-conditioning units shall be of the reverse cycle heat pump type.

The air-conditioning units shall be standard factory assembled, piped, and wired. The units shall be thoroughly tested for all operating conditions. Spares shall be freely available in South Africa.

On request, the appointed contractor/sub-contractor shall provide the Engineer with performance test certificates.

The air-conditioning units and installation in general shall be in accordance with the high/mid wall unit's supplier's recommendations.

Any discrepancies between this specification and the supplier's recommendations that may influence the unit's performance or guarantee shall be clarified with the Engineer during the tender stage.

The indoor unit and condensing unit shall be interconnected with refrigerant piping, electrical wiring, and interlocking control cabling. The pipe and cable connections shall be made in accordance with the unit supplier's recommendations.

The refrigerant shall be of the correct type to comply with regulatory requirements. High/mid wall units shall consist of a direct expansion, indoor fan coil evaporator unit and a separate, remote, and externally located, air-cooled, condensing unit.

Each condensing unit with a connected evaporator unit shall be clearly labelled to identify different split units. The outdoor unit coil shall be treated for corrosion.

High/mid wall split indoor units shall have integral condensate drain tray with drain hose connections.

Electrical interlocking shall be provided to ensure that:

- a. Compressor cannot run without both evaporator and condenser fans running.
- b. It shall not be possible to switch cooling and heating on simultaneously.

General good practice requirements must be adhered to (OEM requirements take preference).

Drawing Reference: KZN-BC-HVAC-TD-00

## 5.2 FIRE INSTALLATION, PROTECTION, DETECTION & SIGNAGE REQUIREMENTS

Fire Installation, Fire protection, Fire Detection and Signage shall be installed in accordance with the following drawings and report.

Drawing Reference: KZN-BC-FI-TD-00  
KZN-BC-FD-TD-00  
KZN-BC-PT-TD-00

Report Reference: KZN-BC-FR-00

## 5.3 WATER RETICULATION REQUIREMENTS

The appointed contractor/subcontractor shall include for necessary ground works (in accordance with the Civil/Structural Engineer's Requirements), including digging trenches, laying in ground, provision for risk of collapse to side of excavations, keeping excavations free from water, bedding and filling, and for ramming in 150mm layer.

The installation work shall be done by, or under the adequate control of a trained plumber as defined by SANS 10400-A, A-18.

Materials, components, fittings and fixtures shall be so selected that they are suitable to withstand, without damage or deterioration, sustained temperatures in accordance with SANS 10252.

The appointed contractor/sub-contractor shall include for necessary couplings between all pipes of similar and dissimilar materials, and between taps and valves.

Geysers overflows to be min Ø22 copper and discharge over gully / full bore. All relevant details, levels, dimensions, etc. must be checked on site prior to commencement of work.

All hot taps to be LHS and cold taps on RHS of fitting except paraplegic where cold water is nearest to WC.

All piping and valves to be colour coded and labelled as described in the specification. All pipe sizes to conform to architect's sanitary schedule.

All piping, whether painted or not, must be clearly labelled as to the pipe contents and the direction of flow. All such labelling must be painted on and must be permanent in nature.

Such labelling must occur at all valves and branches in the piping and on straight lengths at intervals of 10 meters unless otherwise specified. In addition, colour banding must be applied at all points where piping penetrates walls and particularly at entry and exit points from plant rooms.

Colour coding and/or banding to indicate pipe contents must conform to SANS 10140 – Code of Practice for identification and Colour Marking of Piping.

Provision will be made in the pump house pipework for the installation of a direct reading flow meter. This is to be installed in accordance with the manufacturer's requirements.

The fire pumps will be tested and commissioned on site by the appointed contractor/sub-contractor and full operating instructions will be given to designated persons, who will be responsible for the routine maintenance of the plant on an on-going basis.

Drawings are generally diagrammatic and indicative of work to be installed. The run and arrangement of piping (as indicated) will be subject to modifications as required to suit building conditions, to avoid interference with work of other trades, and for convenient and accessible location of all parts of piping systems.

Due to the small scale of the drawings, all required offsets, fittings, valves, drains, etc. are not indicated.

On completion of installation, the appointed contractor/sub-contractor shall submit a full set of 'as-built' drawings and test certificates to be supplied.

Support structures and loading bearing foundations for the water tanks must be designed and approved by the Structural Engineer.

Drawing Reference: KZN-BC-PHW-TD-00  
KZN-BR-PHW-TD-00  
KZN-BC-PT-TD-00

#### 5.4 SEWAGE REQUIREMENTS

All drainage installations shall be in accordance with the municipal by-laws.

The installation work shall be done by, or under the adequate control of a trained plumber as defined by SANS 10400-A, A-18.

The installation work must be confirmed by the plumber with the appointed Wet Services Engineer on site, prior to commencement.

Materials, components, fittings and fixtures shall be so selected that they are suitable for the expected conditions of use and shall comply with SANS 10252.

Pipe sizes to comply with SANS 10252.

All sewer and waste drainage to comply with SANS 10400-P

Piping under walls or foundations need to be encased in concrete as per Structural Engineers requirements.

All coring is subject to approval by the Structural Engineer.

Drawing Reference: KZN-BC-SW-TD-00  
KZN-BR-SW-TD-00

## 6 DESIGN AND DRAWINGS

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The design of the facility is subject to change.

The dimensions and positions of equipment shown on the Engineer's drawings are for design and tender purposes only.

The responsibility for dimensional and layout accuracy remains with the appointed contractor/sub-contractor. The exact positions will be pointed out on site where necessary.

The following drawings shall be submitted by the appointed contractor/sub-contractor to the Engineer for approval:

### 6.1 BUILDER'S WORK DRAWINGS

All building requirements are to be indicated on these drawings to meet the dimensional requirements of the equipment and materials to be installed by the appointed contractor/sub-contractor.

### 6.2 MECHANICAL DRAWINGS

The term 'Mechanical Drawings' means any drawings of items or plants to be manufactured away from the site.

No work shall be proceeded with on or off the site unless these shop drawings have been approved in writing by the Engineer.

#### 6.2.1 DUCTWORK FABRICATION AND INSTALLATION DRAWINGS

The appointed contractor/sub-contractor shall, prior to the commencement of any ductwork manufacture, submit to the Engineer for technical appraisal and approval the fabrication 'Shop Drawings' and 'Installation Drawings' of the ductwork demonstrating the proposed final details of the manufacturing and erection methods of the ductwork.

Ductwork Drawings shall indicate:

- Length of each ductwork section,
- Internal dimensions of the galvanised sheet steel or other materials to be used as specified,
- Dimensions of bends and fittings,
- Thickness of metal; sizes and positions of all stiffeners,
- Angles flanges, etc. Including the methods of fixing and bolting,
- Location of all supports,
- Outline of all insulation,
- Position and sizes of all access doors; test points.

#### 6.2.2 PIPEWORK INSTALLATION DRAWINGS

Prior to the commencement of any manufacture, fabrication, or installation, the appointed contractor/sub-contractor shall submit to the Engineer for technical appraisal installation drawings for the pipework installation.

The drawings shall indicate the location, with dimensions given, of all pipework in relation to the building structure and other pipework and equipment. The position of all ancillaries such as valves, strainers, oil traps, filters, and filter driers, etc. shall be shown together with clearances necessary for removal of strainer baskets, internal parts of all valves, motors for motorized valves, solenoids, etc.

Positions and details of all hangers and supports shall be shown with the positions dimensioned.

Positions of control equipment, test pockets and similar devices shall be shown and dimensioned including clearances required for their removal. Details and outline of insulation and insulation boxes shall be shown including clearances required for removal of the boxes.

#### 6.2.3 AS BUILT DRAWINGS

The appointed contractor/sub-contractor shall submit to the Engineer a complete set of accurately marked-up, CAD drawings of all services installed at completion.

The drawings shall be prepared in accordance with the accepted drawing standards applicable at the time of tender.

The drawings shall be on CAD, a hard copy of each drawing shall be submitted as well as a digital copy containing relevant drawing titles.

## **7 DAMAGE AND PROTECTION OF WORKS**

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The appointed contractor/sub-contractor shall take all precautions necessary for the protection of life, equipment and property in connection with the works during installation.

The appointed contractor/sub-contractor shall be accountable for any damage of equipment during transport and installation.

Equipment delivered to site shall be stored in a well-protected area where it cannot be damaged by either the weather or other trades.

## **8 CORROSION PROTECTION**

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Where applicable, all paint shall be SABS certified for industrial use and shall be approved by the Engineer.

Equipment shall be painted according to the National Colour Standards, SANS 1091.

## **9 COMMISSIONING, MAINTENANCE AND GUARANTEE**

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The installation shall be commissioned in accordance with the relevant codes and recognised commissioning procedure, or code approved by the Engineer:

The appointed contractor/sub-contractor shall submit a commissioning programme to the Engineer at least two weeks prior to the commencement of commissioning with the code or procedure to which the plant will be commissioned.

The results of all checks and measurements shall be recorded in writing during the commissioning period. Commissioning records shall be handed over to the Engineer prior to the first acceptance of the plant.

The commissioning records shall also be included in the operation manuals.

All equipment supplied and work done as part of this contract shall be maintained and guaranteed as per the contract requirements.

## **10 STAFF TRAINING**

---

The appointed contractor/sub-contractor shall be responsible for the training of the client's site staff after the commissioning has been completed. The site staff shall receive enough instruction to ensure that they are fully conversant with the equipment concerned. The operating manuals shall be used during training.

Upon completion of the training exercise the appointed contractor/sub-contractor is to obtain the client's representative's written acceptance of this handover tuition, thus acknowledging complete understanding of the operational procedures for this installation.

Site staff shall be instructed on:

- a. The general operating method of the plant,
- b. Starting and stopping instructions,
- c. Stopping the plant in an emergency and warning against restarting after an emergency,
- d. Positions and normal settings of control equipment,
- e. Safety measures,
- f. Operational checks on gauges, flow switches, indicator lights, etc.
- g. Contact details of competent person responsible for the maintenance of the plant.

## **11 OPERATION MANUALS AND MAINTENACE INSTRUCTIONS**

---

The appointed contractor/sub-contractor shall submit two (2) hard copies and a soft copy of the operation and maintenance manuals to the Engineer.

Manuals shall consist of:

The operation manuals shall be sturdily bound in a strong hard cover file. Material in the manual shall be clear, legible and well-arranged and provided with an index.

The above manuals shall be available three weeks before first handover / practical completion of the installation and no handover shall be considered without these manuals.

- a. Comprehensive literature of the different components of the installation.
- b. Paper prints of all approved drawings and diagrams where applicable.
- c. Soft copies of the as-built drawings in DWG and PDF format.
- d. Start-up and shutdown procedures.
- e. Commissioning data of all equipment in tabulated form.
- f. Prescriptions for routine tests, which shall be performed by the user together with the time when such tests shall be performed (e.g., pressure tests).
- g. Schedule of apparatus and equipment complete with model numbers, optional extras, modifications, electrical requirements, etc.
- h. Detailed daily, weekly, monthly, quarterly, bi-annual or annual preventative maintenance procedures where applicable.
- i. Manufacturer's catalogues.
- j. List of spares for all equipment.
- k. Suppliers telephone numbers and addresses.
- l. Wiring diagrams.
- m. Test certificates.

## 12 SCOPE OF WORK DEFINED IN SPECIFICATIONS

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The specification covers the following:

<b>NO.</b>	<b>SPECIFICATIONS</b>	<b>DRAWING NO.</b>
1	HVAC	KZN-BC-HVAC-TD-00
2.	Fire Installation, Protection & Signage	KZN-BC-FI-TD-00
3.	Fire Detection	KZN-BC-FD-TD-00
4.	Potable Water	KZN-BC-PHW-TD-00 KZN-BR-PHW-TD-00
5.	Hot Water	KZN-BC-PHW-TD-00 KZN-BR-PHW-TD-00
6.	Sewage	KZN-BC-SW-TD-00 KZN-BR-SW-TD-00
7.	Storage Tank & Water Pump Sets	KZN-BC-PT-TD-00
8.	Rainwater Harvesting	As per BOQ
9.	Gate Motors	As per BOQ





**KWAZULU-NATAL**

**DEPARTMENT OF HEALTH**

**STANDARD PREAMBLES TO ALL TRADES**

**REV 3 – JANUARY 2009**

**Compiled by:  
Department of Health  
Infrastructure Development  
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**NOTE:**

Only those clauses or portions of clauses in the following preambles, which refer to items in the Bills of Quantities, shall be considered as applying to the performance of this Contract.

- 2.
- 1.

## ALTERATIONS

**SITE VISIT:** — Tenderers are advised to visit the site prior to tendering and satisfy themselves as to the nature and extent of the work to be done, also to examine the condition of all existing buildings as no claim will be entertained on the grounds of ignorance of the conditions under which the work was to be executed.

**MATERIALS FROM THE ALTERATIONS:** — unless otherwise stated, will become the property of the Contractor and all these materials, together with all rubbish and debris must be carried away and the site left clean and unencumbered.

Items described as “removed” shall mean removed from the site.

Credit for the value of materials from the alterations is to be allowed for on the Summary/ Final Summary page.

Items described as to be re-used or to be handed over to the Administration are to be dismantled where necessary and stacked on site where directed, and the Contractor will be responsible for their removal and storage until required, and shall make good all items missing, damaged or broken at his own expense.

Unless otherwise described, no materials from the alterations shall be re-used in any new work without the written approval of the Department.

Prior to the removal of any timbers from the site, these are to be inspected by Government Entomologists. If any of these timbers are infested by wood destroying agencies, these timbers are to be disposed of in the manner prescribed by the Government Entomologist.

In taking down and removing existing work, particular care must be taken to avoid any structural or other damage to the remaining portions of the buildings.

### **ASBESTOS REGULATIONS 2001:**

In terms of Asbestos Regulations 2001, no individual person, contractor or agent shall remove, demolish or strip any building containing asbestos or products containing asbestos (including asbestos roof sheeting, ceilings, guttering and down pipes) unless the work is performed by a “**Registered Contractor**”, registered with the Department of Labour. All asbestos work shall be carried out under the supervision of an “Approved Inspection Authority”.

**It is a requirement that before any work involving asbestos removal is carried out, the following procedure and documentation is followed: -**

1. Prior to the commencement of any demolition work, written notification shall be given to the Assistant Manager (Inspection and Enforcement), Durban Labour Centre, Masonic Grove, Durban, stating the name, address and details of the person(s) removing or stripping the asbestos. The notification shall include the date, time and place where the proposed work is to be carried out. (Regulation 3).
2. The name and details of the Approved Inspection Authority that is to supervise and confirm that the work is being carried out according to the specific requirements of the Asbestos Regulations 2001 (as amended), including the approved “written work procedure” document. This document shall be submitted and signed at least 14 days prior to commencement of demolition work by the Approved Inspection Authority. (Regulation 21).
3. The production of valid accreditation certification of training for all employees involved in the asbestos removal work.



4. On completion of the asbestos related work a "Clearance Certificate" which includes the asbestos disposal certificate shall be forwarded to the Department by the Approved Inspection Authority.

In terms of the above regulations, it is an offence to carry out any asbestos work as defined in the above regulations without the necessary approval / requirements being met.

Individual persons or contractors found to contravene these regulations will be issued with a **PROHIBITION NOTICE** which in effect will stop all work on site and the offenders will then be liable for prosecution.

**Any employer found guilty under the Asbestos Regulations 2001 may be liable to a fine and or imprisonment not exceeding 12 months.**

**NOTICE OF DISCONNECTIONS:** — The Contractor is to give ample notice to the Department and Local Authorities regarding any disconnections necessary prior to the removal or interruption of electrical or telephone cables, water supply and sanitary services, etc.

**DUST:** — The Contractor is to allow in his rates for taking all precautions necessary to prevent any nuisance from dust whilst carrying out the works.

**SHORING:** — Rates for shoring are to include for the use and waste of all props, needles, wedges, braces, nails and screws, etc. required and for all cutting, notching, framing and fitting, maintaining in position for the required periods and removing at completion. All shoring is to be executed in a manner approved by the Department.

**MATCHING EXISTING WORK:** — The terms "make good" or "making good" to existing work as described in the items shall mean making good with materials to match, all joined to existing.

**FORMING NEW OPENINGS, ETC. IN EXISTING WALLS:** — Rates for items of forming new or altering existing openings are, unless otherwise stated, to include for the following: -

- a) Breaking out for and inserting adequate lintels over the new openings (except where stated in the items as being below an existing beam, slab or lintel), to the approval of the Department. The lintels are to be of in-situ concrete Class C, or of pre-cast pre-stressed concrete or of brickwork in 1:3 cement mortar, with a minimum bearing of 230mm at each end and suitably reinforced, and rates are to include for all necessary formwork, turning pieces, etc. and for wedging and pinning up to existing brickwork over in 1:3 cement mortar.
- b) All shoring and propping required.
- c) Facing up jambs in new brickwork in cement mortar properly bonded to existing,
- d) Building up the portions of the openings stated in the items in new brickwork in cement mortar properly bonded to existing.
- e) Formwork for concrete sills and thresholds where required.
- f) Making good only to the finishes as stated in the items. (Note: — The making good of paint finishes has been measured separately).
- g) Forming rounded angles, throats on external plastered soffits, mitres, etc. where required in all new plaster, render and granolithic finishes.

The supply, building in, fixing, etc. of all windows, doors, frames, etc. to the newly formed openings and the removal of all existing windows, doors, frames, etc. from openings to be altered, have been elsewhere measured.

## 2. **EARTHWORKS**

**SITE CLEARANCE:** — The item given in the Bills of Quantities for site clearance shall be deemed to include the removal from the site, or burning if permitted by the Local Authority, of shrubs and trees with trunks under 200mm girth measured at 1m above ground level,

hedges, bushes, other vegetation, rubbish and debris.  
Holes left by roots are to be backfilled with earth and rammed.

**EXCAVATIONS:** — Rates for excavations are to include for forming and trimming to the correct levels, falls, slopes, curves, etc. for trimming sides, stepping, levelling and ramming bottoms, staging and disposing of the excavated material as described in the items. Rates for excavations to reduce levels over site are also to include for forming and trimming banks to the required batter. The Contractor is to allow in his rates for the bulking of excavated material.

The term “excavate”, unless otherwise stated, shall mean excavate in “soft excavation” as defined below and for the purpose of classifying excavations the following will apply: —

- a) **Soft excavation:** — shall be excavation in material that can be efficiently removed by a back-acting excavator of flywheel power approximately 0, 10 kW per millimetre of tined-bucket width without the assistance of pneumatic tools such as paving breakers, or that can be efficiently loaded without prior ripping or stockpiling by a rubber tired front-end loader of approximately 15t mass and a flywheel power of approximately 100 kW.
- b) **Intermediate excavation:** — shall be excavation in material that requires a back-acting excavator of flywheel power exceeding 0,10kW per millimetre of tined-bucket width and the assistance of pneumatic tools prior to removal by equipment equivalent to that specified in (a) above.
- c) **Hard rock excavation:** — shall be excavation in material that cannot be efficiently removed without blasting or without wedging and splitting prior to removal.
- d) **Class A Boulder excavation:** — shall be excavation in material containing more than 40% by volume of boulders of size between 0.03m<sup>3</sup> and 20m<sup>3</sup> in a matrix of softer material or smaller boulders.  
**Note:** — Excavation of solid boulders or lumps of size exceeding 20m<sup>3</sup> will be classed as hard rock excavation. (2) Excavation of fissured or fractured rock will not be classed as boulder excavation but as hard rock or intermediate excavation according to the nature of the material.
- e) **Class B Boulder excavation:** — shall be excavation of boulders only in a material containing 40% or less by volume of boulders of size between 0.03m<sup>3</sup> and 20m<sup>3</sup> in a matrix of softer material or smaller boulders.  
**Note:** — Those boulders requiring individual drilling and blasting in order to be loaded by a back-acting excavator as specified in (a) above, or by a track type front-end loader, will each be separately measured as Class B boulder excavation.  
The excavation of the rest of the material will be classed as soft or intermediate excavation according to the nature of the material.

**Method of Classifying:** —The Contractor may use any method he chooses to excavate any class of material but his chosen method of excavation shall not determine the classification of the excavation. The Department will decide on the classification of the materials. The classification will be based on inspection of the material to be excavated and the criteria given in (a) to (e) above, as applicable. The decision of the Department shall be, subject to the relevant provisions of the contract, final and binding.

Should the Contractor consider that the excavation is other than “soft excavation” he must notify the Department immediately in order that an inspection be made and a decision arrived at by the Department as to the category of such excavation. Should the Contractor fail to give such notification, the excavation shall be deemed to be “soft excavation” and shall be measured and valued accordingly.

Blasting will only be permitted with the written authority of the Department, if and when permission is granted, it is to be executed only by persons holding the necessary Government Blasting Certificate and subject to all regulations imposed by the Department and/or Local Authority. In addition, the Contractor is to indemnify the Provincial Administration against all claims in respect of damage to persons and property resulting from such blasting operations.

Before commencing any excavations, the Contractor must satisfy himself as to the accuracy of any levels indicated on the drawings, as no claim will be entertained at a later date for any alleged inaccuracy in such levels.

Excavation shall be carried down to such depths as are necessary to obtain firm foundations, but before proceeding to greater depths than are shown on the drawings, the Department's approval must be obtained.

The Contractor will be responsible if he excavates wider or deeper than shown or required. If the excavations are deeper than shown or required such extra excavations are to be filled in with mass concrete at the Contractor's expense. If the excavations are wider than shown or required, any form-work or mass concrete filling required to the side of the concrete foundations is to be executed at the Contractor's expense and to the approval of the Department.

Depths of excavations as approved shall be checked and recorded by the a Departmental Official and the Contractor's Foreman before any concrete is laid or the excavations are otherwise covered or filled in.

Notwithstanding such approval, any excavations which become waterlogged or otherwise spoilt after approval, shall be cleaned out and reformed, at the Contractor's expense and to the satisfaction of the Department, before any concrete, etc. is laid.

**WATER:** — The Contractor shall keep all excavations free from water or mud by pumping, baling or otherwise.

**WORKING SPACE:** — The Contractor is to allow against the items of "excavate to provide working space" for excavating beyond the extent of the net excavations measured to provide the necessary working space for the carrying out of such work as is described in the items. Rates are to include, in addition to the extra excavation, for any additional risk of collapse so incurred and for filling back and compacting the excavated material.

No separate item for working space is provided or will be considered where the face of the measured excavation is 750mm or more away from the finished face of the structure. Separate items for working space for the building of brick foundation walls on ordinary concrete wall footings will not be considered.

In the case of column base and pile cap excavations, where the dimensions between the column face and the excavation face is less than 500mm, working space has been measured for the width of the column face from the commencing level of excavation to the top of the column base or pile cap only where the top of the column base or pile cap exceeds 1.5m below the commencing level of excavation.

**RISK OF COLLAPSE:** — The Contractor shall maintain all excavated faces affecting the safety of the works and workmen. He must either provide all necessary temporary planking, strutting or shoring to all vertical excavated faces or carry the risk of collapse of these faces with all its implications. He must assume full responsibility in this connection and must allow in his rates accordingly. In addition, all excavated faces exceeding 1.5m deep are to be maintained in accordance with Government Regulations.

Quantities reflect the total superficial areas of the vertical excavated faces and will be subject to variation only in so far as these areas may vary, notwithstanding whether any temporary supports are used or not.

**FILLING, ETC.:** — All backfilling and filling under floors and paving must be of selected material from the excavations, unless otherwise stated, returned and compacted in layers as later described and with the top surface dressed to the correct levels and grades, all to the approval of the Department. Under no circumstances will the Contractor be allowed to use clay, peat or other unsuitable material for filling.

Rates for all items of filling with material from the excavations are to include haulage not exceeding 100m from the perimeter of the excavations.

Any filling supplied by the Contractor is to be of suitable material approved by the Department.

**COMPACTION OF FILLING ETC.:** — All filling and backfilling is to be done in layers not exceeding 200mm thick before compaction, with the layers level to ensure uniform compaction. Each layer is to be thoroughly compacted over the whole of the area to a dry density not less than 90% of Mod. A.A.S.H.O. density. The surface of each compacted layer shall be uniform and tightly bonded. Care is to be taken that no damage is done to foundation walls, drains and other services.

The densities of compaction referred to are to be determined by tests carried out in accordance with A.S.T.M. Designation D 1557-58 and at an optimum moisture content of not more or less than 5% of the required Mod. A.A.S.H.O. The Contractor shall be responsible for having sufficient tests taken of the density of the compacted filling to ensure that the required compaction is being attained to the satisfaction of the Department. These tests are to be undertaken by an independent testing authority nominated by the Contractor to the approval of the Department. The costs of all tests in this connection shall be borne by the Contractor and shall be allowed for in his rates.

**PROTECTION AGAINST SUBTERRANEAN WOOD-DESTROYING TERMITES:** — Where protection against termites is to be provided: —

- a) Remove vegetable matter  
All dead roots and other vegetable matter likely to encourage termites must be removed from the ground under, against the building and from all filling material.
- b) Treating the ground  
The ground under surface beds, and below suspended wood floors, must be treated by the application of Soil Insecticides of Chlordane or Aldrin types complying with SANS Specifications 1165 and 1164 respectively, mixed with water and applied at the rate of not less than 5 litres of solution per square metre uniformly over the whole surface. The concentration of the solution must be strictly in accordance with the manufacturer's instructions and to the approval of the Department.

The Department reserves the right to take samples of the diluted solution, at any time, in order to test the concentration of the chemicals used.

Where the ground to be treated is of earth filling, the upper 50mm layer of filling must be levelled by raking, but must not be rammed until after the solution has been applied, and where of natural ground, it must be loosened to a depth of not less than 50mm and similarly levelled, in order to enable the solution to penetrate into the soil. After the solution has been applied and allowed to penetrate the surface, the soil must be well rammed and consolidated.

Before applying the solution to the ground under the floors, splay back earth for a depth and width of 75mm from the internal faces of walls enclosing the floors, against internal walls, sleeper piers, etc. and thoroughly saturate with the solution. After the solution has soaked into the earth, the splayed grooves must be filled with earth and consolidated.

The treated layer of soil under suspended wood floors must be protected with a 75mm thick layer of approved clean gravel, finished to an even surface.

The treated layer of soil under concrete surface beds must be protected with a 25mm thick layer of well-consolidated approved grit prior to laying the waterproofing membrane.

Great care must be taken when laying concrete surface beds, protective layers, etc. in order to avoid rupturing the treated layer of soil. Should the treated layer be ruptured at any

point it must be made good and the area affected re-treated with the soil insecticide.

Contractors are advised that:

- a. Special precautions must be taken to protect the workmen whilst using the soil insecticide.
- b. The treatment of filling or ground under floors shall be done as soon as practicable, so that treatment may dry out before the floors are laid.
- c. The treatment of the ground must be carried out under the supervision of the Department.
- d. The soil insecticide to be delivered to the site in sealed drums clearly labelled or stamped with the name of the product.
- e. In addition to the foregoing the application of the soil insecticide to be carried out in accordance with SANS Code of Practice 0124 — the application of Certain Soil Insecticides for the Protection of Buildings.
- f. The protective layers of gravel or grit have been measured separately.

**RE-USE OF EXCAVATED MATERIAL:** — Material of any kind that may be discovered on the site during the excavation shall remain the property of the Administration. Such material may, if approved, be used for aggregate. Material so used shall be valued and the value deducted from the Contract Sum.

**DEMOLITIONS:** — The Contractor is referred to the preambles for “Alterations” insofar as they apply and the following: —

The demolition of existing buildings is to be done in a practical and safe manner, under the continuous supervision of a competent Foreman. Rates for the demolition of existing buildings are to include for breaking up and removing all external screen walls, steps and ramps, surface water channels, rainwater sumps, gulleys, etc. and grubbing up and removing all foundation walls and footings, disconnecting and removing all services to a point not less than 1m beyond the perimeter of the buildings, plugging off ends of all remaining pipes, and for filling in all holes with clean earth and ramming up to ground level. All movable fittings and furniture, fire extinguishers and electrical and other equipment in the buildings to be demolished are to remain the property of and will be removed by the Administration prior to the commencement of the demolition.

Before commencing the demolitions, the Contractor shall comply with any Local Authority regulations in force in respect of rodent extermination, etc. and he shall obtain the required Clearance Certificate. Items to cover the cost of obtaining the certificate and the fumigation, etc. of the buildings to be demolished have been provided elsewhere in the Bills of Quantities, and the fumigation is to be carried out by a firm specialising in this type of work. The fumigation of the buildings to be demolished shall only be carried out if called for by the Local Authorities and if not required the value of the relevant items in the Bills of Quantities will be deducted from the Contract Sum.

After handing over the site to the Contractor, the risk of any loss or damage to the buildings to be demolished and the materials therein, caused by theft, vandalism, etc. shall be the responsibility of the Contractor and he shall take such precautions as he deems necessary against such loss or damage.

**GRASS PLANTING AND TURFING:** — Is to be “Cape Kweek” or “Umgeni” grass scientifically known as *Cynodon dactylon* or other local fine grass approved by the Department. In areas where fine grass does not grow readily, Kikuyu grass *Pennisetum clandestinum* may be substituted. The areas must be identified and the approval of the Department obtained before Kikuyu grass is to be planted.

**Grass Planting To Level Areas:** — The areas to receive grass are to be weeded and raked free of stones and other superfluous matter and all depressions left by the earthworks plant are to be filled in with approved topsoil. The planting of grass is to be carried out in continuous root planting in rows 200mm apart. The method of planting called “sprigging” may be used as an alternative.

Immediately after completion of each strip or square, the area thus grassed is to be thoroughly watered and lightly rolled. Any drifting or piling up of the top soil due to wind or any other cause must be prevented as far as possible and should such piling up of soil against newly planted grass occur the soil must immediately be raked level and lightly rolled.

**Turfing:** — Banks are to be carefully trimmed to an even surface and weeded and raked free of stones, etc. and all depressions filled in with approved topsoil as before described. Turfing of banks is to be carried out with 25mm thick maximum 500mm x 1000mm weed-free grass sods, of grass as before described, and as approved by the Department. The grass sods are to be set in position in horizontal rows to broken bond and closely fitted together and tamped flat with a timber pummel, a maximum of two sods in every square metre of area covered being staked to the bank to maintain position, with and including one sharpened wood or bamboo skewer 250mm long and with all cavities between sods filled in with approved top soil and the whole area lightly top soil dressed on completion.

**Established Lawn:** — The use of established lawn in pieces size approximately 500mm x 1000mm x 25mm thick in lieu of grass sods on banks will be permitted provided that the established lawn is supplied and laid by a firm experienced in this type of work and to the approval of the Department. The fitting, tamping, staking and top dressing must all be as described for turfing, except that one piece per square metre is required to be staked as described.

**Fertilizer:** — An approved fertilizer of the following types— Type 2:3:2 for grass planted levelled areas and Type 3:2:1 for turfed or established lawn covered banks is to be supplied and applied by the Contractor at the rate of 400 kg per hectare. In the case of grass planted levelled areas the fertilizer is to be applied either before or after grass planting and in the case of turfed or established lawn covered banks the fertilizer is to be applied after the sods or pieces have been laid.

The fertilizer above described is to in addition to any fertilizer which may have been specified to be applied during either the operation of scarifying and grading the area to be grassed or the re-spreading of top soil.

A sample of the existing topsoil or the topsoil to be re-spread is to be sent to an approved fertilizer manufacturer for testing and advice on the acid or alkaline content of the soil. The cost of this test is to be borne by the Contractor if this is not provided free by the fertilizer manufacturer.

The requisite quantities of limestone ammonium nitrate for acidic soil or ammonium sulphate for alkaline soil as determined by the soil test will be supplied to the Contractor by the Department and the cost thereof is to be included in a Provisional Sum elsewhere in the Bills of Quantities. The application of this treatment is to be undertaken by the Contractor and his rates for grassing, etc. must include for same.

**Weed killer:** — "Weed Master or Turf Master" or other approved weed killer is to be applied to the entire grassed or turfed areas at a rate of 4 litres mixed with 200 litres of water per hectare, this being equivalent to 40-45 millilitres mixed with 5 litres of water per fifty square metres. The solution is to be sprayed on with a suitable spraying apparatus to achieve an even distribution. Six to eight weeks later, the operation is to be repeated. The application of weed killer is not to take place during wet weather. Weather conditions should be such as to allow a minimum of two hours or absorption before the likelihood of rain.

**Watering and Rolling:** — The entire turfed area is to be kept clear of weeds, lightly rolled and thoroughly watered throughout the period of the Contract and or at least three months from the time of acceptance of the grounds or until the grassing or turfing is well established if that is sooner, all to the satisfaction of the Department.

In the absence of rain, the initial watering of grassed or turfed areas is to be carried out as follows: —

Grass planted levelled areas: - at least twice a week.

Established lawn areas: - at least once a week.

Turfed areas: - at least once a day for the first ten to fourteen days, thereafter at least once a week.

The Contractor must allow in his rates for providing and removing at completion all necessary temporary water piping complete with fittings, sprinklers, hoses, etc. as required for the proper watering of the grassed or turfed areas of the plateaux and banks.

**Cutting of Grass:** — The Contractor must commence mowing as soon as possible once turfed areas have become established and undertake regular mowing at approximately one-week intervals up to the date of final delivery, except that, during the maintenance period, the mowing of the plateaux will be undertaken by the Institution.

**Note:** — All stages of grass planting and turfing are to be supervised on a full time basis by a competent person with the necessary experience and knowledge.

It shall be the responsibility of the Contractor to advise the Department when the following operations are to be carried out in order that his representative may be present: —

- a) the application of fertilizer
- b) the application of weed killer.

Should the Contractor fail to do so, the Department shall have the right to instruct the Contractor to repeat the operation at his own expense.

### 3. **CONCRETE, FORMWORK AND REINFORCEMENT**

**GENERAL:** — This specification applies to concrete work formed into its final shape and position in-situ.

All concrete and formwork shall be carried out in accordance with SANS Specification 1200 G — Concrete (Structural) (a copy of which the Contractor will be required to keep on the site so that it can be referred to at all times during the Contract), with the following amplifications and amendments: —

**INTERPRETATIONS:** — Clauses 2.1 and 2.2 of SANS Specification 1200G refer. This preamble, together with any other supplementary preambles appearing in these Bills of Quantities shall be deemed to be the project specification and are the "Portion 2" referred to in Clause 2.2.

**DEFINITIONS:** — Clause 2.3 of SANS Specification 1200 G refers. All references to the Engineer shall be deemed to mean the Department.

#### **MATERIALS**

Cement: — unless otherwise specified, shall be one or more of the following and shall, in each case, comply with the requirements of the relevant standard specification: —

Portland cement and rapid-hardening cement to SANS 471 Specification

Portland blast-furnace cement to SANS Specification 626.

Portland cement 15 to SANS Specification 831.

Nevertheless, no cement other than ordinary Portland cement shall be used without the approval of the Department. Cement containing more than 15% blast-furnace slag will not be permitted in columns or in members less than 50mm thick.

In addition (for the abovementioned items) where Ordinary Portland cement is used, blast-furnace slag (from separate containers) **must not** be added in any proportion whatsoever.

No mixing of two different types of cement in the same batch will be allowed, and unless otherwise approved by the Department, the same brand and type shall be used in all exposed concrete.

Lumpy cement, broken sacks and sweepings shall not be used.

Cement supplied in sacks shall be used in the order in which it was delivered and shall not be kept in storage for longer than six (6) weeks without the approval of the Department.

**Water:** — Shall be clean and free from injurious amounts of acids, alkalis, sugar, organic matter and other substances that could impair the strength or durability of the concrete. If so required by the Department, the suitability of the water shall be proved by tests carried out by an approved laboratory.

**Aggregates:** — Unless otherwise specified both the coarse aggregate (stone) and the fine aggregate (sand) shall comply with the requirements of SANS Specification 1083. The Contractor is to prove compliance by means of either a certificate from the supplier or by grading analysis tests.

**Admixtures:** — i.e. materials other than cement, aggregate and water shall not be used in the concrete mix without the approval of the Department. The onus for proof of satisfaction to the Department for any admixture proposed shall be with Contractor.

**Reinforcement:** — for concrete shall be as specified and shall, in each case, comply with one of the following: —

- a) Type A hot rolled mild steel bars of plain round cross section to SANS Specification 920
- b) Type C Class 2 hot rolled high yield stress Grade 1 deformed bars to SANS Specification 920
- c) Type D Grade 1 cold worked deformed bars to SANS Specification 920.
- d) Welded steel fabric to SANS Specification 1024 manufactured from plain hard-drawn mild steel wire.

A sample reinforcing rod, approximately 600mm long, may be taken from each consignment of rods of similar diameter, for testing. If any sample is found unsatisfactory the whole consignment of rods from which the sample was taken will be rejected.

No substitution of the bars specified shall be made without the prior approval of the Department.

## **REINFORCEMENT**

**Bending:** — Reinforcing bars shall be cut and bent according to the dimensions shown on the working drawings and in accordance with SANS Specification 82.

Except as allowed for below, all bars shall be bent cold and bending shall be done slowly, a steady even pressure being used without jerk or impact.

If approved by the Department, hot bending of bars of diameter at least 32mm shall be permitted, provided that the bars do not depend for their strength on cold working. When hot bending is approved, the bars shall be heated slowly to a cherry red heat (not above 840 C°) and after bending shall be allowed to cool slowly in air. Quenching with water shall not be permitted.

**Fixing:** — All steel reinforcement, at the time of placing of the concrete, must be free from loose rust, scale, oil and other agents which will reduce the bond between the steel and the concrete or initiate corrosion of the reinforcement. Reinforcement exposed to sea spray shall be washed down, and the formwork drained, just prior to concreting.

Reinforcement shall be positioned as shown on the working drawings or as directed by the Department and maintained in those positions within the tolerances given in the Specification for Tolerances. It shall be secured against displacement by tying at intersections with 1.6 or 1.25mm diameter annealed wire or by the use of suitable clips or, if permitted by the Department, by welding in accordance with SANS 1856. Welding will not



be permitted on cold worked bars. Reinforcement shall be supported in its correct position by hangers, saddles or cover blocks and aligned by chairs and spacers all of approved design and material. Where such hangers, saddles, chairs or spacers are of steel, they will be detailed on the drawings or in bending schedules.

**Cover:** —The minimum cover of concrete over reinforcement, excluding any applied finish, shall be as shown on the working drawings, or as directed by the Department.

Cover shall be maintained by using cover blocks, which shall be made of small aggregate concrete, not mortar, using the same cement and aggregate type and ratio as the parent concrete. Alternatively, cover blocks may be of the plastic type provided that sufficient number are used to prevent their collapse, that they are of a colour compatible with that of concrete and that the prior approval of the Department is given. Metal cover blocks shall not be used.

If the concrete face has a Class F2 smooth finish or some other special finish as is described elsewhere, hemispherical or pyramid shaped concrete cover blocks shall be used unless otherwise specifically approved by the Department.

**Splicing:** — or joining of reinforcing bars shall be made only as and where shown on the working drawings or as otherwise approved. The length of the overlap in a splice shall be not less than that shown on the working drawings or forty-five times the diameter of the bar if not shown.

**Protection of Exposed Bars:** — If left exposed for future bonding of extensions to the works, reinforcement shall be protected from corrosion as specified by the Department.

**Electric Current:** — Reinforcement shall not be used as a means for conducting electric current unless there is conformity with the requirements of SANS Code of Practice 03.

**Inspection of Reinforcement:** — Reinforcement shall be subject to inspection by the Department after the Contractor is satisfied that it has been completely and correctly fixed. The amount of notice given by the Contractor to the Department before concreting commences that reinforcement is ready for his inspection shall be agreed between the Department and the Contractor at the commencement of the Contract.

## **FORM WORK**

**Design:** — Formwork shall be so designed and constructed by the Contractor that the concrete can be properly placed and compacted and that the required shapes, finishes, positions, levels and dimensions shown on the working drawings are maintained, subject to the tolerances given in the Specification for Tolerances. Unless otherwise directed by the Department, all formwork to beams and slabs shall be evenly cambered, unless otherwise specified or shown on the drawings, to the mid-point of the span of the member at the rate of 2mm per metre of span, all to the approval of the Department and the full cross section of the member shall be maintained after placing of concrete.

The formwork and joints shall be capable of resisting the dead load and pressure of the wet concrete, effect of vibration equipment, wind forces and all other superimposed loads and forces it is necessary for it to carry.

Should it be necessary to support formwork off suspended or ground bearing slabs, the manner of execution of the support shall be agreed with the Department so that overstress of, or damage to, those members is prevented.

In structures having, in whole or part, two or more reinforced concrete floors, props to the approval of the Department shall be provided under the soffits of beams and slabs of any floor which is being used to support the formwork and new concrete of the floor above. These props shall not be removed until the formwork for the new concrete has been struck.

Wedges and clamps shall be used in preference to nails. Joints in forms shall be tight enough to prevent leakage of cement paste.

**Finish:** — The quality of the finished surface of the concrete shall be as shown on the working drawings or as otherwise specified, and the type of formwork used shall be adequate to provide such finishes.

**Ties:** — The type of ties used and their position shall be such that the finish required in terms of the clause "Finish" is achieved. Tie rods are preferable to wire ties and the forms shall not be secured to the reinforcement. No corrodible tie rod or wire tie shall be allowed within the depth of concrete cover, and in the case of water-retaining or tanked structures, no removable tie rod or wire shall pass right through the concrete member.

**Preparation of Formwork:** — Surfaces that are to be in contact with fresh (wet) concrete shall be so treated by coating with a non-staining mineral oil or other approved material, or, in the case of timber forms, by thoroughly wetting surfaces so as to ensure easy release and non-adhesion to formwork during stripping. If any substance other than water is used, every precaution shall be taken to avoid contamination of the reinforcement.

**Re-use of Formwork:** — Before re-use, all formwork shall be reconditioned, and all form surfaces that are to be in contact with the concrete shall be thoroughly cleaned without unduly damaging the surfaces of the formwork.

**Openings:** — Where necessary for the proper placing of the concrete, temporary openings for cleaning, inspection or placing purposes shall be provided, taking cognisance of the finishes specified.

**Removal of Formwork:** — Formwork shall not be removed before the concrete has attained sufficient strength to support its own mass and any loads that may be imposed on it. Except where the Contractor can prove by means of cube tests, at his own expense to the satisfaction of the Department that, because of its strength development characteristics the concrete has attained sufficient strength and that shorter periods are practicable, formwork shall not be removed within shorter periods than those given in Table A. The number of cube tests required shall be equal to the number required for testing at 28 days. Where full design loads are carried, no soffit forms and props may be removed until the full design strength is attained.

In structures having, in whole or part, two or more reinforced concrete floors, props to the approval of the Department shall be provided under the soffits of beams and slabs of any floor which is being used to support the formwork and concrete of the new floor above. These props shall not be removed until the formwork for the new concrete has been struck.

All formwork props shall have been removed from under beams and slabs before the commencement of construction of brickwork thereon, unless otherwise agreed with the Department. Formwork shall be removed carefully so that shock and damage to the concrete are avoided.

**TABLE A—REMOVAL OF FORMWORK (MINIMUM TIMES IN DAYS (24 hrs))**

1	2	3	4	5	6	7	8	9	10
Type of structural member or formwork	Type of cement used								
	Portland cement and Portland cement 15			Rapid-hardening Portland cement* and rapid-hardening Portland cement 15			Portland blast-furnace cement		
	Weather								
	Hot or normal	Cool	Cold	Hot or normal	Cool	Cold	Hot or normal	Cool	Cold
(a) Beam sides, walls, and unloaded columns.	0,75	+	1,5	0,5	+	1	2	+	4
(b) Slabs with props left underneath	4	+	7	2	+	4	6	+	10
(c) Beam soffits with props left underneath, and ribs of a ribbed floor construction	7	+	12	3	+	5	10	+	17
(d) Slab props including cantilevers	10	+	17	5	+	9	10	+	17
(e) Beam props including cantilevers	14	+	21	7	+	12	14	+	21

\* Shorter periods may be used for sections of thickness 300mm or more.

+ In cool weather, stripping times shall be determined by interpolation between the periods specified for normal and cold weather.

### CONCRETE QUALITY

**General:** — Concrete shall comply with the requirements for "Strength Concrete" as specified. The type of aggregate and cement, and their sources of supply, shall not be altered during the currency of the Contract without the prior written agreement of or instruction from the Department.

**Strength Concrete:** — The Contractor shall be responsible for the design of the concrete mix and for the proportions of its constituent materials, measured as described, necessary to produce concrete that complies with the requirements specified by the Department thus:-

- a) For each section of the work, the class of concrete and position on the Works, as shown on the drawings:
- b) For each class of concrete:
  - i) the minimum compressive strength at 28 days as shown in Table B
  - ii) the maximum nominal size of coarse aggregate as shown in Table B

- iii) the slump as shown in Table D
- iv) the maximum cement/water ratios as shown in Table C.

At the earliest possible stage in the Contract, at least 35 (thirty-five) days before the first concrete is placed, or as otherwise agreed with the Department, the Contractor shall submit samples of the aggregates which he proposes to use on the works to the Department.

The Contractor, under the supervision of the Department, shall prepare trial mixes using these same aggregates, to establish his ability to achieve the strengths specified, and satisfactory workability of the concrete. The Contractor shall provide all necessary equipment for, and carry out tests of moisture content of aggregates at the time of preparation of the trial mixes, tests of the slump of the mixes and at the same time cast not less than six standard cubes from each mix for compression tests.

The target strengths to be achieved under trial mix procedure shall exceed the specified minimum compressive strengths by a factor which is acceptable to the Department.

The Contractor shall also, when required to do so, prove the concrete yield obtained per sack of cement by suitable measurement of batches after placing.

No structural concrete work shall be poured until trial mix procedure has been properly followed and satisfactory 7 (seven) day compression strengths achieved. (Equivalent 28 (twenty-eight) day strength =  $\frac{4}{3} \times 7$  day strength + 5 MPA).

Thereafter, the materials, preparation of and method of manufacture of subsequent concrete shall conform accurately to those used in the trial mixes. If materials vary in the course of the Contract from the samples first submitted, the Contractor shall, on the instructions of the Department, repeat the trial mix procedure and vary the proportions to attain the specified qualities.

The costs of preparation of trial mixes, with tests associated with them, shall be borne by the Contractor and must be allowed for in the pricing of the concrete.

A valid concrete test result shall be the average obtained from the testing of three test cubes of concrete in accordance with SANS Method 863.

**TABLE B—CONCRETE CLASSES: STRENGTH, AGGREGATE SIZE AND COMPACTION**

Class	Minimum 28 day cube compressive strength (MPA)	Maximum nominal size of coarse aggregate (mm)	Method of Compaction
50/26 50/19	50	26,5 19,0	Mechanical (see clause "Compaction")
45/26 45/19	45	26,5 19,0	
40/26 40/19	40	26,5 19,0	
35/26 35/19	35	26,5 19,0	
30/37 30/26 30/19 30/13	30	37,5 26,5 19,0 13,2	
25/37 25/26 25/19 25/13	25	37,5 26,5 19,0 13,2	
20/37 20/26 20/19 20/13	20	37,5 26,5 19,0 13,2	
15/37 15/26 15/19	15	37,5 26,5 19,0	Non- mechanical (See clause "Compaction")
10/37 10/26 10/19	10	37,5 26,5 19,0	

The Contractor shall be deemed to have satisfied himself, before tendering, of his ability to produce concrete of the required quality with available materials conforming to the specification, and mixed in the proportions on which his tendered rates are based. Any subsequent alterations of the mix proportions to meet these requirements shall be at the Contractors expense.

If, in the opinion of the Department, the concrete proportions are likely to lead to excessive segregation, honeycombing, bleeding or shrinkage cracking, he shall have the right to order the Contractor to amend the proportions at the Contractors own cost.

**TABLE C — MAXIMUM CEMENT / WATER RATIOS FOR DIFFERENT CONDITIONS OF EXPOSURE**

1	2	3	4	5
Type of structure	Exposure Conditions			
	Mild	Moderate	Severe	Very Severe
Thin sections; reinforced piles; all sections with less than 25mm cover reinforcement.	*	0.53	0.48	0.40
Moderate sections; retaining walls, piers, beams	*	*	0.53	0.43
Exterior portions of mass concrete	*	*	0.53	0.43
Concrete slabs laid on ground	*	0.53	0.48	*
Concrete protected from the weather, inside buildings, or in ground below frost level	*	*		*

\* In these cases the ratio will be based on the strength for the workability desired.

**Consistency and Workability:** — Slump measurements taken in accordance with SANS Method 862 shall be within the limits given in Table D appropriate to the type of construction, or within such other limits as are laid down by the Department.

The concrete shall be of such workability that it can readily be compacted into the corners of the formwork and around reinforcement without segregation of the materials or excessive "bleeding" of free water at the surface.

**TABLE D—SLUMP LIMITS**

1	2	3	4	5
Type of construction	Slump, mm			
	Non-mechanical compaction		Mechanical compaction	
	Max.	mm.	Max.	mm.
Paving and pre-cast units	75	50	50	30
Heavy mass construction	75	25	50	20
Reinforcing foundation walls and footings	125	50	80	30
Slabs, beams, columns, and reinforced walls	125	50	80	30
Slabs and industrial floors on ground	125	75	80	50
Plain footings, caissons, and substructure walls	100	25	60	20

**Ready-mixed Concrete:** — This may be used subject to the approval of the Department. This approval may be withdrawn on 24 (twenty-four) hours notice to the Contractor if at any time if documents do not conform to the requirements of this Specification. Ready-mixed concrete shall also comply with the requirements of SANS Specification 878. Details of the

mix ingredients and tests thereon, the mix designs and relevant tests shall be forwarded to the Department for his approval. Ready-mixed concrete shall be cast within 3 (three) hours of placing all the ingredients in the mixing plant. Ready-mixed concrete shall be subject to the same sampling and testing at the site as that mixed on site and only the results of these tests will be regarded as valid.

## **TRANSPORTATION AND PLACING**

**Transportation:** — Unless agreed with the Department, concrete shall not be pumped into its final position.

The Contractor must provide suitable runways for the distribution of concrete to the various parts of the structure and these must be solidly constructed in such a manner so as to obviate the possibility of interference with the steel reinforcement.

**Placing:** — Unless otherwise agreed with the Department, the Contractor shall give the Department at least 24 (twenty-four) hours notice of his intention to place concrete. No concrete shall be placed without the prior approval of the Department and without a representative of the Department being present. Concrete shall be placed within one hour of the time of its discharge from the mixer. Concrete shall not be re-tempered by the addition of water or other material. The forms to be filled shall be clean internally. All excavations and other surfaces of an absorbent nature that are to come into contact with the concrete shall be dampened with water. There shall be no free-water on the surface against which concrete is to be placed. Wherever possible, the concrete shall be deposited directly into its final position to avoid segregation and displacement of reinforcement and other items that are to be embedded. Deposited concrete shall not be so worked (whether by means of vibrators or otherwise) as to cause it to flow laterally in such a way that segregation occurs. Where possible, the concrete shall be brought up in horizontal layers of compacted thickness not exceeding 450mm and heaping shall be avoided.

Where a chute is used to convey the concrete, its slope shall be such as will not cause segregation, and a suitable spout or baffles shall be provided for the discharge of the concrete. Concrete shall not be allowed to fall freely through a height of more than 3 m, unless otherwise approved. Concrete shall not be placed during periods of heavy or prolonged rainfall.

**Compaction:** — The concrete shall be fully compacted by approved means during and immediately after placing. It shall be thoroughly worked against the formwork and around reinforcement and other embedded fittings without displacing them.

The concrete shall be free of honeycombing and planes of weakness. Successive layers of the same lift shall be thoroughly worked together.

The method of compaction shall be as specified. Mechanical compaction shall be undertaken by means of high frequency immersion vibrators of minimum frequency of 6000 vibrations per minute and a maximum acceleration of 4 g when under load, being capable of visibly affecting concrete over a radius of at least 500mm. Vibrators shall be inserted at about 500mm centres and withdrawn slowly to close the hole formed by the vibrator.

Non-mechanical compaction shall be undertaken by means of spading, rodding or forking.

Over-compaction resulting in segregation, surface laitance or leakage (or any combination of these) shall not be allowed.

Vibrators shall not be allowed to come within 30mm of the face of the formwork in the case of formed finishes, nor within 75mm of the face of the formwork in the case of special finishes.

**Construction Joints:** — Concreting shall be carried out continuously up to the construction joints shown on the working drawings or as prior approved by the Department, except that

if, because of an emergency (such as a breakdown of the mixing plant or the occurrence of unsuitable weather), concreting has to be interrupted a construction joint shall be formed at the place of stoppage in conformity with the detail shown on the drawings for construction joints generally and in the manner which will least impair the durability, appearance and proper functioning of the concrete. The Department shall approve the method adopted for forming the construction joints, one of the following methods being adopted, as relevant: —

- a) Construction joints when concrete is not more than 24h old: —The surface of the concrete shall be brushed with a steel wire brush before new mortar and concrete are placed as specified in (b) below.
- b) Construction joints when concrete is more than 24h but not more than 3 days old: — The surface of the concrete shall be sand-blasted or chipped with a light hammer, swept clean, and thoroughly wetted and covered with a 10mm thick layer of mortar composed of cement and sand mixed in the same ratio as the cement and sand in the concrete mixture. This mortar shall be freshly mixed and placed immediately before the new concrete is placed.
- c) Construction joints when concrete is more than 3 days old: — The procedure specified in (b) above shall be followed, except that the old surface shall be prepared and kept continuously wet for at least 24h before the mortar and new concrete are placed.
- d) Construction joints at tops of columns: — The procedure for brushing or cleaning specified in (a) or (b) above, as applicable, shall be followed before the steel reinforcement of the slab or floor to be cast on the columns is placed in position.

**Curing and protection:** — Formwork shall be retained in position for the appropriate period given in the clause “Removal of Formwork” and shall be considered as providing adequate curing on those surfaces for that period. Should this curing period still be less than that specified, alternatively, should surfaces not be cured by forms then all such concrete shall immediately be protected from contamination and loss of moisture by one or more of the following methods: —

- a) ponding the exposed surfaces by means of water, except where atmospheric temperatures are low, i.e., less than 2°C,
- b) covering the concrete with sand, or mats made of a moisture-retaining material, and keeping the covering continuously wet;
- c) continuous spraying of the exposed surfaces with water;
- d) covering with a waterproof or plastic sheeting firmly anchored at the edges,
- e) using a prior approved curing compound applied in accordance with the manufacturer’s instructions, provided that in this case, the presence of the compound is not detrimental to subsequently applied finishes.

Whatever method of curing is adopted, its application shall not cause staining, contamination, or marring of the surface of the concrete.

The curing period shall be at least 5 days for concrete made with Portland cement, at least 2 days for that made with rapid-hardening Portland cement and at least 7 days if Portland blast-furnace cement is used. When atmospheric temperatures are below 5° C these minimum curing periods shall be extended by 72, 36 and 72 hours respectively.

## CONSTRUCTION DETAILS

**Holes, Chases and Fixing Blocks:** — No holes or chases other than those shown on the working drawings or approved by the Department shall be cut or otherwise formed in the concrete. No blocks for the attachment of fixtures shall be embedded in the concrete unless approved by the Department.

**Pipes and Conduits:** — No pipes or conduits other than those shown on the working drawings shall be embedded in the concrete without the approval of the Department. The clear space between any such pipes and the clear distance between such-a pipe and any reinforcement shall be at least 25mm or the maximum size of the coarse aggregate plus 5mm, whichever is greater. The amount of concrete cover over pipes and fittings shall be at least 25mm.



**Honeycombing and Other Defects:** — After removal of the forms, if the concrete shows any defect in terms of the Specification for Finishes for that concrete, the Contractor shall, on the instructions of the Department, make good the defect at his own cost, by either removing and replacing the defective concrete, or by patching, all as approved by the Department and to the standard of finish required. No remedial work shall be carried out by the Contractor without the prior approval of the Department.

**Building on Concrete Footings:** — No structural load shall be imposed on concrete footings until at least three days after depositing the concrete in the case of mass concrete footings and after seven days in the case of reinforced concrete footings, or as may be directed by the Department.

**RECORDS:** —The Contractor shall maintain written records indicating: —

- a) the date on which each section was concreted, the time taken to place the concrete, and the position of that section in the Works and its construction joints;
- b) daily weather conditions with temperatures being recorded by maximum and minimum thermometers and
- c) the nature of samples and dates on which they were taken. In the case of cubes these shall also state the identification marks, test results and age, minimum strength required and position of parent concrete.

## TESTS

**Compressive Strength:** — During the time in which each class of concrete, having a specified 28 day compressive strength equal to or greater than 20 MPA, is being placed, samples of the concrete shall be taken from the point of deposit at the rate of at least one sample from each 5m<sup>3</sup> of concrete placed in columns, and from each 30 m<sup>3</sup> or part thereof of concrete placed elsewhere, but in either case, nevertheless at least once a week. A group of at least three 150mm test cubes shall be made from each sample for testing at 28 days age. If the Contractor plans to execute further work which relies on previously completed work for support but for which the results of 28 day tests are not available, he is to prove the strength of that concrete by taking and testing at 7 days age an equal number of test cubes to that which is to be tested at 28 days age, prior to the commencement of the planned further work.

The cost of the necessary extra test cubes and testing will be for the Contractor's account. Each group of test cubes shall be deemed to represent the whole of the concrete from which sample was taken and shall be identifiable with the concrete.

The Contractor shall provide, at his own expense, sufficient moulds to keep pace with the rate of concreting. He shall also perform all tasks in respect of compressive strength testing except the actual crushing.

If ready-mixed concrete is used, site testing as specified herein shall still be undertaken, and only the results of such site testing shall be considered in determining the acceptance or otherwise of the concrete.

**Grading Analysis:** — If so directed by the Department, a grading analysis shall be made for each 40m<sup>3</sup> of fine aggregate to be used and for each 75 m<sup>3</sup> of the coarse aggregate to be used. The analysis shall be made by the method given in SANS Specification 1083.

**Determination of Consistency:** — When the slump test is used to measure the consistency of the concrete mix, it shall be carried out by the method given in SANS Method 862 with samples taken in accordance with SANS Method 861.

**Costs of Tests:** — to concrete, trial mixes, cement, aggregates, water and reinforcing steel shall be borne by the Contractor. The Contractor shall also bear the costs of any other tests (including load tests), which are required as a result of failure on the part of the Contractor to meet the requirements of the Specification.

An item against which the Contractor may allow for all costs in connection with tests on concrete cubes has been included elsewhere in these Bills of Quantities.

**Testing Authority:** — The crushing of cubes and testing of other samples except in the case of the clause "Determination of Consistency" shall be undertaken by an independent Authority as approved by the Department. The Contractor shall arrange with the Authority that copies of the results of all tests are sent direct to the Department.

**ACCEPTANCE CRITERIA FOR STRENGTH OF CONCRETE:** — Should any test result obtained from a set of three test cubes of concrete of a specific grade that have been made and tested as specified show that the strength is more than 3 MPA below the specified strength, the concrete represented by such results shall be deemed to have failed to meet the Specification. Should an examination carried out in terms of the clause "Procedure in the event of failure" satisfy the Department that the structural adequacy and durability of that part of the structure where the concrete concerned has been used, is not impaired, the concrete will be acceptable. The Contractor will however be required to review the mix design and any other factors influencing the quality to ensure that further concrete is acceptable.

Where three or more consecutive valid test results (i.e., results of sets of three test cubes that have been made and tested as specified) become available, the following criteria shall apply: —

- a) The average of any three consecutive valid test results obtained on concrete of a specific grade must exceed the specified strength by at least 2 MPA.
- b) If the criterion given in (a) above is not met but the average is at least equal to the specified strength, the concrete cast will be acceptable but the Contractor will be required to adjust the mix design and standard of control.
- c) Should the average result be less than the specified strength, an examination must be carried out in terms of the clause "Procedure in the event of failure" on that part of the structure in which concrete represented by the result has been used.

Alternatively, should a concreting operation be of such size or the testing be of such frequency that thirty or more valid test results (i.e., results of sets of three test cubes that have been made and tested as specified) become available within three months, the Contractor may choose, subject to the approval of the Department, to have the results assessed statistically. In such a case, the average of all the test results of a specific trade of concrete at *any stage* must exceed the specified strength by at least 1,7 standard deviations, failing which the Contractor will be required to adjust the mix design to ensure compliance with this criterion.

**PROCEDURE IN THE EVENT OF FAILURE:** — If after the evaluation of the test results in terms of the clause "Acceptance criteria for strength concrete" an examination of the concrete in the structure is necessary, one or more of the following procedures in the sequence given may be adopted at the discretion of the Department, and for the account of the Contractor, to determine the acceptability or otherwise of the concrete in that particular part of the structure: —

- a) An assessment of the stress level in the structure concerned in relation to the test result obtained.
- b) Non-destructive testing, subject to the availability of similar concrete of proven acceptable quality in comparable members in the same construction as a reference.
- c) The testing of drilled cores in accordance with the relevant SANS Standard Methods.
- d) Full scale load tests in accordance with Section 6 of SANS Code of Practice 0100: Part II.

Where load tests are, in the opinion of the Department, unsuitable or impracticable, and if an examination carried out in terms of the above does not show the concrete strength

to be acceptable, or if a tested portion of the structure fails to pass the tests, the Contractor shall, on the instructions of the Department, replace or strengthen by approved means: —

- a) each portion that failed or contains concrete that failed, as relevant, and
- b) any other portion, irrespective of strength, the functional purpose of which is affected by the portion or concrete referred to in (a) above.

**NON-STRUCTURAL PRESCRIBED MIX CONCRETE:** — Concrete for non-structural purposes shall be “Prescribed mix concrete” produced in accordance with the requirements indicated in the table below, and the Contractor is also referred to the foregoing Preambles insofar as they apply: —

**TABLE E – PRESCRIBED MIX CONCRETE FOR NON-STRUCTURAL PURPOSES**

Class of Concrete	Estimated minimum compressive strength in MPA at 28 days	Maximum nominal size of coarse aggregate in mm	Proportion of Constituents		
			Cement (Parts)	Fine Aggregate (Parts)	Coarse Aggregate (Parts)
A	1	37,5	1	4	8
B	15	19,0	1	3	5
C	20	19,0	1	2 ½	3 ½

Cement and aggregates shall be mixed by volume and the contents of a 50 kg sack of cement shall be taken to be 0.033 m<sup>3</sup>

The cement / water ratios and the maximum and minimum slumps for concrete shall be as previously listed in Tables C and D.

The Department shall have the right to vary the proportions of the constituents in any of the prescribed mixes as necessary to obtain the required compressive strength, optimum density and workability of the concrete. Any variation in the rates of the concrete will only be considered if the proportion of cement to the total volume of aggregate, in each case, is varied from that Specified.

Notwithstanding any requirements previously described, the Department may permit certain items of non-structural concrete in small quantities to be mixed by hand.

Where concrete is mixed by hand, the coarse aggregate shall be spread out on a timber, concrete or metal platform in a flat heap, the sand then spread evenly over the heap, followed by the cement also spread evenly, and the whole thoroughly mixed by shovelling from the centre to the side to form a ring, then back to the centre and again to the side. Water shall then be poured into the ring and the materials mixed into it and then back into the ring, the remainder of the water then added slowly as materials are mixed into it. Mixing shall continue until the colour is uniform and the consistency the same throughout the pile.

**“NO-FINES” CONCRETE:** — shall consist of one part of cement to eight parts of 19mm aggregate (1:8— 19mm stone) with a water/cement ratio of approximately 0,46. This water/cement ratio may be varied slightly to suit conditions on approval by the Department.

The quantity of water used shall be just sufficient to form a smooth grout, which shall completely coat every particle of aggregate, and also to ensure that the grout is just wet enough to form a small fillet at each point of contact between the stones. ‘No-fines’ concrete mixed with excessive water, which results in a thin grout which drops off the aggregate, will be rejected.

“No-fines” concrete shall be placed in its final position within 20 minutes of mixing and shall be placed in continuous horizontal layers. “No-fines” concrete shall be spade worked sufficiently to ensure that it fills the forms but vibrating, tampering or ramming will not be permitted.

**BREEZE CONCRETE:** — shall consists of one part cement to eight parts clean dry furnace ashes, the ashes being free from all coal or other foreign matter and graded up to particles which will pass a 26. 5mm ring from a minimum which passes a 4.75mm mesh. The finer materials from the screening to be first mixed with the cement into the mortar and the ashes added afterwards and thoroughly incorporated. The breeze concrete is to be mixed in batches not exceeding 0, 1 in 3 and each batch is to be immediately placed in position. The ashes for breeze concrete are to be obtained in an unscreened state and are to be kept dry so that sufficient fine material will be obtained from the screening to make the mortar.

## **FINISHES TO IN-SITU CONCRETE**

**Formed Finishes:** — are the concrete surface finishes developed using formwork and whose standard of finish in each class shall be as described.

The Department shall be informed by the Contractor of any defect in terms of this Specification, and no remedial work shall be carried out by the Contractor without the prior approval of the Department. Any defect shall be made good at the Contractor's expense by either removing and replacing the defective concrete, or, in certain instances only, by patching, all as approved by the Department and to the standard of finish required.

**Class F1 Ordinary Finish:** — Formwork panels shall be of such quality that upon removal, the concrete is true and even, free from fins and recesses greater than 5mm size, honeycombing, large air holes and the like. Bolt holes shall be filled if so required by the Department.

**Class F2 Smooth Finish:** —This class of finish requires a high standard of concrete work, formwork and technique.

Concrete placed in any one structure to give this finish shall be made from cement and aggregates from the same source, and similarly, the grading of the aggregate shall be kept constant.

Formwork shall be metal or wrot timber in a new condition designed and constructed to suit the particular job in hand and with shutter bolts and joints between panes in a pattern approved by the Department. Joints between panels shall be watertight, but the use of sealing tape, which marks the concrete, shall not be permitted.

Construction joints shall be in the position and of the detail shown upon the working drawings. Should the Contractor wish to incorporate further construction joints or amend the position of those shown to suit his own requirements or technique, this may be allowed provided that all design considerations are met, that the prior approval of the Department is obtained and that any extra costs are borne by the Contractor. In the case of horizontal construction joints, the top edge of the concrete on the Class F2 smooth finish side is to be struck true and level with a trowel.

Special care shall be taken to ensure that forms are clean of all pieces of tying wire, nails and other debris at the time of concreting.

The standard of finish shall be such that, upon removal of the formwork, no further treatment, other than treatment of bolt holes if required shall be found necessary to provide a straight, smooth and uniform finish of good quality and consistent colour and texture, free of all honeycombing and large air holes.

**UNFORMED FINISHES:** — are those concrete surface finishes developed without the use of formwork -

**Class U1 Ordinary Finish:** — Immediately after placing, the concrete shall be finished by screeding with the edge of a wooden board of straight and true line and working between guides set accurately to level. No mortar shall be added and noticeable surface

irregularities caused by the displacement of coarse aggregate shall be made good by re-screeding after removing or tamping down the offending aggregate.

**Class U2 Wood Float Finish:** — The concrete surface shall first be brought to the standard Class U1 ordinary finish and then floated with a wood float. Floating shall be started as soon as the screeded finish is stiffened sufficiently and the bleed water has evaporated or been removed and it shall be the minimum necessary to produce a surface free from screed marks and uniform in texture.

**Class U3 Steel Trowel Finish:** — The concrete surface shall first be brought to the standard of Class U2 wood float finish with floating being continued until a small amount of mortar without excess water is brought to the surface and then when the floated surface has hardened sufficiently to prevent any more excess fine material from being drawn to the surface, troweling with a steel trowel. Troweling shall be performed with firm pressure such as will flatten the sandy texture of the floated surface and produce a dense uniform surface free from blemishes and trowel marks. Gradual surface irregularities shall not exceed 5mm over any 3m. The sprinkling of sand and/or neat cement on the surface to absorb excess moisture shall not be permitted.

**Class U4 Power Float Finish:** — The concrete surface shall first be brought to the standard of Class U1 ordinary finish using wooden screeding boards or steel rollers. After evaporation or removal of all bleed water and immediately the concrete is stiff enough to support the machine the surface shall be closed with a mechanical power float and then finished with a mechanical power trowel. The texture of the finished surface shall be either non-slip or polished as shown on the drawings. Irregularities shall be of long wavelength not exceeding a curvature of 2mm in 600mm. Under no circumstances shall sand and/or neat cement be sprinkled over the surface either to absorb excess moisture or to fill surface blemishes or irregularities. Power floats and trowels shall be operated by skilled operators.

**TOLERANCES:** — Clause 6 of SANS Specification 1200G refers. Unless otherwise agreed by the Department, 'Degree of Accuracy' shall apply to all concrete work and steel reinforcing.

**SUPERVISION:** — The construction of all concrete work shall, at all times, be under the supervision of a competent person experienced in the production and placing of high-grade concrete. He shall personally supervise all work relating to the concrete construction and pay special regard to: —

- a) The quality, testing and mixing of materials.
- b) The finish, stability and cleanliness of formwork and excavations.
- c) The cleanliness, correct positioning and maintenance in position of steel reinforcement.
- d) The transporting, placing, compacting and curing of the concrete. The construction and stripping of formwork.
- e) The production of samples, test cubes, slump and other tests.

#### **GENERAL**

**Measurement and Payment:** — The provisions of Clause 8 of SANS Specification 1200G will NOT apply and the system of measurement that is adopted in these Bills of Quantities is the only system of measurement that will be recognised in this Contract.

No deductions have been made for pipes not exceeding 200mm internal diameter, reinforcement, conduits, structural steel, bolts and the like.

**Rates for Concrete:** — are to include for mixing, handling and depositing (by hoisting or lowering) in the forms. Rates for items of reinforced concrete are to include for thoroughly working and packing around the steel reinforcement. All reinforcement, except where otherwise described, has been measured separately.

Rates for concrete surface beds are to include for laying in suitable size panels not exceeding 20m<sup>2</sup> or as may be directed. The Contractor is to allow in his pricing of the concrete for all construction joints.

**Striking off and Curing:** — of concrete slabs and surface beds has been measured separately. The rates for all other items of concrete including stairs and landings and concrete bindings, are, except where otherwise described, to include for all necessary striking off of surfaces and curing.

The rates for items of striking off and curing top surfaces of concrete shall, unless otherwise described, apply to level surfaces.

Where exposed sloping surfaces of concrete do not exceed the limits of pitches laid down for the measurement of back shuttering, the striking off and curing of the sloping top surfaces has been measured in the case of concrete slabs and surface beds, and in other-cases provision has been made for dressing the concrete surfaces to splay.

Where items of striking off and curing are described as to falls or ramps this shall include cross-falls, etc.

The rates for striking off and curing of surface beds formed in panels must also include for all necessary temporary formwork in forming the panels.

**Rates for Formwork:** — are to be for use and waste only (except where described as "permanent") and are to include for fitting together in the required forms, propping, strutting, shoring, wedging, plumbing and fixing to true angles and surfaces, cambering formwork to slabs and beams where required, preparation and treatment of surfaces as necessary to ensure easy release during stripping, reconditioning as necessary before re-use, providing necessary temporary openings for the purpose of cleaning, inspection and placing of concrete, and for all straight cutting, splayed edges, intersections, notching and narrow widths, including waste and properly fitting at intersections, maintaining in position for periods as directed and for striking and removing.

Rates for items of formwork to soffits of slabs and to sides and soffits of beams, lintels and the like are to include for horsing exceeding 1,5m and not exceeding 4,5m high unless otherwise stated in the items.

Rates for formwork to soffits of stairs and landings are to include for all necessary horsing.

**Rates for Permanent Formwork:** — are to include for leaving in all formwork, props, etc. as permanent formwork shall be regarded as not being recoverable.

**Rates for Steel Fabric Reinforcement:** — are to include for lapping the reinforcement at all edges, as specified, for all cutting and waste, notching, etc. bending where required, wiring together at laps and for maintaining in position during placing of concrete.

**Rates for Steel Bar Reinforcement:** — are to include for all cutting, bending, hooked ends, wiring together at passing points, hoisting or lowering to the required levels, fixing in accordance with the detail drawings, cover blocks and maintaining in position during placing of concrete. The mass of mild and high yield stress steel bars shall be based on the values shown in Table E1 of SANS Specification 920— Appendix E (with no allowance being made for rolling margin and waste).

The mass of the binding wire required for fastening the reinforcement together is not included in the mass of the reinforcement. Provision for the cost of this wire shall be deemed to have been made by the Contractor in calculating the unit rate for the net mass (i.e. excluding the mass of binding wire) of the reinforcement.

#### **4. BRICKWORK**

**SAND:** — shall comply with the requirements of SANS Specification 1090, washed where necessary and screened through a 2360 micrometer mesh sieve.

**CEMENT:** — shall be Portland cement of normal setting quality complying with SANS

Specification 471 or Portland cement 15 complying with SANS specification 831. Cement containing more than 15 % blast furnace slag will not be permitted to be used.

**LIME:** — shall be hydrated lime complying with SANS Specification 523.

**WATER:** — shall be clean and free from injurious amounts of acids, alkalis, and other organic substances. If so required by the Department, the suitability of the water shall be proved by tests carried out by an approved laboratory.

**CEMENT MORTAR:** — unless otherwise described, shall be composed of one part by volume of cement to five parts by volume of sand.

**COMPO MORTAR:** — unless otherwise described, shall be composed of one part by volume of cement, one part by volume of lime to ten parts by volume of sand.

**STRENGTH MORTAR:** —where required, shall be of the class specified and as defined in Table C-I of SANS Code of Practice 0164—Part I.

**MIXING OF MORTAR:** — the materials are to be mixed dry on a non-absorbent and close jointed timber or iron platform until the mixture is of uniform colour with water added and the mixture turned over until the ingredients are thoroughly incorporated.

No cement mortar that has once commenced to set will be allowed to be used. Mixing platforms are to be cleaned and old mortar removed before any new batch of mortar is prepared for mixing. No mortar mixing by adding additional materials is permitted after 5 (five) hours.

**TESTING OF STRENGTH MORTAR:** — During the time brickwork is being laid samples shall be taken of the mortar being used as shall be directed by the Department. A group of three 70mm x 70mm x 70mm test cubes shall be made from each sample for testing at 28 days of age. Each group test cubes shall be deemed to represent the whole of the batch from which the sample was taken and shall be identifiable with the batch.

The testing shall be undertaken by an independent firm or institution nominated by the Contractor to the approval of the Department. An item for the testing of mortar cubes has been provided elsewhere in these Bills of Quantities.

**BURNT CLAY COMMON BRICKS:** — shall comply with SANS Specification 227 and are to be good quality, sound, hard, well burnt bricks, uniform in size and shape.

A sample load of bricks is to be approved by the Department and all subsequent loads are to be equal thereto.

**BRICKS FOR FOUNDATIONS:** — are to be as above but extra hard burnt bricks. Reject facing bricks may be used in lieu of extra hard burnt foundation bricks provided they are equal to a sample to be submitted to and approved by the Department. These bricks are also to be used for septic tank walls.

**BRICKWORK:** —unless otherwise described is to be in burnt clay common bricks and wherever practicable is to be in stretcher bond with the skins tied together with and including galvanized crimped wire wall ties in accordance with SANS Specification 28. The wire ties are to be of sufficient length to allow each end to be built into brickwork built into every fourth course and spaced at 450mm staggered centres (seven ties per square metre). The bricks are to be well wetted before being laid and the course of bricks laid last is to be well wetted before bedding the next course of bricks upon it. The brickwork is to have all perpend flushed up solid and each course is to be laid on a solid bed of mortar. No false headers are to be used. Whole bricks are to be used except where bats or closers are legitimately required to form bond.

Unless otherwise described one brick walls are taken at a nominal thickness of 230mm.

The joints of all walls to be plastered are to be raked out as the work proceeds to form key for plaster. All walls are to be carried up regularly so that no part is built more than 1,2m higher than the adjoining walls.

Mortar joints generally are not to exceed 10mm thickness unless otherwise indicated on the drawings. If a specific brick scale is indicated on the drawings, either drawn or written, it must be adhered to.

Solid bricks to X-Ray Room walls are to be used. If hollow core bricks are used, these are to be grouted up solid.

**HOLLOW WALLS:** — are to be formed of two thicknesses of brickwork as specified with cavity between, tied together, unless otherwise specified, with and including A.I.S.I. Type 304 stainless steel wire butterfly type wall ties in accordance with SANS Specification 23, of sufficient length to allow each end to be built into brickwork, built into every fourth course and spaced at 450mm staggered centres (seven ties per square metre). Cavities are to be kept clear of all rubbish, mortar droppings and projecting mortar.

**BRICK LININGS TO CONCRETE:** — unless otherwise described are to be tied to concrete with and including A.I.S.I. Type 304 stainless steel wire wall ties complying with SANS Specification 28 with one end embedded is to deep into concrete and other end built into the brick joints and spaced not less than seven ties per square metre.

**REINFORCED BRICK LINTELS:** — unless otherwise detailed are to be constructed in accordance with KZN Public Works Type Drawing.

**PRE-CAST AND PRE-STRESSED CONCRETE LINTELS:** — where specified, are to be of approved manufacture and the Contractor is to provide the Department with a certificate issued by the manufacturer certifying that the lintels are adequate for the purpose in terms of span, loading and number of courses and construction of brickwork above the lintel. The manufacturer is also to specify the minimum bearing required at each bearing end and the nature and period of temporary propping required. Rates or pre-cast pre-stressed concrete lintels are to include for any cement mortar filling required and for temporary propping in accordance with the manufacturer's instructions.

**BAGGING DOWN BRICKWORK:** — shall be carried out when the mortar in joints is still soft by rubbing over with wet rough sacking until all joints and crevices are evenly filled, including additional mortar if necessary to obtain an even surface or, when the mortar in joints is set, by rubbing over as described but including cement grout as necessary to fill up the joints and crevices.

**CRAMPS:** — for timber door frames shall be 1.6mm thick galvanized hoop iron 32mm wide with one end turned up 50mm and twice screwed to stile of frame and built 450mm deep into wall with other end turned up into brick joint and cranked as necessary where built into cavity wall. Cramps shall be built in approximately 330mm from top and bottom of stile and intermediately at not exceeding 825mm.

**TIES TO WALL PLATES, RAFTERS, ETC.:** — shall be 1.6mm thick galvanized hoop iron 32mm wide and at least 1500mm long with one end turned up and built in not less than ten courses deep into brickwork or embedded in concrete beams or slab and with end left projecting and wrapped around timber rafter and spiked to timber wall plate. Where ties are embedded to concrete beam or slab, they must be wrapped around the bottom steel bar reinforcement of the beam or slab.

**WELDED MESH BRICK REINFORCEMENT:** — shall be 55mm, 80mm, 155mm or 235mm wide consisting of two 3.55mm main high tensile steel wires at 50mm, 75mm, 150mm or 230mm centres respectively with 2.80mm high tensile-steel cross wires electrically welded at 300mm centres, lapped 150mm at end joints, 75mm at angles and built 110mm into connecting walls. No allowance has been made for laps.



**BITUMEN EMULSION WATERPROOFING TO BRICKWORK:** — The inner thickness of external superstructure walls whether hollow or solid, behind facing bricks, is to be bagged and painted with two coats of approved bitumen emulsion waterproofing compound.

**FACING BRICKS. PAVING BRICKS, QUARRY TILES, ETC.:** — Facing bricks shall comply with SANS specification 227. Facing bricks, paving bricks, quarry tiles, terra cotta grille blocks, etc. are to be of the types and colours specified, specially selected, free from blemishes, square on all faces, uniform in size, shape and colour and equal to a sample to be deposited with and approved by the Department.

Special care must be taken to preserve the arrases and faces of facing bricks, paving bricks, quarry tiles, etc. during transit and handling.

**FACED BRICKWORK:** — Facing bricks shall be sorted to ensure proper mixing of the bricks within the colour range of each type of facing bricks. Sudden changes in the general colour of faced brickwork in any one type of facing brick will not be acceptable. Sand used in mortar for faced brickwork is to be clean washed sand and sand from the same source is to be used throughout to maintain a uniform appearance. Faced brickwork is to be pointed as specified as the work proceeds. Keyed-in joints are to be formed with a round jointing tool and square recessed joints are to be approximately 6mm deep formed with a square jointing tool. All perpends are to be accurately kept. The bond is to be broken, if necessary, in the centre of panels above and below windows, above doors, between openings and in the centre of sides to piers. No broken bond will be allowed at reveals or quoins. All cutting to face bricks is to be done with a carborundum or other approved high-speed brick saw. Faced brickwork is to be protected from injury, mortar splashes, etc. and cleaned down with spirits of salts and scrubbed down with water at completion to the approval of the Department.

**PAVING BRICKS AND QUARRY TILES:** — unless otherwise described are to be pointed as the work proceeds with 6mm wide keyed-in joints. Paving bricks and quarry tile paving, sills, etc. are to be protected from injury, mortar splashes, etc. and cleaned down with spirits of salts and scrubbed down with water at completion to the approval of the Department.

**FIBRE CEMENT SILLS:** — are to be of approved manufacture without fixing lugs, even in shape, uniform in colour, free from cracks, twists and other defects, in single length between reveals and of the thickness and colour specified and equal to approved sample.

## **RATES**

**Brickwork Generally:** — Rates for brickwork are to include for hacking the face, or raking out the joints, of brickwork where necessary to form key for plaster, etc. and for plumbing angles and surfaces, all square cutting, wedging and pinning against columns, beams, slabs, etc. for all waste in cutting and wire ties required in tying skins together as described.

Rates for hollow walls are to include in addition to the above for keeping the cavities clean and free of mortar droppings and for butterfly type wall ties, all as described.

Where items are described as cut and pinned, built in, bedded, wedged and pinned, etc. rates are to include for grouting in or bedding solid with 1:3 cement mortar, unless otherwise stated.

Where window units, etc. are described for building in as composite, rates are to include for assembling of units as required and, unless otherwise described, for tap screwing to coupling mullions or transoms, including holes:

**Faced Brickwork, etc.:** — Rates for all fair and faced brickwork, brick paving, grille block walls and the like are to include in addition to the foregoing for building or laying to true surfaces and angles, all fair square cutting and fitting and cleaning down to approval at

completion.

Rates for brick sills, copings, steps, margins, thresholds and the like shall include for fair ends and angles unless different bricks or tiles are used or special cutting is required.

Rates for items described as "Extra over ordinary brickwork" are to be for the extra cost of the facing bricks specified over common brickwork built in stretcher bond, and are to include for building in cement mortar consisting of one part cement to five parts clean washed sand and for pointing as described.

Rates for items described as "Labour and Material" are to be for the full cost of the facing bricks specified, and otherwise as above described.

Rates for all cut face brick linings are to include for cutting and bonding at ends.

**Quarry Tiles:** — Rates are to include for all square cutting and fitting, bedding and jointing in cement mortar consisting of one part cement to three parts clean washed sand, for pointing as described as the work proceeds and cleaning down to approval at completion.

Rates for treads, sills, copings, cappings, skirtings etc. are to include for pointing to exposed edges, ends and projecting soffits.

**Air Bricks:** — Rates for air bricks and air vent, gratings are to include for forming openings through the walls, for all necessary jack arches and turning pieces, for plastering all round the openings in cement mortar, and where in hollow walls, for building cavity solid all round in addition.

**Fibre Cement Sills:** — Rates are to include for all square cutting, waste, and fitting and for bedding in an approved epoxy adhesive.

**Terra Cotta Grille Blocks:** — Rates are to include for all square cutting and waste and fitting, bedding and jointing in cement mortar consisting of one part cement to three parts clean washed sand and for pointing with keyed in joints on both faces and into reveals of openings as the work proceeds.

## 5. WATERPROOFING

**GENERAL:** — All measurements are nett — no allowance being made for laps in sheet materials or for waste in cutting.

**WORKMANSHIP:** — All work is to be carried out to the approval of the Department by skilled and qualified workmen and in accordance with the methods prescribed in SANS Code of Practice 021 for waterproofing of buildings.

All work is to be executed in accordance with the instructions issued by the manufacturer of the material being used. Roof coverings and linings are to be laid to the falls, cross falls, etc. provided in the screeds or other surfaces to which they are to be applied.

Surfaces to be waterproofed are to be dry and cleaned of all dust, chips, etc. immediately prior to the commencement of this work and are to be free of any contaminating substances or projections that may damage the waterproofing materials being used.

**POLYETHYLENE SHEETING:** — is to comply with SANS Specification 952 and bear the SANS mark. The sheeting is to be laid with a minimum lap of 150mm, unless otherwise specified, at angles and junctions with laps sealed in accordance with the manufacturer's instructions.

**MASTIC ASPHALT ROOFING:** — is to conform to SANS Specification 297 and is to be laid hot in two or three layers, as stated, with each layer of minimum 4mm thickness and laid to break joint with the underlying layer by not less than 150mm.

Prior to the commencement of any work, the specialists who lay the mastic asphalt roofing are to satisfy themselves as to the acceptability of the surfaces upon which the mastic asphalt is to be laid, as the said specialists will be held fully responsible therefore.

Mastic asphalt to surfaces not exceeding 10-degree slope is to be laid in two layers on and including one layer of approved reinforced waterproof building paper lapped 75mm at all edges. Rates are to include for all cutting and waste on building paper.

Mastic asphalt to surfaces exceeding 10 and not exceeding 20 slope is to be laid in two layers on surfaces which have been hacked, grooved or scoured to provide an adequate key. Rates are to include for the necessary preparation of the surfaces.

Mastic asphalt to vertical surfaces and surfaces exceeding 20-degree slope is to be laid in three layers on and including any necessary expanded metal lathing securely fixed to the surfaces to prevent creeping. Where vertical surfaces do not exceed 300mm in height the surfaces to receive mastic asphalt may alternatively be prime coated with a latex based bitumen emulsion primer prior to the application of the mastic asphalt.

Anile fillets to all internal angles are to be run in one operation.

Finishing coats of bituminous-based aluminium paint on mastic asphalt roofing have been measured separately.

**FLEXIBLE GLASS-FIBRE REINFORCED POLYESTER WATERPROOFING:** — shall be of the type specified, or other approved, supplied and laid in-situ by a specialist sub-contractor, all to the approval of the Department and shall carry a written 10 (ten) year guarantee.

The waterproofing applied in-situ shall consist of one layer of three-ply bituminous felt underlay bonded to the substrate and covered with flexible glass-fibre reinforced polyester waterproofing comprising a chopped strand glass-fibre mat having a minimum mass of 450g / m<sup>2</sup>, impregnated with flexible unsaturated polyester resin and finished with two coats of abrasion-resistant flexible unsaturated polyester surface coating which shall not show any sign of the glass-fibre reinforcement. The total mass of the waterproofing (excluding the bituminous felt underlay) shall be not less than 1.8kg / m<sup>2</sup>.

Chopped strand glass-fibre mat reinforcement is to comply with the requirements of SANS Specification 419.

All unsaturated polyester resins are to be suitable for their intended use and comply with SANS Specification 713 and are to be ultra-violet ray stabilised.

All flexible glass-fibre reinforced polyester waterproofing is to be finished to approved opaque colours (excluding red or orange tints), is to be properly cured, and is to be free from porosity, blisters, cracks, surface crazing or other defects which may affect its appearance or its performance, with the surface colours consistent throughout.

Samples of flexible glass-fibre reinforced polyester waterproofing are to be submitted to and approved by the Department and all work executed is to be equal to the approved samples.

**EXPANSION JOINT SEALANTS:** — Polysulphide sealants, where specified, are to be approved polysulphide sealants complying with SANS Specification 110 Type 2, well compacted into joint.

Rates are to include for priming joints where recommended by the manufacturer of the sealant being used with a suitable and approved primer.

All work is to be executed by the manufacturer of the material, or other specialist firm, all in accordance with the manufacturer's instructions.

**RATES:** — for all roofing and linings are to include for cleaning and preparing the surfaces to be waterproofed as before described, for protecting from damage and cleaning down, flood-testing if required and handing over in an acceptable and guaranteed watertight condition at completion.

**Rates for sheet waterproofing materials** are to include for all dressing, bending, narrow widths, angles, intersections, cutting and waste and where applicable for the extra material required for lapping and for sealing laps as described.

**Rates for roofing described as laid on “flat” roofs** are to include for laying to slopes not exceeding 100mm from the horizontal.

## 6. ROOF COVERINGS

**CONCRETE ROOFING TILES:** — shall conform to SANS Specification 542. The tiles are to be of pattern and colour specified and is to be even in thickness, uniform in shape and colour and free from cracks and blemishes. The tiles are to be laid to “straight bond” in accordance with SANS Code of Practice 062 with vertical joints and bottom edges of each course ranging perfectly straight.

Unless otherwise specified each tile in every third course, all tiles in eaves and ridge courses and tiles in every course on each side of hips and valleys shall be secured with copper clout headed nails driven into the battens or with approved non-corrodible tile clips and nails in accordance with the manufacturer’s instructions. Where nail holes in tiles have been cut off at hips, valleys, top edges, etc. new holes are to be drilled.

All ridge and hip cappings are to be of the types specified and of colour to match the roofing tiles. The cappings are to be bedded, jointed, pointed and torched up over roofing tiles in 1:3 cement mortar tinted to match the tiles. Where cappings having butt jointed ends are specified, an approved damp proof course conforming to Type C of SANS Specification 952 is to be fixed under, laid over the roofing tiles in accordance with the manufacturer’s instructions.

Barge cappings are to be of the types specified and of colour to match the roofing tiles. The barge capping tiles are, unless otherwise specified, to be bedded, jointed, pointed and touched up over roofing tiles in 1:3 cement mortar tinted to match the tiles with every tile drilled and secured with copper clout headed nails to timber barge boards or bearers (elsewhere measured).

Concrete tiles to residential units in non hail area’s are permitted.

**“CHROMODEK” ROOFING SHEETS:** - Shall be the secret fixed type, supplied with all fittings in full-length sheets in the profile and colour as specified. Sheets shall be a minimum of .58mm and maximum of .8mm thickness. When .58 thick sheets are used, purlin spacings shall be a maximum of 1.2mtrç and maximum 1.5mtrç for .8 thickness. Sheets shall leave the factory in the specified colour and any scratches etc., due to handling are to be ‘touched up’ on site after installation. All fixings, valleys, cappings and securing clips shall be to manufacturers’ recommendations and no variations shall be accepted without prior approval from the department.

0,58mm thick roof sheeting for purlins up to 1,2m spacing and 0,8mm thick roof sheeting for purlins exceeding 1,2m – 1,5m spacing.

In area’s up to 30Km from the coast, metal roof sheeting to be 0,58mm thick with special corrosion protection as supplied in “Global- Duro” roofing sheets. All other area’s to be 0,58mm as “Global-Tech corrosion protection. 0,58mm “Klip Lock 700 “ or “Crafflock “ and 0,8mm “ Brownbuilt “. ( 0,8mm is recommended for high rainfall and snow fall area’s due to deeper trough. )

**RATES:** — for roof coverings, are to include for all necessary half tiles at verges and for all square cutting and waste at verges, abutments, and top and bottom edges and to both sides of ridges.

Rates for cappings, etc. are to include for all short lengths, cutting, waste and fitting at intersections.

All measurements are nett. No allowances have been made for overlaps.

**CORRUGATED IRON ROOFING, CLADDING AND FITTINGS:** — are to be of an approved brand and are to be manufactured from galvanized steel sheets of the thickness specified after galvanising and having a galvanized coating of "Isacor Coating Designation Z275" for inland areas and 'Z600" for coastal areas as specified.

Roofing, etc. shall be lapped one and a half corrugations at sides and 30mm at ends unless otherwise specified. Roofing, etc. shall be fixed to timber purlins, rails etc. with standard galvanized drive screws 65mm long and to steel purlins, etc. with 8mm galvanized hook bolts of the lengths stated.

Each screw or bolt shall be fitted with one lead washer and one bituminous felt washer and shall be spaced not less than one screw or bolt to every alternate corrugation across the width at end laps and ends of sheets and at each intermediate purlin or rail.

**Rates for roofing, cladding and fittings are to include for: —**

- a) Fixing as described.
- b) Bedding washers in an approved mastic sealing compound
- c) Coating projecting ends of hook bolts and nuts with bitumen after fixing
- d) All square notches, square cutting and waste, laps, fitting and drilling. All measurements are nett. No allowance has been made for laps.

**FLUTED STEEL ROOFING, CLADDING AND FITTINGS:** — are to be approved galvanized fluted steel sheets and fittings manufactured from galvanized steel sheets of the thickness specified after galvanising

(a) **Galvanized steel sheets and fittings:** — are to be manufactured from galvanized steel having a galvanized coating of "Isacor Coating Designation Z275" for inland areas and of "Z600" for coastal areas as specified with the sheets having a plain galvanized finish and the fittings an embossed galvanized finish.

Roofing, etc. shall be fixed to timber purlins, rails, etc. with standard drive screws of the lengths stated and to steel purlins, rails, etc. with 8mm galvanized hook bolts of the lengths stated. Each fixing screw or bolt shall be fitted with washers as recommended by the manufacturer of the roofing

Vertical cladding shall be fixed with broad flutes externally - unless otherwise described - to timber rails with standard galvanized drive screws 50mm long and to steel rails with 6mm diameter x 25mm long galvanized sheet bolts. Each fixing screw or bolt shall be fitted with washers as recommended by the manufacturer of the cladding including drilling steel rails as necessary.

(b) **Baked enamel finished galvanized steel sheets and fittings:** — are to be manufactured from un-passivated galvanized steel having a galvanized coating of "Isacor Coating Designation Z275" and finished where described in the items, with approved factory applied baked enamel finish of colours to be selected by the Department.

Roofing, etc. shall be fixed to timber purlins, rails, etc. with sherardised or stainless steel drive screws of the lengths stated and to steel purlins, rails, etc. with 8mm diameter sherardised or stainless steel hook bolts of the lengths stated. Each fixing screw or bolt shall be fitted with washers as recommended by the manufacturer of the roofing.

Vertical cladding shall be fixed with broad flutes externally, unless otherwise described, to timber rails with sherardised or stainless steel drive screws 50mm long and to steel rails with 6mm diameter x 25mm long sherardised or stainless steel sheet

bolts. Each fixing screw or bolt shall be fitted with washers as recommended by the manufacturer of the cladding including drilling rails as necessary.

- (c) **Generally:** — where sheet lengths are in excess of 12m these have been measured separately.

Roofing, etc. shall be lapped one flute at sides and 230mm at ends unless otherwise specified. Fixing roofing sheets are to be spaced one every crest along purlins at top and bottom edges of roof slopes and one to every alternate crest along intermediate purlins. Fixings to vertical cladding are to be spaced one to every alternate trough to each rail.

Fittings, unless otherwise specified, are to be lapped a minimum of 150mm and where necessary are to be drilled for and fixed with the fixings securing the roofing and cladding sheets.

**Rates for roofing, cladding and fittings are to include for: —**

- (a) Fixing as described and in accordance with the manufacturer's instructions.
- (b) Seam bolting all side laps at not exceeding 450mm centres with 6mm diameter x 25mm long sheet bolts or with 20mm x No. 14 self-tapping screws and each screw or bolt is to be fitted with washers as recommended by the manufacturer of the roofing.
- (c) Fixing of fittings where described as fastened to roofing, cladding, etc. with approved pop rivets spaced at not more than 340mm centres.
- (d) Sealing side and end laps of sheeting and end laps of fittings with one continuous strip of approved 5mm diameter pre-formed flexible sealant strip.
- (e) Coating the exposed heads of fixings and fasteners to baked enamel finished materials and cut edges of sheets and fittings with matching touch-up compound supplied by the manufacturer of the sheeting and in accordance with his instructions.
- (f) All square notches, square cutting and waste, laps fitting and drilling. No punched holes will be permitted.
- (g) Taking special care at all times to prevent damage to the finished surfaces of the baked enamel finished materials.

All measurements are nett. No allowance has been made for laps.

## **7. CARPENTRY AND JOINERY**

**NOMENCLATURE OF TIMBERS:** — Timber described as "softwood" is to be South African softwood of the relevant type, grade, etc. as specified.

The names used for imported timbers are those given in Supplement No. 1 to SANS Code of Practice 12 under "Nomenclature of Standard Trade Names of Imported Commercial Timbers used in South Africa" and the Contractor is referred thereto.

**TIMBER SIZES:** — Sawn and wrot timbers are to be of the full sizes stated.

Where "out of" sizes have been shown for wrot timbers on the drawings, an allowance of 4mm for each wrot face off the sizes shown has been made.

Doors, fanlight, sashes, manufactured boarding, plywood, veneers, etc. must be of the full thickness specified.

Where doors, door frames, fanlights and frames; sashes, windows and frames are measured as numbered items, the overall sizes are given to the nearest 10mm.

Tolerances in nominal dimensions for imported timber shall not exceed the following:

- a) For nominal dimensions up to 76mm the actual dimension may be 2.5mm under for each 25mm
- b) For nominal dimensions 76mm and over the actual dimension may be 1.6mm under for

each 25mm.

**STORAGE OF TIMBERS:** — Timber delivered to the site is to be properly stacked above ground, either on bearers or platforms under cover and protected from inclement weather.

**ORDERS:** — for timber, are to be placed immediately after the Contract is signed, as the Contractor will be held responsible for any delay in delivery.

**PRE-TREATMENT OF TIMBERS:** — All permanent timbers installed in the buildings are to be treated against borer, cryptoterms, termites, and all wood destroying agencies with an approved preventative, all in accordance with SANS Code of Practice 05.

Any surface subsequently exposed by cutting or planing must be touched up with the same preservative solution and rates are to include for all preservative required.

The Contractor is to obtain a certificate from the merchants supplying the treated timber, to the effect that the timber has been treated against wood destroying agencies. The Department has the right to remove samples of the treated timber to have tests carried out by the Division of Entomology or any other Authority.

Temporary timber on the site, e.g. shuttering props, etc. must be free from wood destroying agencies. Any timber so affected is to be immediately removed from the site.

Materials which do not comply with the above requirements or are in any way damaged or discoloured by the pre-treatment must be replaced by the Contractor at his own expense, if so directed by the Department.

**STRESS GRADING OF SOFTWOOD TIMBER:** —The Mechanical Stress Grading of Softwood Timber (Flexural Method) shall be in accordance with SANS Code of Practice 0149.

**STRUCTURAL TIMBER:** — for carpentry is to be South African softwood in accordance with SANS Specification 563 and, unless otherwise specified, of Stress Grade V4, and branded accordingly. If it is necessary to use sizes that have to be re-sawn, these shall be re-graded and stamped with the respective SANS stress grade mark. Unless this is done, timber which is re-sawn is no longer considered as complying with the specification and shall on no account be used.

**BRANDERING / BATTENS:** — of cross-sectional size 50 x 50mm and under shall be South African softwood in accordance with SANS Specification 653 and branded accordingly.

**JOINERY AND SHELVING:** — Softwood for joinery and shelving shall be South African softwood (S. A. Pine) in accordance with SANS Specification 1359 and branded accordingly. All timber for joinery is to be air or kiln-dried to a moisture content of approximately 12 %.

Shelving to linen stores to be timber slatted with wall bands or free standing units as specified.

**STRUCTURAL LAMINATED TIMBERS:** — are to be of the sizes detailed, wrot on all faces and are to be manufactured by an experienced fabricator to the approval of the Department. Adhesives used must meet the requirements of the current SANS 1204 for external use.

The surface appearance of members shall be Class C (Constructional) or Class S (Selected) as defined in SANS Specification 876 and as stated in the items

**FINGER-JOINTED TIMBERS:** — are to be manufactured in accordance with SANS Code of Practice 096— "The manufacture of finger-jointed structural timber".

Contractors wishing to use finger-jointed timber must supply a guarantee that the finger jointing complies with the above Code of Practice and that the glue is suitable for the particular member.

**JOINTING OF PURLINS, FASCIAS, RAILS, BEAMS, ETC.:** —shall, unless otherwise detailed, be as follows: —

Purlins, slating battens, etc. of cross-sectional size 50 x 76mm and under shall be jointed over the rafter. Larger sized purlins may be dealt with in the same way or by using some other suitable, recognised method. All purlins and battens shall be fixed to the supporting rafter by at least one nail skew driven from the direction of the ridge. Where the purlin or batten is fixed at more than 900mm centres, at least two nails shall be used at every fixing point.

Fascias shall be jointed over rafters.

Beams, rails, etc. shall be jointed over a support or at 1/5th span with a recognised joint using bolts, etc.

Roof and floor plates are to be halved at joints, angles and intersections and nailed together.

Floor joists and bearers are to have splayed heading joints nailed together and staggered to occur over bearers and sleeper piers respectively.

Sawn brandering is to be butt-jointed at heading joints and angles and where wrot, is to have splayed heading joints and mitred angles over all point of support.

**HARD WOODS:** — (Red Meranti and Sapele) are to be best quality, specially selected and well seasoned, free from all sapwood to the approval of the Department and are to be well kiln-dried.

Red Meranti is to be even in grain and colour, selected from "Standard and Better" grade from Malaysia. Sapele is to be *Entaindrophragma cylindrium* of F..A.S. grade.

#### **PREFABRICATED TIMBER ROOF TRUSSES: -**

**Design:** —The design of prefabricated roof trusses, bracing, and secondary members forming part of the total timber roof construction shall be prepared by a professional structural engineer (Truss Systems Engineer) strictly in accordance with SANS Code of Practice 0160 and the superimposed loading, unless otherwise specified, is to be taken as that for inaccessible roofs.

**Analysis:** — From the configuration and mechanism shown on the tender drawings the Truss System Engineer shall submit, through the Contractor, to the Department detailed calculations and working drawings showing timber sizes, connections, truss dimensions, etc.

This submission must include details of both trusses and bracing as specified below:

- a) **TRUSSES:** The analysis of the truss system is to include diagrams of the trusses with marked up members and nodes showing dimensions, positions of supports and positions and values of applied loads, which, if not specified in the tender documents, must be derived from an approved source of reference which shall be indicated in the analysis. Due account must be taken of any eccentricity particularly at supports.

The analysis must also indicate allowable stresses, internal axial forces, moments and resulting stresses, as well as timber sizes and grades and detailed plate sizes

- (b) **BRACING:** Bracing must be designed to withstand the forces specified in SANS Code of



Practice 0163 clauses 6 and 7.

If the bracing system incorporates trusses, the additional forces must be shown in the analysis of the trusses.

The drawings must give all the information necessary for the construction of the bracing.

An outline of the bracing system, including temporary bracing must be shown on a working drawing giving clear details of fixings and anchorages into the supporting structure at wall plate level. Interference of bracing with truss members must be taken into account. Moments caused by forces applied between node points of bracing trusses and the axial forces must be given in the bracing calculations, also sizes and fixings of the bracing system.

**Submissions:** — A copy of letter reference TR1 (attached at the end of this document) completed and signed by the Truss System Engineer must be submitted by the Contractor at the same time as the list of Sub-Contractors. Two sets of calculations and drawings with pertinent erection instructions for the whole roof construction as presented by the Truss System Engineer must be submitted to the Department for consideration and permission to proceed.

This in no way absolves the Contractor of his responsibilities.

Any modifications to design or drawings are to be arranged directly between the Truss System Engineer and the Department. It will be the Contractor's responsibility to ensure that information is presented to the Department in good time and no claims will be entertained in respect of any delays resulting from the late approval of drawings, etc.

Any difference in cost between the roof system initially submitted by the Contractor and the finally accepted system to meet the original design requirements will be for the account of the Contractor.

The Truss System Engineer will be required to inspect the roof structure and certify on letter reference TR2 (attached at the end of this document) that the construction is in conformity with his design, and any costs in this respect must be included in rates for the truss system.

If, in the opinion of the Department, further visits are necessary due to errors or omissions on the part of the Contractor or the Truss System Engineer the costs of these inspections will be for the account of the Contractor.

**Fabrication and Storage:** — Fabrication shall not commence until written permission has been given by the Department. The prefabricated roof trusses shall be manufactured, supplied and delivered to site by an approved manufacturer with all members accurately mitre cut, close butted and rigidly fixed together by approved galvanized metal spike connectors applied simultaneously to both sides of every joint by use of a mechanical press in accordance with SANS Code of Practice 0163.

Permissible deviations in fabrication of trusses are to be as specified in SANS Code of Practice 0155.

The following will not be permitted at joints: —

- b) knots, splits or finger joints
- c) varying member thicknesses
- d) plates not fully pressed into timber
- e) gaps between members exceeding 1.5mm average over the width of the mitred members.

Stress grade marks must be clearly visible on all members.

Relevant dimensions must be checked on site before fabrication. Trusses must be stored off the ground and under cover both at the factory and on site.

**Erection and Bracing:** — Unless otherwise instructed, erection must be carried out as described in “The Erection and Bracing of Timber Roof Trusses” published by the Truss Plate Association of South Africa and the National Timber Research Institute - CSIR.

Where the overall lengths of trusses exceed 13 m, complete braced bays are to be assembled on level ground and lifted into position suspended at maximum 3m intervals from a spreader bar. Alternatively, braced bays may be assembled in position on a minimum of two lines of temporary intermediate supports below node joints. Temporary supports must be removed before roof covering is placed.

The erector must be suitably qualified and must satisfy the Department that he can meet the specification.

Where the roof incorporates a hipped end, the construction is to commence with the hip, otherwise erection is to be commenced with a fully braced bay.

Temporary bracing must be installed as erection proceeds in accordance with the accepted design.

The Contractor must notify the Department in sufficient time in order that an inspection may be made before the roof covering is placed.

The trusses will be subject to the following tolerances: —

- a) maximum out of straight — length/400
- b) maximum out of vertical at any point—height/200.

**Rates:** — The Contractor is to allow in his rates for the roof trusses for the design, manufacture, supply, hoisting and fixing of the roof trusses and permanent bracing, any necessary temporary bracing, and for the costs of all inspections by the Truss System Engineer.

Purlins or battens for roof coverings have been measured elsewhere. Rates for roof trusses are also to include for the exposed rafters at eaves overhangs to be wrot all round and trimmed and splay cut as required.

**INSULATION, WATERPROOFING AND DUST PROOFING MATERIAL FOR ROOFS:** — shall be of an approved aluminium foil faced both sides laminated Kraft Paper and synthetic reinforced material fixed in accordance with the manufacturer's instructions, lapped 150mm at all edge, unless otherwise specified.

**GYP SUM PLASTERBOARD:** — is to be in accordance with SANS Specification 266.

**GYP SUM COVED CORNICES:** — are to be in accordance with SANS Specification 622.

**FIBRE CEMENT SHEETS:** — are to be in accordance with SANS Specification 685.

**FIBRE CEMENT CELLULOSE SHEETS:** — are to be in accordance with SANS Specification 803.

**HARDBOARD:** — is to be in accordance with SANS Specification 540. Tempered and un-tempered hardboard is to be conditioned in accordance with the manufacturer's instructions before fixing in position.

**VENEERS:** — All decorative face veneers are to be selected kiln dried of best quality of the respective timbers, free from knots, cracks, patchwork, sapwood and other defects and bonded under heat and hydraulic pressure with water-resistant synthetic resin adhesive.

Commercial veneers are to be selected rotary cut hardwood veneers and otherwise as

described above.

**PLYWOOD:** — is to be long grain three or five-ply type manufactured with hardwood veneers with selected face veneers as described, bonded under heat and hydraulic pressure with water-resistant synthetic resin adhesive and sanded to a smooth finish.

**CHIPBOARD:** — All joinery fixtures shall be manufactured from 18mm Moisture resistant V313 Melamine Faced Chipboard (Particle Board) only with 32mm worktop as specified.

**BATTEN BOARDING:** — is to be long grain three-ply boarding manufactured with kiln-dried South African Meranti softwood core formed of laminations not exceeding 45mm wide and faced on both sides with selected veneers as described, bonded under heat and hydraulic pressure with water-resistant synthetic resin adhesive and sanded to a smooth finish.

**DECORATIVE LAMINATE LININGS:** — are to be 1.2mm thick approved general purpose quality high pressure decorative melamine laminate sheeting with satin finish and of selected colours and patterns, and rates are to include for all square cutting and waste and square notching, close cut and mitred external angle intersections where required and for bonding to the timber backings with an approved adhesive in accordance with the manufacturer's instructions.

The linings are to be cut out of single sheets in obviate joints but where joints are unavoidable, the sheets are to be butted to form a tight inconspicuous joint.

**NAILS AND SCREWS:** — Mild steel nails are to be in accordance with SANS Specification 820. Mild steel and brass screws are to be round headed, countersunk, etc. as appropriate and are to be in accordance with SANS Specification 1171. Nails and screws shall be of the size, length and type appropriate to their respective uses.

**PLUGS, ETC.:** — Where items of woodwork are described as "plugged", these may be nailed to timber plugs or slips built into the structure, and where described as "plugged and screwed" these may be screwed to timber or approved patent fixing plugs.

**SHOT FIXING:** — Where items of woodwork are described as "shot fixed" these are to be fixed with an approved cartridge-assisted tool, and rates are to include for all nails, spikes, blanks, washers, cartridges, accessories, etc.

**CARPENTRY:** — Timbers are to be the best of their respective kinds, free from sap, shakes, large, loose or dead knots, wavy edges and other defects and thoroughly seasoned. Wrot surfaces are to be finished clean, smooth and free from tool marks.

Timbers shall be in as long lengths as possible.

Rates for sawn and wrot structural timbers are to include for notching, splay and birds mouth cutting, housing, halving, scarfing, cutting timbers to the required lengths, spiking and clinching and or hoisting and fixing timber in position.

**CEILINGS:** — are to be of the types described, fixed to timber brandlering, bearers etc. as described and with panels set out so as to give even width panels not less than half a sheet wide at edges. Brandlering shall be spaced at not more than 400mm c/c and fixed at right angles to sheets.

**FLUSH PLASTERED CEILINGS:** — are to be formed of gypsum plaster board of the thickness stated, generally in 1200mm widths and long lengths, fixed grey side down to timber brandlering, bearers, etc. as described, with butted joints between the boards covered with 65mm wide strips of galvanized wire scrim fixed along both edges, including all square notches and square cutting and waste, and the ceiling finished with two coats of approved retarded hemi hydrate gypsum plaster applied in accordance with the manufacturer's instructions to a finished thickness of not less than 6mm, including pressing into scrim over joints and finished to a smooth polished surface.

**TRAP DOORS:- 900 x 600 Prefabricated hinged trap door.**

**SUSPENDED CEILINGS BOARDS:** — are to be of the types described or as specified — normally 6mm x 600mm x 1200mm embossed fibre cement boards - and inclusive of their component parts must be of sufficient strength to perform the function for which they are to be used, manufactured from best quality materials and conform to the requirements of the Fire Master. The exposed surfaces of all ceiling panels and supporting members are to be uniform in colour and free from surface blemishes.

Hangers are to be galvanized and are to be at maximum 1, 2mtr centres to meet the requirements of the specification, each with one end fixed to the suspension grid main bearers and the other end fitted with suitable galvanized fixing straps to the roof structure. Fixing points must be agreed to by the Department before any power shot fixings are made. Hangers must not be suspended from air-conditioning ducts. Hangers to be provided at all four corners of recessed light fittings.

Component parts and fixings other than aluminium must be non-corrosive and able to withstand atmospheric pollution. Surfaces of aluminium which are in contact with other materials when fixed, particularly ferrous metals, are to be suitably insulated to prevent electrolytic corrosion.

All work is to be executed by specialists in accordance with the manufacturer's instructions, and to the approval of the Department.

Rates for ceilings are to include for hangers, suspension systems, ceiling panels, for constructing the ceilings in a manner suitable for carrying air conditioning diffusers and light fittings in the positions required, for setting out the ceilings to layouts approved by the Department, for all non-standard size panels, for modifications to standard suspension systems as necessary to work around any air-conditioning ducts or pipes or light fittings, for all necessary square cutting and waste, notching and fitting around projections, columns, etc.

**EXPOSED TEE-SYSTEM SUSPENDED CEILINGS:** — are to be of the type described with main tees and cross tees spaced at the required centres to suit the sizes of panels used, with the cross tees fitted between and notched to form a flush fit with main tees unless otherwise described. All suspended ceilings to be fitted with shadow line trimming to perimeters.

Main and cross tees shall be holed as necessary and provided with timber wedges or steel clips to prevent ceiling panels from lifting.

**CONCEALED TEE-SYSTEM SUSPENDED CEILINGS:** — are to be of the type described with main and cross tee section bearers spaced at the required centres and all properly fitted together at intersections.

**ALUMINIUM TRIMS TO CEILINGS:** — are to be of extruded aluminium of 6063-TF or equivalent quality and temper, of the sections described. Anodised trims are to be of the colour stated.

Rates are to include for all cutting, fitting at intersections, mitres, etc. and rates for items described as fixed with screws are to include for countersunk drilling and fixing with approved countersunk stainless steel screws.

**INSULATION MATERIAL FOR CEILINGS:** — shall be 75mm thick resin bonded glass wool / mineral wool thermal insulation blanket complying with SANS Specification 1381 of the thickness specified, delivered to the site in unopened rolls in its original factory wrappings over solid gypsum boards or styrene of 25mm thickness as specified glued to suspended ceiling tiles.

## **DOORS: —**

**Flush Doors:** - Semi-solid and solid laminated flush doors are to be of approved manufacture complying with SANS Specification 545.

The doors are to be finished on both sides with the facing veneers specified and concealed on both stiles unless otherwise specified, with hardwood edge strips and where doors are required to receive a transparent finish, the edge strips are to match the facing veneers.

Doors with rebated meeting stiles are to have edge strips to the meeting stiles not less than 19mm thick.

Each door or leaf of double door, described as hung to swing, is to be fitted with necessary hardwood reinforcing blocks for bottom shoe and top centre of spring hinge.

Unless otherwise specified, all flush doors are to be interior quality, but, where exterior doors are specified, the glue used must comply with Type WBP of SANS 2304.

**FRAMED, LEDGED AND BRACED BATTEN DOORS, ETC.:** — Doors described as filled in with V-jointed boarding are to be filled in flush on one side with tongued and grooved vertical boarding, V-jointed on one or both sides and of the thickness stated. The boarding is to be in narrow widths, closely cramped up, rebated on outer edge and housed to grooves in stiles and rails and twice brass countersunk screwed at each intersection.

Ledges and braces and inner edges of the abutting stiles and rails are to be chamfered to form a V-joint at junction with the boarding. Braces to fall from lock to hinge side.

**ENTRANCES TO SECLUSION WARDS:** - Entrances to seclusion ward buildings shall be fitted with remote controlled full height 'Man Trap' Security Cubicles with bell pushes fitted to both entry and exit sides and remote unlocking / release operation enabled from security booth.

**Doors to Seclusion Rooms:** - Doors to seclusion rooms are to be steel lined solid core units with 100mm x 100mm viewing panel, glazed with 40mm bullet proof glass in a steel frame. Steel lining for doors is to be epoxy laminated to doors and around edges. Internal steel lining to be primed and finished with approved epoxy paint. External face of doors to be finished in veneer as per DOH standard details. Doors to be hung to open inward on special 6mm galvanized steel door frames with lugs pre welded to frame to fit every third course of brickwork. The complete unit is to be hot dip galvanized and built into surrounding 230mm solid brick walls. No welding to be done on site.

**NOTE:** - Above Anti-Bandit Security doors are solely supplied by "Chubb" and "Bitcon Industries" as a complete unit with all fittings and ironmongery.

## **DOORS TO X-RAY UNITS**

Entrance doors to X-Ray rooms shall be top hung sliding door size 1830 x 2032 x 40mm, complete with heavy duty sliding door track – 'Henderson' or other approved -, 2.2mm lead insert between panels and four door stoppers. Door is to overlap door opening 100mm each side when closed.

**JOINERY:** — All timbers shall be in as long lengths as possible. Lengths for joinery shall be single where possible and where joints are unavoidable, they shall be made as inconspicuous as possible.

Timber for grounds, firrings, blocks, plugs, etc. shall be sound and free from defects.

All joinery work is to include for work in connecting by mortise and tenon, dovetailing, housing, flush pinning, etc. as may be by required and for all screws, nails and glueing

together and for sinking flush all exposed screws unless otherwise specified.

Wrot surfaces and edges are to be steel scraped and sandpapered before and if necessary, after fixing.

Edges are to be arras rounded unless specified to be angle rounded.

"Arras rounded" denotes that the sharp edges are slightly rounded off and that no mitring is required.

"Angle rounded" denotes rounded from 3mm to 10mm radius and is to include for housed and mitred joints.

Hardwood doors, frames, jamb and soffit linings, etc. are to be treated on all surfaces with one coat of approved sealer before building in, etc. and rates for these items must include for this. Batten doors with tongued and grooved battens are to have the tongues and grooves well sealed before assembling. The sealer used shall be compatible with the finishing coats to be applied.

Horns of door frames are to be checked and splayed back where frames are fixed projecting or flush with surface and built in.

Where doors, fanlights or sashes are described as hung to butts on steel or aluminium frames, rates are to include for supplying necessary steel, brass or stainless steel screws.

Panel work is to be secured to the grounds, etc. with screws concealed behind the mouldings or by sinking the screws and pelleting as directed.

Joinery is to be framed up, but not glued or wedged, immediately the order is given to commence work. Wherever possible, joinery shall not be placed or fabricated in position until the plaster has dried out. Reasonable tolerance shall be provided at all connections between the joinery and building carcass so that any irregularities, settlements or other movements shall be adequately compensated. All joinery shall be accurately scribed to fit the contour of any irregular surface. Should the joints of any joinery open or give, such defective work is to be taken down, refitted and redecorated or replaced by new joinery at the Contractor's expense.

Only brass screws may be used for hardwood joinery.

The Contractor is to allow for cross-tonguing all solid wood sections unobtainable in single widths.

No joinery is to be primed until it has been inspected and approved by the Department.

All joinery liable to injury must be protected to the satisfaction of the Department. Rates must include for this temporary protection.

Rates for timber frames, mullions, transoms, linings, standards, rails, fascias, cornices, skirtings, beads, picture rails, etc. are to include for mitres, etc.

Rates for all items of timber-are to include for fixing and planting on as may be required with necessary panel pins or nails.

#### **PARTITIONS:**

These are to be of an approved system of standard construction, with an average sound rating of not less than 30 decibels taken over the whole face area.

Framing is to be natural finish anodised aluminium comprising posts at 1200mm centres unless otherwise described, with transom rails where specified, fitted between the posts, a

rail against ceiling and an aluminium standard skirting on each side at base, all neatly and securely fixed together.

Provision is to be made at the base of the partitions and in the ceiling rails and posts for electrical wiring, which will be installed under the electrical sub-contract, and the ceiling tails and end posts are to be fitted with continuous removable access plates.

Solid panelling is to be approved solid chip core panels of the thickness specified faced on both sides as described in the items.

Glazed panels are to be glazed as required, complete with all necessary natural finish anodised aluminium glazing beads and vinyl glazing strips.

Louver panels where specified are to be approved natural finish anodised aluminium adjustable louver sets each comprising head and sill weather bars and two jamb strips each fitted with louver brackets with spring loaded clips for and fitted with and including louvers as required and complete with tilt bars and operating lever handles. Where the openings are not the correct size to suit a full number of standard width louver blades, an alternate head weather bar must be provided to suit a fixed louver blade of the required width. The louver sets are to be fitted with the jamb strips positioned horizontally so that the louvers will be fixed vertically.

Partitions are to be in 1200mm modules, unless otherwise specified, except at ends where the odd lengths are to be made up by a narrow width at one end of the partition.

Ends of partitions against walls, window frames, etc. and the top edge of partitions against ceilings are to be fitted on both sides of partition with approved vinyl scribing sections fitted between the structure and the end post or top rail of the partition.

Plain openings are to have aluminium frames similar to door openings neatly fitted into the framing.

Doors are to be solid laminated flush doors complying with SANS Specification 545. The doors are to be finished on both sides with veneer as described in the items and concealed on both stiles with matching hardwood edge strips.

Where doors are described as having observation openings, these openings are to be of the sizes stated, glazed as specified with all edges bedded in approved neoprene gaskets and fixed with 10 x 25mm wrot matching hardwood rebated glazing beads mitred round and bradded to both sides.

Rates for doors are to include for all necessary additional aluminium framing to form door openings, and for hanging the doors on and including one and a half pairs of 102mm satin chrome finish brass hinges to each door.

All locks to doors in demountable partitions are to be supplied with two keys, and are to be controlled by the same master key as the mortise locks used elsewhere in the Contract when specified.

Unless otherwise specified all veneered solid panelling and doors are to be finished as follows: —

Prepare, stop with tinted stopping, apply an approved stain as necessary to achieve uniform colour appearance, and three coats of approved clear matt polyurethane finish including burnishing with steel wool between coats.

Rates for demountable partitions are to include for supplying, assembling, erecting, finishing, glazing and fixing complete between finished surfaces of concrete floors, plastered walls and ceilings, and all in accordance with the manufacturer's instructions.

## **DEMOUNTABLE PARTITIONS 50MM ( NATURAL ANODISED).**

### **Extruded Aluminium Sections**

Supply and fit demountable "Kappa" partition system comprising anodized aluminium U-Channel fitted to suspended ceilings. Vertical split-post (mullion) to be fitted between floor and ceiling U-Channel at 1225mm c/c with angle brackets. Once framing is fixed, fit panels into place and secure with clip-on cover plates.

All aluminium sections may be anodized or powder coated in a variety of colours.

### **Panels**

41mm thick semi solid core panels 2032 x 1200mm. The panels are made up of two outer skins of 3.2mm hardboard cladding. Lower panels to be provided with a 150mm wide solid mid-rail 850mm from the base of the panel to the centre of the mid-rail built in as part of the construction. The panels to be prepared before applying the final finish as specified.

### **Construction**

Right angled corners to be formed with natural anodized aluminium radiused corner post fitted from floor to ceiling. Floor fixing to be angle brackets and ceiling fixing to be hidden block. The ceiling U-Channel butts up against radiused corner post.

### **Door Frames**

Door frames to be natural anodized aluminium pre-fitted with woolpile gaskets, clipped into H-Profile at head and clipped into combination split post and cover plate at styles. The rebate on the door frame caters for standard doors of a thickness between 40mm and 44mm.

### **Glazing**

Glazed panes to be framed with H-Profile fitted horizontally at top and bottom, butted against side of split-post and clip on cover plate combination and fixed with angle brackets. Glazing sections pre-fitted with woolpile gaskets and set into H-profiles and into post / cover plate combinations to form a neat glazing opening. Glazing beads pre-fitted with woolpile gaskets and then clipped into glazing section.

### **Termination**

Openings for louver frames, sliding doors and windows, serving hatches and partition ends are to be lined with the aluminium termination section.

### **Skirtings**

76mm high aluminium skirting to be glued to panels.

## **DRYWALL PARTITIONS:**

### **Studs**

50mm x 33.5mm x 0.5mm thick drywall galvanised steel studs are used. The studs to receive aluminium extrusions clipped onto both sides of the stud. Framing to be securely fixed to walls, floor and ceilings where necessary. Stud connectors to be used to join horizontal studs to vertical studs.

### **Floor Track**

52mm x 25mm x 0.6mm galvanised sheet steel track to be used.

### **Panels**

12,7mm thick tapered edged gypsum plasterboard panels used and decorated in situ with panels secured to either side of framework.

Patient care areas to be 12mm Supa Wood panels in framework as specified.

### **Construction**



Internal walls are constructed by fixing drywall studs to floor track @ 600mm c/c. Wall and ceiling junctions are formed by fixing 84mm x 19mm aluminium ceiling and wall channel to wall or ceiling. The floor track is then fixed into this; alternatively, these components may be fixed simultaneously. The studs are then fixed to floor.

The partitions, unless otherwise described are to be 75mm thick and covered both sides with 12,7mm thick tapered edged gypsum board in 1200mm widths to height specified.

The gypsum boards are screwed @ +/- 300mm c/c at all intersections to the floor and head wall tracks and vertical studs.

Using self-drilling, self-tapping, rust proofed countersunk screws, with screw heads and joints between boards and between abutting edges of boards flushed up with an approved jointing material.

#### **Exposed Aluminium Framing**

Door frames, glazing termination and ceiling and wall channels to be natural anodised aluminium. 25 x 25 x 1.5 aluminium angle stuck to external corners of partitioning. 80mm high aluminium skirting glued in position.

#### **Glazing**

Aluminium glazing section is clipped onto the flanged end of the stud around the glazing perimeter. The glazing section has a recess to accept a rectangular clip-in glazing bead which enables 3mm-8mm thick glass to be received in the system. The glass is retained with various sizes of PVC glazing gasket.

#### **Termination**

Openings for louver frames, sliding doors and windows, serving hatches and partition ends are to be lined with the aluminium termination section.

#### **Skirting**

The system is designed to accept recessed base, female, 60mm high aluminium skirting.

#### **Sound Insulation**

75mm Fibreglass Cavity Bat with a 35g glass tissue or 75mm Isotherm "Acoustisorb" mineral wool blanket is to be installed between studding before fixing final outer panel.

All work is to be executed by a firm specialising in this type of work and all to the approval of the Department.

### **8. FLOOR COVERINGS, PLASTIC LININGS, ETC.**

**FLOOR SHEETING:** — are to be of the composition, type, size and thickness specified with colour, pattern, graining, etc, consistent throughout, all to the approval of the Department.

Thermoplastic floor tiles: — are not to be used.

Fully flexible vinyl floor sheeting: — are to comply with SANS Specification 786 and is to be 2.5 mm nominal thickness.

Recessed entrance mats with brass frame at main entrance into a health facility as "Belgotex" Grimbuster or other approved. This to be positioned outside before entering.

In patient care area's, no perforations to floor covering is to be made. Eg door stops, door barrel bolt floor keeps etc.

Where the specified sizes and/or thicknesses of floor sheeting differ from those in the SANS Specifications, such items of floor sheeting shall comply in all other respects with the relevant SANS Specifications.

**SKIRTINGS, STAIR NOSINGS, EDGING STRIPS, ETC.:** —are to be of the types and sizes specified and are to be of approved manufacture

**CARPET TILES AND SHEETING:** — are to be of the types specified and of approved colours and patterns all to approval of the Department.

## **LAYING: —**

Vinyl Floor covering laying procedure and polishing.

Site conditions required before the layer commences an installing of a Resilient Floor covering. Some of these conditions may appear obvious, but they are not always complied with. If any of the following recommendations are ignored, it is likely that a number of problems will arise during or after installation of the flooring.

1. All building materials and equipment, e.g. sand, scaffolding, tools, etc. should be removed. (Do not allow heaps of sand, concrete, etc., to remain on the surface of the sub-floor since moisture transfer to the sub-floor takes place).

2. All resilient flooring materials require a smooth, hard, clean and level surface, not only for appearance but also for achieving a satisfactory adhesive bond and long-term durability. The Specifier and the Main Contractor shall ensure that the sub-floor is acceptable to receive the resilient flooring specified in respect of levelness, smoothness, soundness and cleanness. (The SANS Code of Practice 070/1991 as amended 1993 Section 9.3 details the requirements in this regard).

The flooring contractor shall ensure that the sub-floor is sufficiently dry prior to the installation of the flooring material. The floor should be tested by means of a Hygrometer or a TrameX. (Of the instruments available for determining moisture levels in sub-floors, the most practical and accurate is the hygrometer).

## **SHEETING**

Ensure that the following steps are followed during the installation:

1. Trim off factory leading edge before laying sheeting.
2. Align the sheet in position that there is an opening no bigger than 1mm between adjacent sheets. For the best results, the width of a credit card is an acceptable measure.
3. Apply adhesive according to the manufacturers' specifications.
4. Roll the floor during and after installation with a 68kg roller to maximize the adhesion between the sheeting and the adhesive.
5. Complete the welding 24 hours after the installation. Groove the joints open with a suitable hand or electric groover to a width of not wider than 3mm and not deeper than 1.5mm. Weld the joints with a hot air welding gun with temperature settings of between 4-6 temperature setting and use a speed nozzle that will not burn the material or damage the coating. Use a sharp spatula and guide plate and remove the excess welding in two stages.
6. All vinyl sheeting needs to be stripped and sealed 72 hours after installation. Please ensure you use a good quality product.

### **2.1 HYGROMETER**

When a hygrometer is positioned on a sub-floor surface, the reading of the relative humidity of the entrapped air space is obtained.

- A hygrometer reading of less than 70% indicates that the sub-floor is sufficiently dry for flooring to be laid upon it.
- If the hygrometer indicates a final reading of more than 70% when the initial reading of the atmosphere was less than 70% then the sub-floor is unacceptably damp and must be allowed to dry out before any flooring is installed.
- If the hygrometer indicates a final reading of more than 70% when the initial reading of the atmospheric humidity was also greater than 70%, as can occur in coastal areas, then the following applied:
  1. If the final reading is significantly higher than the initial reading, then the sub-floor must be considered to be unacceptably damp.
  2. If the final reading is similar to, or less than the initial reading, then the moisture content of both the atmosphere and the sub-floor are similar.

## 2.2 TRAMEX CONCRETE MOISTURE ENCOUNTER (C.M.E.)

Any reading on the C.M.E. of 60% or less indicates acceptable moisture content for the installation of any vinyl floor covering.

## 3. Floor Preparation – New and Existing (old) Screeds

3.1 Use of screed smoothing compounds should be avoided except for making minor repairs, however should a full skim be required, then the most common method in both instances is the use of a smoothing compound e.g. **Pavelite** in combination with **Pavelite Bonding Liquid**, mixed to the correct ratio and consistency. Only recommended products, mixed strictly in accordance with manufacturers instruction should be used. Do not use smoothing compound on power floated finishes. It is recommended that in new structures the screeding should be as specified by "Tal" using "Screedmaster", the pumped method.

A badly undulating floor may require grinding by mechanical means to improve the overall levelness. Although smoothing compounds such as **Pavelite** will improve the sub-floor it will not achieve perfection.

3.2 In cases where old vinyl floor coverings have been uplifted, leaving a bitumen adhesive residue, it is recommended that a strict procedure relating to the "Preparation of Sub Floors with Bitumen Residue", be complied with.

(This method may not constitute good flooring practice, but has proved to be successful on many occasions. No guarantee is however given or implied).

## 4. Construction joints (saw cuts) and Expansion Joints

4.1 Construction joints (saw cuts) in the sub-floor should be cleaned out, and the sides of the saw cut be painted with **Pavelite Bonding Liquid** and allowed to dry. The joint should then be filled with a mixture of **Pavelite** and **Pavelite Bonding Liquid**. It is advisable to slightly overfill the joints, which when dry should be rubbed down with a carborundum stone.

4.2 Expansion joints should be filled with a suitable **Sealant** to prevent the ingress of dirt. It is **bad flooring practice to lay flooring over such a joint**. The flooring should stop at the edge of the joint and cover strips placed over the joint itself. Expansion joints and cover strips should be discussed and designed by a structural engineer.

5 Correct setting out is critical, and consideration should be given to the squareness of the area. It is safest to set out from the longest outside wall.

5.1. The recommended notching for a trowel to spread adhesive is a V notch of 1,5 x 1,5 x 1,5mm at 4,00mm centres. Consideration should however be given to the porosity of the sub-floor. Ensure the use of the recommended adhesive with the appropriate flooring. **Do not** spread the adhesive over a larger area than can be covered within the working/open time of the adhesive.

5.2 All installations must be rolled with a 68kg three sectional articulated metal floor roller on completion, within the working time of the adhesive.

5.3 Welding of sheeting is to be done only after 24 hrs after installation.

### 5.3. a. Trimming

While the welding rod is still warm, trim off most of the top half using a sharp spatula and spatula guide which fits over the welding rod. Carry out the final trimming using the spatula knife only, when the welding rod has cooled.

### 5.3.b Glazing

The trimmed welding rod will tend to soil more rapidly than the sheeting. It is therefore important to glaze the surface of the trimmed welding rod.

6. After installation the flooring should be adequately protected, preventing damage caused by other trades working on the site.

7. The completed floor should not be washed or polished for a period of 72 hours after the installation in order to allow the adhesive to cure. This period will vary from one adhesive to another.

7.1 The vinyl floor covering must be cleaned with an approved water based floor Stripper, in order to achieve an acceptable standard of cleanliness for sealing. Avoid excessive use of water at all times

7.2 Foreign matter such as paint stains, tar, etc. which may not respond to the process must be removed by other means.

7.3 Three coats of a Water Based Emulsion floor dressing, shall then be applied on completely dry surface in accordance with the manufacturer's instructions, allowing one hour drying time between the first and second application of each dressing coat.

**RATES:** —for all floor coverings are to include for laying as described, for cleaning down backing surfaces before laying and or all square and raking cutting and waste and fitting, fair cutting at edges where no skirting occurs, protecting from injury, and for cleaning down, etc. as described, at completion.

Rates for all wall linings are to include for laying as described, cleaning down backing surfaces before laying, sizing backing surfaces if necessary to ensure proper adhesion, all square and raking cutting and waste and fitting, fair cutting at exposed edges, bending at angles and for all narrow widths and protecting from injury and cleaning down, etc. as described, at completion. Wall linings in widths not exceeding 300mm to returns, reveals and the like have not been measured separately, but have been included in the area of the general items of wall linings and rates must include or this.

Rates for skirting, stair nosing, edging strips, etc. is to include for fixing as described, cutting to lengths and fitting at intersections, mitres, ends, etc. and for cleaning down at completion.

## 9. IRONMONGERY

Ironmongery is to be to the approval of the Department and rates are to include for fixing screws of corresponding metal and finish and for oiling and easing as required at completion.

Where catalogue references are given, the articles are to be of the brand specified or other approved.

No two-lever mortise locks are to be used.

Mortise locks, cylinder locks, cupboard locks, etc. are to differ so that no key will pass a second lock, unless otherwise specified. Where mortise locks, cylinders, locks, etc. are specified to be "en-suite" they are to be made "en-suite" in the specified number of "suites". The "suites" are to be controlled by differing sub-master keys with a grand master key controlling all "suites", and no sub-master is to pass any lock of another "suite".

All locks are to be fitted with two keys and the locks are to be stamped with consecutive numbers and the keys to each are to be stamped to correspond with the lock.

Items of ironmongery specified as chrome plated or satin chrome finish are, unless otherwise specified, to be chromium plated or satin chrome finish on solid brass.

Items of ironmongery specified aluminium are to be natural anodised.

Where items of ironmongery are specified as fixed to pressed steel door frames, the Contractor is to ensure that the suppliers of the steel frames prepare the frames for all keeps and do all mortising and drilling required and receive all information necessary regarding ironmongery. Preparation of steel doorframes for ironmongery has been measured elsewhere.

Where tests of ironmongery are described as "plugged and screwed" these are to be screwed to patent fixing plugs of approved manufacture, and this shall include for plugging and screwing to brickwork or concrete.

Key tags are to be 40mm diameter x 3mm thick plaster of approved colour, engraved on face with the required number of letters and numerals finished in an approved colour, and the tag is to be holed for and fitted with a steel split ring and fixed to key.

Engraved plastic door signs and numeral plates are to be of 5mm thick clear plastic with square polished edges all round with an approved coloured background and sans-serif letters and numerals as described in the items, reverse engraved in the plate with splayed sides and flat reading face and finished in an approved contrasting colour. Each sign is to be twice drilled for and fixed to softwood or hardwood, unless otherwise described, with chromium plated round beaded brass screws. Unless otherwise described, the signs are to be 50mm high with 30mm high, engraved letters or numerals and are to allow a minimum margin of 25mm at both ends. All signs are to be equal to sample to be submitted to and approved by the Department.

Pictorial plastic signs are to be of 5mm thick clear plastic of the sizes stated in the items with square polished edges all round and with the silhouette described in the items applied to the back of the plate by means of the silk screen process in an approved colour and the whole back of the plate finished in an approved contrasting colour. Each sign is to be four times drilled and fixed to softwood or hardwood, unless otherwise described, with chromium plated round-headed brass screws. All signs are to be equal to sample to be submitted to and approved by the Department.

## 10. **STRUCTURAL STEEL WORK**

**GENERALLY:** — The fabrication, assembly and erection of structural steelwork is to be executed in accordance with SANS Specification 1200H — Structural Steelwork (a copy of which the Contractor will be required to keep on site so that it can be referred to at all times during the Contract) with the following amplifications and amendments: —

**INTERPRETATIONS:** — Clauses 2.1 and 2.2 refer. This preamble, together with any other supplementary preambles appearing in these Bills of Quantities shall be deemed the project specification and are the "Portion 2" referred to in Clause 2.2.

**DEFINITIONS:** — Clause 2.3 of SANS Specification 1200H refers. All references to the Engineer shall be deemed to mean the Department.

**SUB-CONTRACTORS:** — The Contractor shall either (a) have adequate satisfactory and approved experience in this type of work or (b) employ an approved specialist structural steelwork Sub-Contractor. The Contractor, in the case of (a), or the specialist Sub-Contractor, in the case of (b), shall employ at all stages of the Works both on and off site a competent Supervisor experienced in the work.

**MATERIALS:** — Unless otherwise shown on the drawings or hereunder, all rolled sections shall be hot rolled mild steel, and all materials shall comply with one of the following: —

- a) Weldable Structural Steels to SANS 4360.
- b) Hollow sections to SANS 4848 Part 2 and SANS 6323.
- c) Cold rolled sections to SANS 2994.
- d) Black bolts and nuts to SANS 135.
- e) Precision bolts and nuts to SANS 136.
- f) High-strength friction-grip bolts and nuts to SANS 1282.
- g) Flat and tapered washers to SANS 1149.
- h) Electrodes for welding to SANS 455.

**SHOP DETAIL DRAWINGS:** — The Contractor shall prepare shop detail drawings, in conformity with the details shown on the structural steelwork drawings and to show all information necessary for complete fabrication, assembly, erection and painting. In the preparation of the shop detail drawings the Contractor is to comply with the requirements of SANS Code of Practice 0162.

The cost of preparing all necessary shop detail drawings and copies thereof is to be allowed for by the Contractor in his rates.

The Contractor shall submit two copies of his shop detail drawings to the Department for approval at least 10 days before fabrication of the member concerned is due to commence. Such approval does not imply that a complete and comprehensive check of the detail drawings has been carried out, and the Contractor shall remain responsible for ensuring that the steelwork is correctly fabricated, assembled, erected and painted.

**SUBSTITUTION OF SIZES, ETC.:** — No substitution of sizes or joints additional to those shown on the drawings shall be made without the prior approval of the Department. Except in cases of proven non-availability of materials specified, any additional costs involved due to substitution shall be for the Contractor's account.

**FIXINGS:** — The positions and manner of fixing the hangers for suspended ceiling air-conditioning ducts, pipe installations, etc. to the structural steelwork are to be approved by the Department before work on such installations commences.

### **FABRICATION, ASSEMBLY AND ERECTION**

**Welding:** — shall be carried out in accordance with SANS Code of Practice 044 and the relevant recommendations of SANS Code of Practice 0162 and SANS 5135, and in any case of conflict, the SANS Codes of Practice shall be deemed as binding.

All welders employed on the Works shall be currently classified at least as grade 2 welders as defined by SANS Code of Practice 044. Should the Department so request, proof of the classification shall be produced.

Unless otherwise specified all welds are to be continuous fillet welds of 6mm leg length or not less than the thinnest plate or section being welded.

**Handling, Storage and Erection:** — of members is to be undertaken in such a manner to prevent overstress or damage. Should overstress or damage occur, the Department shall be informed and his instructions sought.

Storage shall be arranged such that damage to applied finishes is prevented.

All plant and equipment used in the erection of structural steelwork shall be adequate in every respect. The Contractor shall allow in his rates for all necessary temporary bracing, and for maintaining and finally removing such temporary bracing.

**Fixing of Bolts, etc.:** — Unless approved by the Department, no pre-drilled fixings for bolts, etc. will be permitted through hollow section members. Any hollow section member that has been drilled or punctured in any way shall be considered condemned and must be replaced to the satisfaction of the Department.

### **INSPECTION AND TESTING**

**Facility for Inspection:** — The Contractor shall afford to the Department all reasonable access to inspect the steelwork at any stage of its fabrication, and shall give due notice before delivery of steelwork to the site to allow inspection and tests to be conducted if so required by the Department.

**Cost of Tests:** — The cost of all tests required by the Department shall be borne by the Administration, except that the costs of the following tests shall be borne by the Contractor:-  
(a) Testing of welders and equipment  
(b) Such tests (including load tests) as may be necessary by failure on the part of the Contractor to meet the requirements of the specification.

**Procedure in the Event of Failure:** — In the event of a failure of a test, the Contractor shall

either replace the defective item or prove its sufficiency by means of a load test carried out in accordance with Appendix B of Chapter 6 of the South African Standard Building Regulations. If so required by the Department the Contractor shall also demonstrate by means of tests at his own cost that all like members meet the requirements of the Specification.

## **PRIMING OF STRUCTURAL STEELWORK**

### **General**

#### **(a) Painting conditions.**

No painting shall be undertaken when one or more of the following conditions exist: —

- (i) The atmospheric or steel temperature is below 10<sup>o</sup> C,
- (ii) The atmospheric or steel temperature is expected to fall below 7<sup>o</sup> C before the paint is dry,
- (iii) The atmospheric or steel temperature is high enough to cause damage to the paint film,
- (iv) In fog or mist,
- (v) The relative humidity is greater than 90 %,
- (vi) Surfaces are or will be wet or damp from rain or other causes,
- (vii) Surfaces are contaminated by dirt, dust, grease, oil or other matter detrimental to painting,
- (viii) Wind will deposit dust onto un-dried surfaces.

#### **(b) Extent of shop painting.**

All surfaces shall be primed as described in the shop except: —

- (i) Those to be encased in concrete which are to be left as prepared metal; unless otherwise specified
- (ii) Contact surfaces of high strength friction-grip bolt connections which are to be left as prepared metal
- (iii) Edges or faces yet to be welded which are to be left as prepared metal over sufficient width from the weld to avoid contamination of the weld or damage to the paint by the effect of welding.

#### **(c) Paint identification, storage and preparation.**

All paint shall be supplied in unopened original containers showing the manufacturer's name and trademark date of manufacture and the relevant SANS or other specification number.

No paint shall be used past its maximum life span but otherwise oldest paint shall be used first. Containers shall not be opened until required and opened containers shall be used before unopened containers

Before use, paint shall be thoroughly stirred and prepared in accordance with manufacturer's instructions.

#### **(d) Thinning.**

No paint shall be thinned except strictly in accordance with manufacturer's instructions.

#### **(e) Dry film thickness.**

Where not specifically later stated this shall be in accordance with manufacturer's instructions for spreading rates. A tolerance of approximately 10% of that thickness will be allowed.

#### **(f) Touching-up surfaces.**

Surfaces shall be protected against damage, but should this occur, then the paint shall be rubbed down over the damaged and surrounding area to a sound surface and then restored by re-applying the removed coat properly feathered in with the existing.

Upon completion of site connections, these connections shall be stripe painted with the specified primer before any further painting is carried out.

**Class P1 Preparation and Priming Coat:** — Unless otherwise specified, rates for structural steel-work are to include for Class P1 Preparation and Priming Coat as follows:-

(i) Surfaces are to be cleaned in accordance with SANS Code of Practice 064 to remove all rust, scale, grease, oil, etc. endeavouring to bring the surface to a bright metallic condition, and painted, unless otherwise specified, with one coat of red -oxide zinc chromate primer in accordance with SANS Specification 909 prior to despatch from the works.

(ii) Upon delivery to the site and again after erection any bared or damaged surfaces are to be made good with similar primer.

The Contractor is advised that the finishing coats of paint to be executed after the erection of the structural steelwork have been measured elsewhere.

**Class P2 Preparation and Priming Coat:** — Where specified, rates for structural steelwork are to include for Class P2 Preparation and Priming Coat as follows: —

(i) Surfaces shall be thoroughly cleaned by sandblasting to Swedish Standard SIS 055900 standard Sa 2½ to give minimum peak to valley profile of 50 micrometer when measured by SANS Draft Test Method No. 772.

(ii) Surfaces shall be blown thoroughly clean with compressed air and within four hours of sandblasting, one coat of "Plascon SN 162 Ironguard-4-Zinc" or other approved primer of minimum dry film thickness of 75 micrometer shall be applied by pressure pot spray system in accordance with the manufacturer's instructions in the shop.

(iii) Upon delivery to the site and again after erection, any bared or damaged surfaces are to be made good with similar primer.

The Contractor is advised that the finishing coats comprising one intermediate coat and one finishing coat of chlorinated rubber paint to be executed after the erection of the structural steelwork have been measured elsewhere.

**Class P3 Preparation and Priming Coat:** — Where specified, rates for structural steelwork are to include for Class P3 Preparation and Priming Coat as follows: —

(i) Surfaces shall be thoroughly cleaned by sandblasting to Swedish Standard SIS 055900 standard Sa 2½ to give maximum peak to valley profile of 50 micrometer when measured by SANS Draft Test Method No. 772.

(ii) Surfaces shall be blown thoroughly clean with compressed air and within four hours of sandblasting, one priming coat of "Epidermix 352" or other approved epoxy coal tar of minimum dry film thickness of 75 micrometer shall be applied in the shop.

(iii) Upon delivery to the site and again after erection, any bared or damaged surfaces are to be made good with similar primer.

The Contractor is advised that the finishing coat comprising a further coat of epoxy coal tar to be executed after the erection of the structural steelwork has been measured elsewhere.

**MEASUREMENT AND PAYMENT:** — The provisions and Clause 8 will **NOT** apply and the system of measurement which is adopted in these Bills of Quantities is the only system of measurement which will be recognised in this Contract.

**RATES FOR STRUCTURAL STEELWORK:** — Rates for structural steelwork are to include for all necessary cutting to lengths, splay cut ends, shaping, holing, tapping, threading, forging, turning, assembling, welding, and fixing in position.



## 11. METALWORK

**PROPRIETARY MATERIALS:** — Where proprietary materials are specified, the materials used are to be of the type, specified or other approved by the Department.

**RATES:** — for all metalwork, unless otherwise stated, are to include for cutting to length, shaping, turning, threading, forging, fitting, assembling, riveting, welding, welded running joints, filing smooth, also for all screws and holes and hoisting and fixing in position. All screwed work is to have full threads.

**WELDING AND BRAZING:** — Where items are described as welded or brazed, rates must include neat welding or brazing by experienced workmen using a recognised process and for cleaning and filing or grinding off smooth, all to approval. All welding is to be continuous unless otherwise described.

**SCREW FIXINGS:** — Where items are described as tap screwed, grub screwed, set screwed, etc. rates must include for the necessary screws, for drilling all components and for tapping the components where necessary to receive such screws.

**PIPE MEMBERS:** — All galvanized mild steel pipe members are to be “medium” pipes complying with SANS 1387. Diameters of pipes, unless otherwise stated, are normal internal diameters.

**PRIMING OF STEELWORK:** — All items of fabricated mild steel except where described to be galvanized, are to be cleaned in accordance with SANS Code of Practice 064 to remove all scale, rust, grease, oil, etc. endeavouring to bring the surface to a bright metallic condition, and painted, unless otherwise specified, with one coat of red-oxide zinc chromate primer in accordance with SANS Specification 909 prior to despatch from the works.

**GALVANISING OF STEELWORK:** — All steel surfaces described to be galvanized are to be thoroughly sand, grit or steel shot blasted to white metal in accordance with SANS Code of Practice 064 and fluxed ready for galvanising, and the completed unit is to be hot dip galvanized after fabrication in accordance with SANS Specification 763 for general applications on the relative thicknesses of metal.

The zinc coating shall be continuous and of even thickness over all surfaces entirely free of bare spots, dull, rough patches, blisters and other imperfections and shall show no signs of peeling. Where site welding has to be done, the welds are to be properly cleaned down and cold galvanized to the approval of the Department.

If requested by the Department, the manufacturer shall carry out tests to prove that the requisite mass / thickness of zinc coating is applied and that it is of uniform thickness. The tests shall be made by attaching a test piece of mild steel, approximately 250 x 25 x 6mm, by means of wire, to an article being galvanized, and subjecting the test piece to the same cleaning, fluxing and galvanising treatment as the article being galvanized, and at completion, the test piece tested by a method approved by the South African Bureau of Standards, the cost of which will be borne by the Contractor.

**CHROMIUM PLATING OF STEELWORK:** — All items of fabricated mild steel described to be chromium plated are to be properly de-greased, cleaned and polished perfectly smooth before plating and all in accordance with SANS Specification 728. All items are to be first nickel-plated then chromium plated to provide a bright mirror finish and all plating is to be equal to sample to be submitted for the necessary approval by the Department.

**PRESSED STEEL DOOR FRAMES:** — shall be manufactured from mild steel sheet 1.60mm thick for single rebated frames and 1.20mm thick for double rebated frames. Rebates shall be suitable for 42mm thick doors and fanlights.

The sections are to be accurately bent to form the profiles. Corners are to be mitred and welded and reinforced at back with 1.60mm thick steel angle sections. Transoms for

fanlights are to be let into the jambs and welded. All welds are to be solid and cleaned off flush, leaving a perfect outside finish.

Each frame is to be fitted with one pair of sturdy angle or channel section tie bars at base, welded below the frame, and where required for additional strength, cross struts of the same section are to be welded between and at right angles to the main tie bars. Each frame is also to be fitted with one 'diagonal brace as temporary support, standard 230mm long corrugated adjustable building-in lugs at jambs, three rubber shock absorbers in rebate of lock jambs of frames for single doors and one rubber shock absorber, for each leaf in the rebate of the head or transom of frames for double doors.

All frames are to be primed on all surfaces with an approved red oxide zinc chromate priming coat in accordance with SANS Specification before leaving the manufacturer's works, unless specified to be hot dip galvanized, and rates are to include for touching up where necessary with similar primer after building in.

Where frames are specified to be galvanized they are to be hot dip galvanized after manufacture in accordance with the relevant provisions of SANS Specification 763 for general applications on the relative thicknesses of metal.

Frames, unless otherwise described, are to be fitted with one and a half pairs of 100mm five-knuckle loose pin steel hinges, unless otherwise specified for each door or each leaf of double door and with one pair of 75mm five-knuckle loose pin steel hinges for each fanlight. The three-knuckle leaf of each hinge is to be welded into the frame or transom.

Where frames are described to be fitted with brass butts, the frames are to be checked out and fitted, unless otherwise specified, with one and a half pairs of 100mm double bronze washered brass butts for each door or leaf of double door, unless otherwise described, as one pair of 75mm brass butts for each fanlight, with open leaf of each butt secured to the frame or transom by means of 6mm diameter countersunk headed brass set screws screwed to and including a 3mm thick steel backing plate of suitable size welded to frame or transom and drilled and tapped to receive the set screws.

Where frames are described to be fitted with aluminium hinges the frames are to be checked out for and fitted, unless otherwise specified, with one and a half pairs of 100mm five-knuckle aluminium hinges of 6082 alloy with nylon bushes for each door or leaf of double door, unless otherwise described, and one pair of similar hinges to each fanlight, with the three-knuckle leaf of each hinge secured to the frame or transom by means of 6mm diameter countersunk headed stainless steel set screws screwed to and including a 3mm thick steel backing plate of suitable size welded to frame or transom and drilled and tapped to receive the set screws.

Where frames are to be prepared for the top centres of floor spring hinges, a 6mm thick steel backing plate of suitable size is to be welded into the back of the frame and drilled and tapped to receive the fixing screws of the top centre.

The preparation of frames or all items of ironmongery, other than butts, has been measured separately and the rates against these items are to include for all drilling, mortising, tapping for screws, etc. required for the fixing of keeps, brackets, etc. of the items of ironmongery described. Preparation of frames for locks and latches is to include, in addition to the above, for recessing and fitting the frames with and including standard keeps and adjustable striking plates to suit the types of locks and latches used and with totally enclosed mortar guards 1, 15 metre high above finished floor.

Door and fanlight sizes are given to the nearest 10mm. The building in of frames has been measured separately.

**STAINLESS STEEL DOOR FRAMES:-** shall be manufactured from grade 304 stainless steel sheet 1.60mm thick for single and double rebated frames to profiles as per detailed drawings. Rebates shall be suitable for 42mm thick doors and fanlights. Stainless steel

frames to be used only in Patient Treatment facilities.

**PRESSED STEEL CUPBOARD DOOR FRAMES:** — shall be manufactured from 1.20mm thick mild steel sheet standard sections, having rebates for 42mm thick doors, and fitted with transoms and/or mullions where required and with sill section allowing the cupboard doors to be taken down to general floor level with the floor level inside cupboards not less than 12mm above general floor level. The frames are to be 102mm wide overall.

The sections are to be accurately bent to form the profiles. Corners are to be mitred and welded and reinforced at back with 1.60mm thick steel angle sections. Transoms, mullions and sills are to be neatly fitted at intersections and welded. All welds are to be solid and cleaned off flush, leaving a perfect outside finish.

All frames are to be fitted with rubber shock absorbers to the lock jambs of single doors, and to the head, transom and sill of double doors. Each door is to be fitted with standard corrugated adjustable building in lugs at jambs.

All frames are to be primed on all surfaces with an approved red-oxide zinc chromate priming coat in accordance with SANS Specification 909 before leaving the manufacturer's works, unless specified to be hot dip galvanized, and rates are to include for touching up where necessary with similar primer after building in.

Where frames are specified to be galvanized they are to be hot dip galvanized after manufacture in accordance with the relevant provisions of SANS Specification 763 for general applications on the relative thicknesses of metal.

Frames are to be fitted with one pair of 100mm five-knuckle loose pin steel hinges for each lower door or each leaf of lower double door and with one pair of 75mm five-knuckle loose pin steel hinges for each upper door or each leaf of upper double door. The three-knuckle leaf of each hinge is to be welded into the frame or mullion. Frames for single cupboard doors shall be prepared for locks or catches as specified and the frames for double doors are to be prepared for two barrel bolts for the first closing leaf of lower doors and one barrel bolt for the first closing leaf of upper doors.

Overall sizes are given to the nearest 10mm. Building in of the frames has been measured separately.

**STEEL WINDOWS AND DOORS:** — shall be in accordance with SANS Specification 727 and the frames are to be provided with fixing lugs or are to be holed for screwing as required.

Industrial type windows are to be suitable for glazing from the inside and all other windows from the outside, unless otherwise described.

Side hung and vertically pivot hung sashes shall open to at least 90 degree horizontally pivot hung sashes to at least 80 degree and bottom hung sashes to 30 degree. Unless otherwise stated, hinges for side hung opening out sashes are to be of the projecting type for easy cleaning.

All opening sashes are to have polished brass furniture.

The transoms and mullions of all purpose-made windows and doors are to be equally spaced between the outer frames of the windows and doors to form openings of equal size. Where this is not the case either the width or the height of the opening is stated, unless otherwise stated, the fixed lights and sashes of all purpose-made windows are to be in one square and the sashes and doors are to open out.

Windows and doors, unless otherwise specified, shall be of "one piece" construction. Composite windows and doors are to be supplied complete with all necessary standard coupling transoms or mullions.

Stock and purpose made residential type steel windows and school type windows of residential section shall be constructed of standard 25mm steel sections and of metal not less than 3mm thick.

Stock and purpose made industrial type steel windows shall be constructed with main frames of standard 35mm steel sections and of steel not less than 3mm thick, with sashes of standard 25mm steel sections and of steel not less than 3mm thick.

"Universal" sections, where specified, shall be not less than 33mm wide (measured over one opening section only) and of metal not less than 4mm. thick, and with all sight lines maintained (whether consisting of all fixed lights, all opening sashes, or portions of both) and with all glass in the same plane.

Stock and purpose made steel doors, sidelights and fanlights, shall be constructed with the doors of "Universal" sections as before described and the sidelights and fanlights of standard residential sections as before described. Bottom openings in doors and sidelights shall be fitted with kicking plates of one thickness of 1.60mm mild steel sheet fixed with metal beads. Frames of outward opening doors shall be fitted with bottom sills of door framing section (stepped sills) and of inward opening doors with metal ties welded to frames for embedding in threshold (flush sills)

**Top Hung Sashes:** — are to open out on a pair of steel hinges having brass pins and washers and fitted with brass peg stay, steel peg and locking bracket.

**Outward Opening Side Hung Sashes:** — are to open out on a pair of steel projection hinges having brass pins and washers and fitted with brass two-point handle and brass striking plate and brass sliding stay with friction fastener.

**Inward Opening Side Hung Sashes:** — are to open in on a pair of steel hinges having brass pins and washers and fitted with brass single point handle and steel engaging hook and brass sliding stay with friction fastener.

**Bottom Hung Sashes:** — are to open in on a pair of steel hinges having brass pins and washers and fitted with steel concealed side arms with brass guides and brass spring catch for long arm or hand operation and steel catch plate.

**Horizontally Pivot Hung Sashes:** — are to have brass adjustable friction ring centres and fitted with brass spring catch for long arm or hand operation and steel catch plate.

**Projected Out Sashes:** — are to be balanced on steel concealed side arms, the top of the sash fitted with spring loaded brass shoes to slide in brass guides and fitted at bottom with brass handle and brass striking plate.

**Doors:** — are to be hung on one and a half pairs per leaf of steel projection hinges with brass pins and washers and fitted with mortise lock set as specified, and each lock is to be provided with two keys.

Brass concealed bolts are to be fitted at top and bottom of meeting edge of first closing leaf of double doors. Sidelights and fanlights are to be hung as described for windows.

**Adjustable Louver Sets:** — are to be natural anodised aluminium louver sets of approved manufacture consisting of head and sill weather strips complete with neoprene gaskets and two jamb strips each fitted with louver brackets with spring loaded clips for the specified width of glass louver blades complete with tilt bars and operating lever handles. Where openings are not of a height to suit standard width louver blades an alternate head section with static clips must be provided to take a fixed louver blade of the required width. The louver sets are to be screwed to the steel window frame with stainless steel self-tapping screws and all portions of the louver set which come in contact with the window frame are to be insulated with approved pressure sensitive PVC tape to prevent electrolytic corrosion.

**Burglar Bars:** — are to be standard type burglar bars formed of 20 x 5mm mild steel bars riveted at intersections and riveted at ends to the window frames. The burglar bars to the small-pane type windows are to line through with the glazing bars and windows of the horizontal-pane type or of the no-glazing bar type are to be fitted with burglar bars which are divided as for the small-pane type window.

**Fly screens:** — are to be standard type fly screens suitable for residential opening-out type steel windows, unless otherwise described, and are to be constructed of stove enamelled pressed steel frames fitted with 0.25mm thick mosquito-proof mesh glass-fibre gauze. The fly screens are to be clipped onto the inner face of the steel window after all painting is completed.

All steel windows and doors are to be primed on all surfaces with an approved red oxide zinc chromate priming coat in accordance with SANS Specification 909 before leaving the manufacturer's works, unless specified to be hot dip galvanized, and rates are to include for touching up where necessary with similar primer after building in.

Where steel windows and doors are specified to be galvanized they are to be hot dip galvanized in accordance with the relevant provisions of SANS Specification 763 for general applications on the relative thicknesses of metal.

Loose metal glazing beads, where specified, are to be of an approved type and size, and are to be fixed with screws set in the correct positions for the type of glazing to be used, and neatly mitred at angles.

Immediately the windows and doors have been delivered on site, they are to be thoroughly overhauled and all necessary adjustments or repairs are to be made before they are fixed in position. A further inspection is to be made after building in and any further servicing required must be carried out in order to leave windows and doors in a satisfactory condition after glazing is completed.

All glass and glazing has been measured elsewhere.

Sizes of windows and doors are given to the nearest 10mm. The building in of windows and doors has been measured separately.

**STAINLESS STEEL:** — is to be of the thickness and grade specified and unless otherwise stated is to be buffed to an even satin finish to the approval of the Department.

All welding to stainless steel shall be by argon arc process and where filler rods are used these are to have properties not less than those of the parent metal. All welds are to be ground off smooth and uniform and the whole buffed to an even finish all over. Stainless steel is to be cut and bent in such a manner that a minimum of welding is required.

Where bending is required, all external angles are to be arras rounded and all internal angles are to be radiused.

All stainless steel work is to be of the highest quality and executed by specialists in this type of work and to the approval of the Department.

**Note that where stainless steel fittings are specified and support work or fixings with bolts, nuts, rivets, etc, are required / specified, these fixings and support work are to be of stainless steel of the same rating / grade as the equipment specified.**

**ALUMINIUM AND ANODISED ALUMINIUM:** — is to be of the brand specified or other approved and of 6063-TF or equivalent quality and temper.

Aluminium bars and sections shall comply with the relevant clauses of SANS 1476, extruded tube and hollow sections with the relevant clauses of SANS 1474, and sheet and

strips with the relevant clauses of SANS 1470. All alloys to be anodised are to be of anodising quality.

Aluminium is to be free from flaws, hammer and die markings or other imperfections.

Anodising of aluminium is to be carried out in accordance with SANS Specification 999 by an approved process. The average anodic film thickness shall be 25 micrometer, and at no point should the anodic film thickness fall below 22 micrometer or be thicker than 30 micrometer.

Prior to anodising, all surfaces are to be de-greased and cleaned, all irregularities removed and flushed off smooth and buffed where necessary.

All anodised aluminium must be coated with a suitable "non-yellowing" methylacrylate lacquer film, approved by the Department, over the entire surface. The lacquer film must be continuous and of a uniform average thickness not less than 10 micrometer. The lacquer thickness must be determined by use of a film meter or other instrument methods as described in ASTM B244-49T. Rates for anodised aluminium must include for this protective coating.

Before the work is put in hand, samples of finish are to be submitted to the Department for approval, and all finished work is to be equal in all respects to the approved samples.

The Contractor shall provide all samples required for testing in accordance with SANS Specification 999. If required, tests on the anodic film are to be carried out at the works of the anodised to verify that the work conforms to SANS Specification 999, the cost of which will be borne by the Contractor.

The surfaces of all aluminium which are jointed to or are in contact with other materials when fixed, particularly ferrous metals, are to be suitably insulated to prevent electrolytic corrosion.

Joints in all aluminium members are to be neatly formed in an approved manner with screw heads, pins, rivets, etc. concealed so that the joints are practically invisible. Screw or bolt jointing is to be kept to a minimum and will be permitted only when welding is impracticable. Unless otherwise described, stainless steel screws or bolts are to be used for jointing and fixing aluminium work. Welded joints are to be formed by argon arc process using SANS 1476/NS6 welding rods and finished off smooth.

Welding is to be executed in such a manner as not to affect the colour of the material or the anodic coating.

Exposed heads of screws, pins, rivets, etc. in coloured anodised aluminium are to be touched up with enamel paint to match the coloured anodised finish.

No deviation may be made from the general requirements or dimensions, but improvements in the general construction and design affecting neatness, strength or durability may be introduced. If any deviation is proposed, the Contractor must submit detailed drawings showing the particular construction and form or section he proposes to use and such drawings, details and samples of fittings, etc. are to be approved by the Department before manufacture is commenced and every facility must be given for the work to be inspected during manufacture.

No work may be fixed in position until it has been inspected and approved. Anodised aluminium work must be erected as near to the end of the Contract period as possible, to minimise the danger of damage or deterioration.

All work is to be suitably protected during building operations and left in a clean and satisfactorily finished condition on completion. In particular, all anodised aluminium work must be protected against damage, and against deterioration or discolouration caused by

mortar droppings, wax, paint, etc. all to the entire satisfaction of the Department. All work so damaged, deteriorated or discoloured must be replaced at the Contractor's expense.

Rates for aluminium work are to include for necessary cutting to lengths, shaping, turning, threading, forging, fitting, assembling, riveting, welding, welded running joints, filing smooth, also for all screws and holes and hoisting and fixing in position. All screwed work is to have full threads.

**ANODISED ALUMINIUM WELDED WINDOWS AND DOORS:** — are to be of an approved manufacture and design.

Windows and doors are to be fabricated from Medium Universal equal leg sections, unless otherwise specified, measuring 33mm over one opening section and not less than 4mm thick through the flanges and not less than 4.75mm through the web, unless otherwise stated.

The aluminium sections are to be of approved manufacture and of 6063-TF or equivalent quality and temper and are to be anodised after manufacture to the approval of the Department. Welds are to be electrically flash butt resistance welded, properly ground and cleaned off to give a uniform appearances.

Anodising, etc. is to be carried out as before described.

All windows and doors are to be suitable for internal glazing and are to be fitted with approved anodised aluminium glazing beads of the "clip on" type. Drilling for the fixing of glazing beads is to be done to suit the thickness of the glass used.

The frames are to be perfectly flat, square, butt-welded at joints (mechanical joints will not be permitted) and all opening sashes must fit perfectly on all faces and open or close freely without binding at any point. The glazing bars must be continuous with continuous intersections (mitred intersections will not be permitted) with ends scribed and fitted to the frames with shouldered ends passed through and riveted over. The sight lines of the main frame, whether consisting of all fixed lights, all opening sashes or portions of both and the glass plane must be the same throughout each window.

Weathering on sections is to be solid extruded with the sections (screwed or riveted on strips will not be permitted) except weather bars to sills of inward opening sashes which must be welded on and not screwed or riveted except in the approved designs of built-up transoms.

No steel is to be used in the manufacture of the windows unless it is stainless steel of quality to A.I.S.I. Type 316. All fittings, butt hinges, screws, nuts, bolts, etc. are to be of high quality aluminium or other approved non-corrosive material compatible with aluminium and of sufficient strength to perform the functions for which they are used. The handles, sliding stays and peg stays are to have nylon washers, bushes and pressure pads and are to be secured to the frames with screws having riveted ends. Pop rivet fixings will not be permitted.

The transoms and mullions of all purpose-made windows and doors are to be equally spaced between the outer frames to form openings of equal size. Where this is not the case, either the width or the height of the opening is stated. Unless otherwise stated, the fixed lights and sashes of all purpose-made windows and doors are to be in one square and the sashes and doors are to open out.

Frames must be provided with suitable fixing lugs bolted on to frame with aluminium alloy bolts or are to be holed for screwing as required with lugs or holes spaced one near top, one near bottom and not more than 750mm apart intermediately each side of frame. Frames more than 900mm wide are to be provided with similar fixings to top and bottom and not more than 750mm apart.

All composite windows, doors, etc. are to be supplied with suitable and approved coupling mullions or transoms. Rectangular hollow section transoms where specified are to be